	Course Title: **STRENGTH OF MATERIALS**		
	Scheme (L:T:P) : **4:0:0**	Total Contact Hours: **52**	Course Code: **15ME31T**
	Type of Course: **Lectures, Self Study & Quiz**	Credit :**04**	Core/ Elective: **Core**
CIE- 25 Marks			SEE-100 Marks

Prerequisites: Knowledge of basic mathematics and Science.

Course Objectives: It aims at enabling the student to understand & analyze various types of loads, stresses & strains along with main causes of failure of machine parts.

1. The subject is pre-requisite for understanding principles of Machine design.
2. Understanding mechanical properties of materials will help in selecting the suitable materials for various engineering applications

On successful completion of the course, the students will be able to attain CO:

	Course Outcome	**CL**	**Linked PO**	**Teaching Hrs**
CO1	Understand and distinguish the behavior of simple load carrying members subjected to an axial, shear and thermal Loading.	*R/U/A*	1,2,3,9	**14**
CO2	Interpret the Variation of moment of inertia for different Mechanical Engineering Sections such as fly wheel	*R/U/A*	1,2,4,9	**10**
CO3	Draw and Compare the shear force and bending moment diagram on beams under varying load conditions.	*R/U/A*	1,2,4,9	**12**
CO4	Assess Bending and shear stresses in beams subjected to different loadings for different machine parts	*R/U/A*	1,2	**07**
C05	Differentiate in strain energy stored in a body when the load is suddenly applied and gradually applied	*U/A*	1,2	**03**
C06	Design simple solid and hallow shaft for power transmission keeping view of Environmental and sustainability aspects	*R/A*	1,2,6	**06**
		Total sessions		**52**

Legend: R; Remember, U: Understand A: Application

COURSE-PO ATTAINMENT MATRIX

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
STRENGTH OF MATERIALS	3	3	1	3	-	1	-	-	3	-

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.

Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.

If >40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3

If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2

If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1

If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

COURSE CONTENT AND BLUE PRINT OF MARKS FOR SEE

Unit No	Unit Name	Hour	Questions to be set for SEE			Marks weightage	weightage (%)
			R	U	A		
1	SIMPLE STRESSES AND STRAINS	14	05	05	20	30	21
2	MOMENT OF INERTIA	10	05	05	20	30	21
3	SHEAR FORCE AND BENDING MOMENT	12	05	05	20	30	21
4	THEORY OF SIMPLE BENDING	07	05	05	20	30	21
5	STRAIN ENERGY AND IMPACT LOADING	03	-	05	05	10	06
6	TORSION OF CIRCULAR SHAFT	06	05	--	10	15	10
	Total	52	25	25	90	145	100

Legend: R; Remember, U: Understand A: Application

UNITI: SIMPLE STRESSES AND STRAINS   14 Hrs

Simple stresses & strains viz. tensile, compressive, Shear, Crushing, Thermal stresses, & corresponding strains,Hook's Law –Problems on Direct Stress & Linear Strain- Stress- Strain curve for Ductile material and Brittle material with all parameters.- factor of Safety. Elastic Constants - Lateral Strain ,Poisson's ratio, Bulk Modulus, Shear Modulus ,Volumetric Strain-Relation between elastic constants- Problems on elastic constants. Hoop stress-Longitudinal Stress in thin cylindrical & spherical shells subjected to internal pressure.-Problems on thin cylindrical shells.

UNITII: MOMENT OF INERTIA   10Hrs

Centre of Gravity, Moment of Inertia & its Importance -Parallel & Perpendicular Axis Theorem-C.G of Rectangle, Triangle, Circle, Semi-circle, Trapezium, Cone-Problems on

finding CG of T-Section, I-Section, L-Section, Channel-Section. Moment of Inertia of solid &Hollow sections like Rectangle, Triangle, Circle- Moment of Inertia about C.G for I section, T section. L-section and Channel Section.

UNTIII: SHEAR FORCE AND BENDING MOMENT DIAGRAMS   12Hrs

Definition - Shear Force and Bending Moment –Types of beams, types of load acting on beams ,Sagging & Hogging Bending Moment and its importance –sign convention to draw SFD and BMD- Concept of Maximum bending moment, Point of Contra flexure & its importance-Drawing S.F & B.M Diagram for Cantilever, Simply Supported Beams subjected to Point Load and U.D.L

UNIT IV:THEORY OF SIMPLEBENDING   07Hrs

Introduction, assumptions in theory of simple bending.-Bending stress, relation between bending stress & radius of curvature (without proof).-Position of neutral axis, moment of resistance-Bending equation (without proof)-Modulus of section for rectangular, hollow rectangular and hollow circular sections-Beams of uniform Strength-problems

UNIT V: STRAIN ENERGY AND IMPACT LOADING   03Hrs

Introduction -Strain Energy-Types of loading-Sudden, Gradual & Impact Load-resilience, proof resilience and modulus of resilience-Equation for strain energy stored in a body when the load is gradually applied and suddenly applied – problems.

UNIT VI: TORSION OF CIRCULAR SHAFT   06Hrs

Introductionto Torsion , Angle of Twist , Polar Moment of Inertia , Torsion equation-(without proof)-Assumptions in theory of Torsion -Power Transmitted by a shaft, axle of solid and hollow sections subjected to Torsion - Comparison between Solid and Hollow Shafts subjected to pure torsion- Problems. (No problem on composite and non homogeneous shaft)

TEXT BOOKS

1. Ramamurtham. S., *"Strength of Materials",* 14th Edition, Dhanpat Rai Publications, 2011
2. Khurmi R S, *"Applied Mechanics and Strength of Materials",* 5 Edition, S.Chandand company

REFERENCES

1. Popov E.P, *"Engineering Mechanics of Solids",* 2nd Edition, Prentice-Hall of India, New Delhi, 2002.
2. Nash W.A, *"Theory and problems in Strength of Materials",* Schaum Outline Series, McGraw-Hill Book Co., New York, 1995.

3. Kazimi S.M.A, *"Solid Mechanics"*, Tata McGraw-Hill Publishing Co., New Delhi, 2003.
4. Ryder G.H, *"Strength of Materials",* 3rd Edition, Macmillan India Limited, 2002.
5. Bansal R. K, *"Strength of Materials",* Laxmi Publications, New Delhi, 2012.
6. Timoshenko S.P, *"Elements of Strength of Materials",* Tata McGraw-Hill, Delhi,

LIST OF SOFTWARE/LEARNING WEBSITES

1. www.nptel.iitm.ac.in/courses/.../IIT.../lecture%2023%20and%2024htm

2. www.wikipedia.org/wiki/Shear_and_moment_diagram

3. www.freestudy.co.uk/mech%20prin%20h2/stress.pdf

4. www.engineerstudent.co.uk/stress_and_strain.html

5. https://www.iit.edu/arc/workshops/pdfs/Moment_Inertia.pdf

SUGGESTED LIST OF STUDENT ACTIVITYS

Note: The following activities or similar activities for assessing CIE (IA) for 5 marks (Any one).

1. Each student should do any one of the following type activity or any other similar activity related to the course and before conduction, get it approved from concerned Teacher and HOD.
2. Each student should conduct different activity and no repeating should occur

1	Calculate Moment of Inertia of Fly Wheel of engine present in your laboratory
2	Market Survey specific to properties of Various type of Materials used in Mechanical Engineering and make report
3	Compare the strength of solid shaft with that of hallow shaft for same power transmission for an automobile and make report

Course Delivery:
- The course will be delivered through lectures and Power point presentations/ Video.

- **MODEL OF RUBRICS /CRITERIA FOR ASSESSING STUDENT ACTIVITY**

RUBRICS FOR ACTIVITY(5 Marks)						
Dimension	**Unsatisfactory**	**Developing**	**Satisfactory**	**Good**	**Exemplary**	**Student Score**
	1	**2**	**3**	**4**	**5**	
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	Ex: 4
Fulfill 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	5
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.	3
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	2
Average / Total marks=(4+5+3+2)/4=14/4=3.5=4						

Note: This is only an example. Appropriate rubrics/criteria may be devised by the concerned faculty (Course Coordinator) for assessing the given activity.

Course Assessment and Evaluation Scheme:

	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment	CIE	IA	Students	Three IA tests (Average of three tests will be computed)	20	Blue books	1,2,3,4,5,6
				Student activities	05	Report/Log of activity	
	SEE	End Exam		End of the course	100	Answer scripts at BTE	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	1 & 2,3 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3,4,5,6 Effectiveness of Delivery of instructions & Assessment Methods

Note: I.A. test shall be conducted for 20 marks. Average marks of three tests shall be rounded off to the next higher digit.

Directorate Of Technical Education   Karnataka StateMECH   15ME31T

Note to IA verifier: *The following documents to be verified by CIE verifier at the end of semester*

1. Blue books(20 marks)
2. Student suggested activities report for 5 marks and should be assessed on RUBRICS
3. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods.

FORMAT OF I A TEST QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks		
Ex: I test/6 th weak of sem 10-11 Am	I/II SEM	Strength of Materials	20		
	Year:	Course code:15ME31T			
Name of Course coordinator : CO's:____			Units:__		
Question no	Question	MARKS	CL	CO	PO
1					
2					
3					
4					

Note: Internal choice may be given in each CO at the same cognitive level (CL).

MODEL QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks		
Ex: I test/6 th weak of sem 10-11 Am	III SEM	Strength of Materials	20		
	Year: 2015-16	Course code:15ME31T			
Name of Course coordinator :			Units:1, Co: 1,2,3.9		

Note: Answer all questions

Question no	Question	CL	CO	PO
1	Explain linear and lateral strain 3 MARKS	U	1	1,2,3,9
2	A bar of 30mm diameter is subjected to an axial pull of 80KN. The measured extension is 0.1 mm on a gauge length of 200mm and the change in diameter is 0.004mm. Calculate the poison's ratio and the values of young's Modulus, bulk modulus and Modulus of rigidity. 7 MARKS	A	1	1,2,3,9
3	A mild steel bar of 15mm diameter was subjected to tensile test. The test bar was found to yield at a load of 90KN and it attains maximum	A	1	1,2,

load of 180KN and ultimately fails at a load of 67.5 KN. Determine the following: tensile stress at the yield point, ultimate stress and stress at the breaking point, if the diameter of the neck is 7.5mm.

OR

A bar of steel 1m long 50mm wide and 10mm thickness is subjected to an axial load of 10KN in the direction of its length. Find the changes in length, width, thickness and volume.10 MARKS

3,9

MODEL QUESTION PAPER (SEE)
Diploma in Mechanical Engineering
III Semester
Course title: STRENGTH OF MATERIALS

(Answer any 6 questions from part A and Any 7 from Part B)

PART-A(Each questions carries 5 marks)
1. Define bulk Modulus and Shear Modulus
2. Explain thermal stress and Shear Modulus
3. State Parallel and perpendicular axis theorem
4. Locate CG for Triangle Rectangle, Circle, Semi-circle, Trapezium, Cone with the help of plain figure
5. Define Shear force and Bending Moment in beams
6. Explain Point of Contra flexure in a beam
7. List the aassumptions in theory of simple bending
8. Explain Beams of Uniform Strength
9. Explain Strain energy and Resilience

PART-B(Each questions carries 10 marks)
1. A steel rod 30mm x 12.5mm and 500mm long is subjected to a axial pull of 75KN. Determine the changes in length, width and thickness and volume of bar. If young's modulus is 200KN/mm^2.
2. A bar of 30mm diameter is subjected to an axial pull of 80KN. The measured extension is 0.1 mm on a gauge length of 200mm and the change in diameter is 0.004mm. calculate the poisson's ratio and the values of young's Modulus, bulk modulus and Modulus of rigidity.
3. An I section consists of top flange 100 X 30 mm, bottom flange 200 X 40 mm and web 180 X 20 mm. Find the M.I. about an axis passing through C.G. parallel to the base.

4. Calculate M.I. of an angle section 100 X 80 X 10 mm about an axis passing through the centroid and parallel to shorter leg.

5. A cantilever of length 3 m carries a uniformly distributed load of 1.5 KN/m for entire length and a point load of 2 KN at a distance of 1 m from the free end. Draw the shear force and the bending moment diagrams for the beam.

6. A simply supported beam of length 5 m carries point loads of 2 KN and 4 KN and 5 KN at a distance of 1 m, 3 m and 4 m from left support. Draw S.F. and B.M. diagrams for the beam.

7. A steel plate is bent into a circular arc of radius 10m. The plate is 100mm wide and 15mm thick, assuming the value of $E=2X10^5$ N/mm^2. Find the maximum stress induced in the plate and value of bending moment which produced this stress.

8. A simply supported wooden beam of span 1.3 m is carrying a central point load of 40 KN. If the allowable bending stress in the timber is taken as 8 N/mm^2, find the breadth and depth of the timber. Take b=0.6d.

9. (a).List the assumptions made in theory of Torsion   -5M

b)An axial pull of 25KN is suddenly applied on a steel rod of 3 m long and 900mm^2 in cross-sectional area. Calculate the strain energy stored in the rod. Take young's modulus is $2x10^5$ N/mm^2.   −5M

10. A solid circular shaft is required to transmit 80KW at 160 rpm. The permissible shear stress in the shaft is 60 N/mm^2. The maximum Torque transmitted exceeds the mean torque by 20% more than mean torque. The angle of twist is not to exceed 10 in a length of 20 times the diameter of the shaft. The valve of rigidity modulus is 0.8x10^5 N/mm2.

MODEL QUESTION BANK
Diploma in Mechanical Engineering
III Semester
Course title: STRENGTH OF MATERIALS

CO I: Understand and distinguish the behavior of simple load carrying members subjected to an axial, shear and thermal Loading.

LEVEL: REMEMBER QUESTIONS

1. Define Poisson's ratio and Modulus of Rigidity
2. Define bulk Modulus and Shear Modulus
3. Describe maximum stress and factor of safety

LEVEL: UNDERSTANDING QUESTIONS

4. Explain linear and lateral strain
5. Explain thermal stress and volumetric strain
6. Explain Hoop's stress and longitudinal stress in thin cylindrical shells
7. Explain thermal stress and Shear Modulus

LEVEL: APPLICATION QUESTIONS

8. Relate between elastic constants

9.Draw stress strain diagram for Ductile materials with all parameters

10.Draw stress strain diagram for Brittle materials with all parameters

11..A load of 5KN is to be raised with the help of a steel wire. Find the diameter of the steel wire, if the stress is not to exceed 100MPa.

12.A tensile test is performed on a brass specimen 10mm in diameter using a gauge length of 50mm. When applying axial tensile load of 25KN, it was observed that the distance between the gauge marks increase by 0.152mm, calculate modulus of elasticity of brass.

13.A punch with a diameter 20mm is used to punch a hole in an aluminium plate of thickness 4mm .If the ultimate shear stress for the aluminium is 275MPa, what force P is required to punch through the plate.

14.The following data pertains to a tension test conducted in laboratory:

 i. Diameter of the specimen = 15mm
 ii. Length of the specimen = 200mm
 iii. Extension under a load of 10 KN=0.035mm
 iv. Load at yield point = 110KN
 v. Maximum load = 190 KN
 vi. Length of the specimen after failure = 255mm
 vii. Neck diameter = 12.25mm

Determine: i) Young's modulus, ii) Yield stress iii) Ultimate stress, iv) Percentage elongation, v) percentage reduction in area, vi) safe stress adopting factor of safety of 1.5.

15.A rod of diameter 15mm and 50mm long is subjected to tensile load of 25KN. The modulus of elasticity for steel rod may be taken as 200 KN/mm^2. Find stress, strain and elongation of the bar due to applied load.

16.A rod of cross sectional area 15mm x 15mm and 1m long is subjected to a compressive load of 22.5KN. calculate the stress and decrease in length if young's modulus is 200GN/m^2.

17.A load of 4KN is to be raised with the help of a steel wire. The permissible tensile stress should not exceed 70N/mm^2. What is the minimum diameter of wire required? What will be extension for 3.5m length of wire? Assume young's modulus is 196.2 GN/m^2.

18.A mild steel bar of 15mm diameter was subjected to tensile test. The test bar was found to yield at a load of 90KN and it attains maximum load of 180KN and ultimately fails at a load of 67.5 KN. Determine the following: tensile stress at the yield point, ultimate stress and stress at the breaking point, if the diameter of the neck is 7.5mm.

19.The following data pertains to a tension test conducted in laboratory:

i.   Diameter of the specimen = 20mm
ii.   Gauge Length of the specimen = 100mm
iii.   Final length=130mm
iv.   Final diameter =11.5mm
v.   Yield Load = 92KN
vi.   Ultimate load = 165 KN

Determine: i) Yield stress ii) Ultimate tensile stress, iii) Percentage elongation, iv) percentage reduction in area.

20. A hallow steel column has to carry an axial load of 3MN. If the external diameter of the column is 300mm, find the internal diameter. The ultimate stress for steel is to be 480N/mm^2. Take factor of safety as 4.

21. A short column has an internal diameter of 200mm. What should be the minimum external diameter so that it may carry a load 1600KN with factor of safety 7.5. Take ultimate stress of steel as 472N/mm^2.

22. A steel rod 30mm x 12.5mm and 500mm long is subjected to a axial pull of 75KN. Determine the changes in length, width and thickness and volume of bar. If young's modulus is 200KN/mm^2.

23. A steel bar 2.4 long and 30mm square is elongated by a load 400KN. If poisons ratio is 0.25 find the increase in volume. Assume E=200KN/mm^2.

24. The young's modulus for a given material is 100KN/mm^2 and its modulus of rigidity is 40KN/mm^2. Determine its bulk modulus and also its lateral contraction if the diameter is 50mm and length 2m and extension 2mm.

25. A bar of steel 1m long 50mm wide and 10mm thickness is subjected to an axial load of 10KN in the direction of its length. Find the changes in length, width, thickness and volume.

26. A bar of 30mm diameter is subjected to an axial pull of 80KN. The measured extension is 0.1 mm on a gauge length of 200mm and the change in diameter is 0.004mm. calculate the poisson's ratio and the values of young's Modulus, bulk modulus and Modulus of rigidity.

CO 2: Interpret the Variation of moment of inertia for different Mechanical Engineering Sections such as fly wheel

LEVEL: REMEMBER

1. Define centre of Gravity and Moment of Inertia
2. State Parallel and perpendicular axis theorem

LEVEL: UNDERSTANDING

3. Locate CG for Triangle Rectangle, Circle, Semi-circle, Trapezium, Cone with the help of plain figure

LEVEL: APPLICATION

4. Determine the centroid of the T-section of a flange 100 X 10 mm. Also find the M.I. of the section about XX axis through centroid.
5. Find the centre of gravity of the I-section having top flange of 100 X 20 mm, web 120 X 20 mm and bottom flange 150 X 20 mm. Also find M.I. of the section about XX axis passing through C.G. of the section.
6. Find the C.G. of L-section of dimensions 100 X 80 X 20 mm. Also find the M.I. of the section through C.G. and parallel to shorter leg.
7. Find the moment of Inertia about the centroidal axis XX and YY of the T-section 160 mm wide and 160 mm deep. The flange and web thickness 50 mm each.
8. Find the M.I. about the centroidal XX axis parallel to the flange for the T-beam. Size of the flange120 X 20 mm, size of web 120 X 20 mm.
9. An I section consists of top flange 100 X 30 mm, bottom flange 200 X 40 mm and web 180 X 20 mm. Find the M.I. about an axis passing through C.G. parallel and perpendicular to the base.
10. Calculate M.I. of an angle section 100 X 80 X 10 mm about an axis passing through the centroid and parallel to shorter leg.
11. Calculate the C.G. and moment of inertia for a Channel section of size 100 X 100 X 20 mm about XX and YY axis.

C0 03: Draw and Compare the shear force and bending moment diagram on beams under varying load conditions.

LEVEL: REMEMBER

1. Define Shear force and Bending Moment in beams
2. Name the types of loads acting on beams with illustration

LEVEL: UNDERSTANDING

3. Explain Sagging and Hogging bending Moment
4. Explain Point of Contra flexure in a beam

LEVEL: APPLICATION

5. A cantilever beam of length 3m subjected to a point load of 5 KN, 8KN and 12 KN at a distance of 1m, 1.5m and 2.5m from the free end. Draw SFD and BMD.
6. A cantilever beam of length 4m subjected to a point load of 3 KN, 5KN and 8 KN and 10 KN at a distance of 1m, 1.5m and 3m and 3.5 m from the free end. Draw SFD and BMD.
7. A cantilever beam of length 3 m subjected to two point loads of 10 KN acting at the free end and 15KN at the middle of the beam. Draw SFD and BMD.
8. A cantilever beam 1.5 m long carries point loads of 1 KN, 2KN and 3 KN at 0.5 m, 1.0 m and 1.5 m from the fixed end respectively. Draw the SFD and BMD for the beam.
9. A cantilever beam of 1.4 m length carries a uniformly distributed load of 1.5 KN/m over its entire length. Draw S.F and B.M diagrams for the cantilever.

10. A cantilever AB 1.8 m long carries a point load of 2.5 KN at its free end and a uniformly distributed load of 1 KN/m from A to B. Draw the shear force and the bending moment diagrams for the beam.

11. A cantilever beam of 2 m length carries a uniformly distributed load of 1.5 KN/m over its entire length and also a point load of 3 KN at a distance of 0.5 m from the free end. Draw S.F and B.M diagrams for the cantilever.

12. A cantilever of length 2.5 m carries a uniformly distributed load of 2 KN/m for a length of 2 m from the free end and a point load of 2 KN at the free end. Draw the shear force and the bending moment diagrams for the beam.

13. A cantilever of length 3 m carries a uniformly distributed load of 1.5 KN/m for entire length and a point load of 2 KN at a distance of 1 m from the free end. Draw the shear force and the bending moment diagrams for the beam.

14. A cantilever 5 m long carries point loads of 30 KN and 10 KN at a distance of 1 m from the fixed end. In addition to this the beam carries a UDL of 10 KN/m between point loads. Draw shear force and bending moment diagrams for the cantilever.

15. A simply supported beam of length 6 m carries point loads of 2.5 KN and 4 KN at a distance of 2 m and 4 m from left support. Draw S.F. and B.M. diagrams for the beam.

16. A simply supported beam of length 5 m carries point loads of 2 KN and 4 KN and 5 KN at a distance of 1 m, 3 m and 4 m from left support. Draw S.F. and B.M. diagrams for the beam.

17. A simply supported beam of length 8m carries a UDL of 10KN/m for a distance of 6m from left support. Draw S.F and B.M diagram for the above beam. Also calculate the maximum B.M. on section.

18. A simply supported beam of length 8m carries two point loads of 30KN and 40KN respectively at a distance of 1.5m and 6.5m from the left support. Also it carries a UDL of 10KN/m between the point loads, draw shear force and bending moment diagram.

19. A simply supported beam of 6m span is carrying a UDL of 20KN/m over a length of 3m from right support. Draw S.F d and BMD. Also calculate maximum B.M.

20. Draw S.F and B.M diagram for a simply supported beam 6m long carrying UDL of 2KN/m over the entire length and point loads of 5 KN,4 KN and 3 KN at 3m,4m and 5m from left support respectively.

21. A simply supported beam of span 6m carries two point loads of 5 KN and 10 KN at 1m and 2m respectively from left support and also carries an UDL of 10KN/m over a length of 3m from the right support. Draw SFD and BMD.

CO 04: Assess Bending and shear stresses in beams subjected to different loadings for different machine parts

LEVEL: REMEMBER

1. List the aassumptions in theory of simple bending
2. Describe the relation between Bending Stress and Radius of Curvature
3. Describe the moment of resistance and radius of Curvature in a beam

LEVEL: UNDERSTANDING

4. Explain Beams of Uniform Strength
5. Explain modulus of Section for Rectangular and Circular sections

LEVEL: APPLICATION

1. Write Bending equations with all notation
2. A steel wire of 10mm diameter is bent into circular shape of 5m radius, determine the maximum stress induced in the wire. Take E=2X10^5 N/mm^2.
3. A steel plate is bent into a circular arc of radius 10m.The plate is 100mm wide and 15mm thick, assuming the value of E=2X10^5 N/mm^2.Find the maximum stress induced in the plate and value of bending moment which produced this stress.
4. The moment of inertia of a beam section 500mm deep is 700X10^6 mm^4.Find the longest span over which a beam of this section when simply supported could carry a UDL of 40 KN/m. The maximum flange stress in the material is not to exceed 110 N/mm^2.
5. A cast iron pipe of external diameter 65mm and internal diameter of 45mm and of length 5m is supported at its ends. Calculate the maximum bending stress induced in the pipe if it carries a point load of 100N at its centre.
6. A rectangular beam 300mm deep is simply supported over a span of 4m. What UDL/m the beam can carry if bending stress is not to exceed 120 N/mm^2.
Take I=80X10^{6}mm^4.
7. A timber joist 150 X 250 mm is simply supported over a span of 3m. If it carries a total UDL of 10 KN/m inclusive of its weight, find the maximum stress induced in the joist.
8. A rectangular beam 300 mm deep is simply supported over a span of 4 m. What UDL the beam may carry if the bending stress is not to exceed 120 MPa. Take I=225 X 10^6 mm^4.
9. A simply supported wooden beam of span 1.3 m is carrying a central point load of 40 KN. If the allowable bending stress in the timber is taken as 8 N/mm^2, find the breadth and depth of the timber. Take b=0.6d.
10. A circular pipe of external diameter 70 mm and thickness 10 mm is used as a simply supported beam over an effective span of 2.5 m. Find the maximum point load that can be applied at the centre of span if permissible stress in the tube is 150 N/mm^2.
11. .A steel plate is bent into an arc of a circle of radius 10 m. If the breadth of the plate is 150 mm and thickness 25 mm and E=2X10^5 N/mm^2, calculate the maximum stress induced in the plate and the bending moment which can produce this stress.
12. A timber is freely supported and has a span of 6 m. If the UDL of 10 KN/m and a point load of 5 KN at a point 3.5 m from left support is loaded. Determine the dimensions of the beam. Assume depth of beam as twice as its breadth. Take f=10 N/mm^2
13. A beam is simply supported and carries UDL of 30 KN/m over the entire span. The section of the beam is rectangular having depth of 400mm. If maximum stress in the material is 120 N/mm^2 and M.I. of the section is 7 X 10^8, find the span of the beam.
14.

CO 05: Differentiate in strain energy stored in a body when the load is suddenly applied and gradually applied

LEVEL: UNDERSTANDING

1. Explain Strain energy and Resilience
2. Explain proof resilience and modulus of resilience
3. Explain Suddenly applied and gradually applied load
4. Explain Suddenly applied and Impact load

LEVEL: APPLICATION
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5. Calculate the strain energy stored in a bar 2.5 m long ,50mm wide and 40mm thick when it is subjected to a tensile load of 50KN.Take young's modulus is $2x10^5$ N/mm^2

6. An axial pull of 25KN is suddenly applied on a steel rod of 3 m long and 900mm^2 in cross-sectional area. Calculate the strain energy stored in the rod. Take young's modulus is $2x10^5$ N/mm^2.

CO 06: Design simple solid and hallow shaft for power transmission keeping view of Environmental and sustainability aspects**.**

LEVEL: REMEMBER

1. List the assumptions made in theory of Torsion

LEVEL: APPLICATION
....

2. Write the torsion equation with all notations
3. Compare the Strength of Hollow and Solid shaft
4. A solid circular shaft is required to transmit 100KW at 200 rpm. The permissible shear stress in the shaft is 70 N/mm^2.Find the diameter of the shaft.
5. A solid circular shaft is required to transmit 90KW at 180 rpm. The permissible shear stress in the shaft is 75 N/mm^2.The maximum Torque transmitted exceeds the mean torque by 20% more than mean torque. Find the suitable diameter of the shaft.
6. .A solid circular shaft is required to transmit 120KW at 180 rpm. The permissible shear stress in the shaft is 70 N/mm^2.The maximum Torque transmitted exceeds the mean torque by 30% more than mean torque. Find the suitable diameter of the shaft. Also find the angle of twist in a length of 2 meter. The valve of rigidity modulus is 0. $9x10^5$ N/mm^2.
....
7. A solid circular shaft is required to transmit 100KW at 180 rpm. The permissible shear stress in the shaft is 60 N/mm^2. Find the suitable diameter of the shaft. The angle of twist is not to exceed 1^0 in a length of 3 meter. The valve of rigidity modulus is 0. $8x10^5$ N/mm^2.
8. A solid shaft of diameter is 110 mm required to transmit 180KW at 120 rpm. The angle of twist is not to exceed 1.5^0 .Find the length of shaft. The valve of rigidity modulus is 0. $8x10^5$ N/mm^2.
9. A solid circular shaft is required to transmit 40KW at 120 rpm. The permissible shear stress in the shaft is 40 N/mm^2.The maximum Torque transmitted exceeds

the mean torque by 25% more than mean torque. Find the suitable diameter of the shaft.

10. A solid circular shaft is required to transmit 80KW at 160 rpm. The permissible shear stress in the shaft is 60 N/mm^2.The maximum Torque transmitted exceeds the mean torque by 20% more than mean torque. The angle of twist is not to exceed 1^0 in a length of 20 times the diameter of the shaft.   The valve of rigidity modulus is 0. 8x10^5 N/mm^2.Find the diameter of the shaft.

11. 8. A solid circular shaft is required to transmit 75KW at 200 rpm. The permissible shear stress in the shaft is 50 N/mm^2.The maximum Torque transmitted exceeds the mean torque by 20% more than mean torque. The angle of twist is not to exceed 1.2^0 in a length of 30 times the diameter of the shaft.   The valve of rigidity modulus is 84x10^{3}N/mm^2.Find the diameter of the shaft.

12. A solid circular shaft is required to transmit 1MW at 240 rpm. The permissible shear stress in the shaft is 60 N/mm^2.The maximum Torque transmitted exceeds the mean torque by 25% more than mean torque. The angle of twist is not to exceed 1^0 in a length of 2.5 meter.   The valve of rigidity modulus is 80KN/mm^2.Find the diameter of the shaft.

13. A Hollow shaft is required to transmit 300KW at 90 rpm. The permissible shear stress in the shaft is 60 N/mm^2.The maximum Torque transmitted exceeds the mean torque by 25% more than mean torque. The internal diameter is half of the external diameter, Find the internal diameter and external, diameters of the shaft.

14. A Hollow shaft is required to transmit 500KW at 100 rpm. The permissible shear stress in the shaft is 60 N/mm^2.The maximum Torque transmitted exceeds the mean torque by 15% more than mean torque. The internal to external diameter ratio is 3/5. The angle of twist is not to exceed 1^0 in a length of 3.5 meter The valve of rigidity modulus is 80KN/mm^2.Find the minimum external diameter of the shaft.

15. A solid circular shaft is required to transmit 40KW at 400 rpm. The Ultimate shear stress in the shaft is 360 N/mm^2 with a factor of safety as 8.The maximum Torque transmitted exceeds the mean torque by 15% more than mean torque. Find the diameter of the shaft.

16. If a Hollow shaft is to be used in place of solid shaft, Find the internal diameter and external, diameters of the shaft with the internal to external diameter ratio is 1/2.The material is same

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

	Course Title: **MECHANICS OF MACHINES**		
	Scheme (L:T:P) : **4:0:0**	Total Contact Hours: **52**	Course Code: **15ME32T**
	Type of Course: **Lectures, Self Study & Quiz**	Credit :**04**	Core/ Elective: **Core**
CIE- 25 Marks			SEE- 100 Marks

Prerequisites: Knowledge of basic mathematics and Applied Science, Engineering Graphics

Course Objectives:

1. To provide basic concept of kinematics and kinetics of machine elements.
2. To study basics of power transmission.
3. To study the effect of friction.
4. To Study the essentiality of balancing.
5. To acquaint with working principles of CAM Mechanism.
6. To study the different types of vibration and to understand critical speed of shaft

Course Outcomes:

On successful completion of the course, the students will be able to attain CO:

	Course Outcome	**CL**	**Linked PO**	**Teaching Hrs**
CO1	Analyze and Apply the knowledge of these machines, mechanisms and related terminologies in mechanical engineering science in maintaining sustainable environment and its impact on society	*R/U/A/An*	1,2,3,4,5,6 10	**10**
CO2	Select appropriate power transmission mechanisms	*R/U/A*	1,2,3,4,5,6 10	**11**
CO3	Analyze the effect of friction on machine elements	*U/A/An*	1,2,3,4,5,6, 10	**10**
CO4	Appreciate the essentiality of balancing in Rotating Parts..	*U/A*	1,2,3,4,5,6 10	**07**
CO5	Construct CAM profile for the specific follower motion	*R/U/A*	1,2,3,4,5,6 10	**10**
CO6	Understand the Terminology and types associated with vibration in machine elements	*R/U*	1,2, 10	**04**
			Total sessions	**52**

Legend: R; Remember, U: Understand A: Application

COURSE-PO ATTAINMENT MATRIX

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
MECHANICS OF MACHINES	3	3	3	3	3	3	-	-	-	3

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.

Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.

If $\geq$40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3

If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2

If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1

If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

COURSE CONTENT AND BLUE PRINT OF MARKS FOR SEE/

Unit No	Unit Name	Hour	Questions to be set for SEE/Marks			Marks weightage	weightage (%)
			R	U	A		
1	BASIC KINEMATICS	10	5	5	20	30	21
2	TRANSMISSION OF POWER	11	5	5	20	30	21
3	FRICTION	10		5	20	25	17
4	BALANCING	07	--	10	10	20	14
5	CAM MECHANISAMS	10	5	5	20	30	21
6	MECHANICAL VIBRATIONS	04	5	5	--	10	06
	Total	52	20	35	90	145	100

Legend: R; Remember, U: Understand A: Application

UNITI: BASIC KINEMATICS   10Hrs

Definition-Kinematic link or element-Types of links-Kinematic pair–Types-Types of constrained Motions- Kinematic chain- Definition of Machine, Structure and Mechanism-Difference between Machine and Structure ,Mechanism-Inversions-Types of Kinematic Chains-Four Bar Chain- Beam Engine-Coupling Rod of Locomotive-Single Slider Crank Chain- Pendulum Pump-Crank and Slotted Lever Quick Return Motion Mechanism-Double Slider Crank Chain-Elliptical trammel-Scotch yoke mechanism-Oldham's coupling.

UNTII: TRANSMISSION OF POWER   11Hrs

Belt Drives-types of flat belt drives-open, cross, idler pulley, compound, cone pulley and fast and loose pulley. Velocity Ratio, Slip and creep of belt, length of belt, Ratio of driving Tensions, Centrifugal Tension and Initial Tension-Power Transmitted by belts (Flat and V-Belt) and ropes- Maximum power transmitted by belt (without proof)-Problems on belt drives-Introduction to Gears - Classification of Gears-Spur Gear Terminology-Problems on

gears –(centre distance only) Introduction to Gear Trains-Types of Gear trains –Simple, Compound, Reverted and Epicyclic gear trains- Problems on Gear Trains

UNITIII: FRICTION   10Hrs

Friction-Introduction-Types of Friction, Laws of solid friction, coefficient of friction, limiting angle of friction, angle of Repose -Friction in Journal Bearing-Power Transmission in the Journal bearing-Friction in Thrust Bearing-Pivot Bearing– Flat and Conical bearing-Collar Bearing –Problems on bearings (Assuming uniform pressure theory)- Friction in Clutches-Single Disc Clutch- Multiple Disc Clutch- Problems on clutches (Assuming uniform wear theory)-Introduction to Brakes-Internal Expanding Brake (Mechanical & Hydraulic).

UNIT IV:BALANCING   07 Hrs

Introduction-Static and Dynamic balancing-Balancing of single rotating massby a single mass rotating in the same plane -Balancing of several masses rotating in the same plane-Problems on above (Analytical and Graphical methods).

UNIT V: CAM MECHANISAMS   10Hrs

Cams-Introduction-Classification of followers and cams-Terminology of cam- Displacement diagram for the following Motion of follower-Uniform velocity -Simple Harmonic Motion (SHM)-Uniform Acceleration and Retardation Motion (UARM),Cam profile construction for Knife edge follower and Roller follower.

UNIT VI: MECHANICAL VIBRATIONS   04Hrs

Introduction- Terms used in Vibrations-Types of Vibrations-Free Vibrations- Forced Vibrations-Damped Vibrations-Types of Free Vibrations- Longitudinal, Transverse and Torsional- Critical or Whirling speed of a shaft.

TEXT BOOKS

1. Rattan.S.S, "*Theory of Machines*", Tata McGraw -Hill Publishers, New Delhi, 2009.
2. Khurmi R S, Guptha J.K *"Theory of machines "*, 5 Edition, S.Chand and company ,Delhi ISBN 81-219-2524-X

REFERENCES

1. Thomas Bevan, *"Theory of Machines",* CBS Publishers and Distributors, 3rd Edition, 2005.
2. Ramamurti,V., *"Mechanism and Machine Theory",* 2nd Edition, Narosa Publishing House,2005.
3. Ghosh.A and A.K.Mallick, *"Theory of Mechanisms and Machines",* Affiliated East- WestPrivate Limited, New Delhi, 1998.
4. Rao.J.S and Dukkipati R.V, "*Mechanism and Machine Theory",* Wiley-Eastern Limited,New Delhi, 1992.

LIST OF SOFTWARES/ LEARNING WEBSITES:

1. http://nptel.iitm.ac.in/video.php?subjectId=112104121
2. http://www.technologystudent.com/gears1/gears7.htm
3. http://kmoddl.library.cornell.edu/model.php?m=20http://www3.ul.ie/~kirwanp/whatisacamandfollowersyste.htm
4. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-Delhi/Kinematics%20of%20Machine/index.htm
5. http://elearning.vtu.ac.in/12/enotes/Des_Mac-Ele2/Unit6-RK.pdf
6. www.tecquipment.com/Theory_of_Machines.aspx
7. www.researchgate.net/.../0094-114X_Mechanism_and_Machine_Theory
8. www.journals.elsevier.com/mechanism-and-machine-theory/
9. www.iftomm.org/
10. www.wiziq.com/online-tests/44047-mechanical-theory-of-machine
11. www.cs.ubc.ca/~murphyk/Teaching/CS340-Fall07/infoTheory.pdf

SUGGESTED LIST OF STUDENT ACTIVITYS

Note: the following activities or similar activities for assessing CIE (IA) for 5 marks (Any one)

- Each student should do any one of the following type activity or similar activity related to the course and before take up, get it approved from concerned Teacher and HOD.
- Each student should conduct different activity and no repeating should occur

1	List the mechanisms which you are using in your day to day life. Sketch any three from these. Study and submit handwritten report of 500 words
2	Take a photo of a actual kinematic mechanism used in an automobile, study and submit handwritten report of 500 words
3	Analyse the effect of friction in real situation and submit handwritten report of 500 words
2	List the mechanism used in a typical car. study and submit handwritten report of 500 words
3	Identify and measure the dimensions of Flywheel used in automobile. study and submit handwritten report of 500 words
4	Identify the type of clutches and cams used in different automobiles and also the type of brakes in automobile and bicycle. study and submit handwritten report of 500 words
5	Visit the market and collect the data of items which are used in any mechanisms. Data includes specifications, cost, applications, etc. Also name the mechanism/s in which such item/s is/are use .Study and submit handwritten report of 500 words

Course Delivery

- The course will be delivered through lectures and Power point presentations/ Video
- Teachers can prepare or download PPT of different topics on Mechanisms usage in mechanical engineering application.
- Motivate student to take case study on kinematics, power transmission and to inculcate him for self and continuous learning.

MODEL OF RUBRICS /CRITERIA FOR ASSESSING STUDENT ACTIVITY

RUBRICS FOR ACTIVITY(5 Marks)

Dimension	Unsatisfactory 1	Developing 2	Satisfactory 3	Good 4	Exemplary 5	Student Score
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	Ex: 4
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	5
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.	3
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	2
				Average / Total marks=(4+5+3+2)/4=14/4=3.5=4		

Note: This is only an example. Appropriate rubrics/criteria may be devised by the concerned faculty (Course Coordinator) for assessing the given activity.

Course Assessment and Evaluation Scheme:

	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment	CIE	IA	Students	Three IA tests (Average of three tests will be computed)	20	Blue books	1,2,3,4,5,6
				Student activities	05	Activity sheets	1,2,3,4,5,6
	SEE	End Exam		End of the course	100	Answer scripts at BTE	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	1 & 2,3 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3,4,5,6 Effectiveness of Delivery of instructions & Assessment Methods

Note: I.A. test shall be conducted for 20 marks. Average marks of three tests shall be rounded off to the next higher digit.

Directorate Of Technical Education   **Karnataka StateMECH**   **15ME32T**

Note to IA verifier: *The following documents to be verified by CIE verifier at the end of semester*

1. Blue books (20 marks)
2. Student suggested activities report for 5 marks and should be assessed on RUBRICS
3. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods.

FORMAT OF I A TEST QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks
Ex: I test/6 th weak of sem 10-11 Am	I/II SEM		20
	Year:		
Name of Course coordinator : CO's:____			Units:__

Question no	Question	MARKS	CL	CO	PO
1					
2					
3					
4					

Note: Internal choice may be given in each CO at the same cognitive level (CL).

MODEL QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks
Ex: I test/6 th weak of sem 10-11 Am	IVSEM	**MECHANICS OF MACHINES 15ME32T**	20
	Year: 2016-17	Course code:15ME41T	
Name of Course coordinator :			Units:1,2 Co: 1,2

Note: Answer all questions

Question no	Question	MARKS	CL	CO	PO
1	Explain lower pair and higher pairs	05	U	1	1,2,3,4, 5,6,10
2	List the different types of constraint motion Explain any one.	05	R	1	1,2,3,4, 5,6,10
3	A shaft rotating at 200 r.p.m. drives another shaft at 300 r.p.m. and transmits 6 kW through a belt. The belt is 100 mm wide and 10 mm thick. The distance between the shafts is 4m.The smaller pulley is 0.5 m in diameter. Calculate the stress in the belt, if it is an open belt drive, Take $\mu = 0.3$. **OR** Two parallel shafts are to be connected by spur gearing. The approximate distance between the shafts is 600 mm. If one shaft runs at 120 r.p.m. and the other at 360 r.p.m., Calculate the number of teeth on each wheel, if the module is 8 mm. Also determine the exact distance apart of the shafts.	10	A	2	1,2,3,4, 5,6,10

Directorate Of Technical Education   Karnataka StateMECH   15ME32T

IV- Semester Diploma Examination

Course Title: **MECHANICS OF MACHINES**

Time: **3 Hours**]   [Max Marks**: 100**

Note: Answer any **SIX from Part A** and any **SEVEN from Part B**

PART-A   6x5=30 marks

1. List the different types of constraint motion Explain any one.
2. Explain with a neat sketch bull engine.
3. Explain open belt and cross belt drives.
4. Calculate the power transmitted by a belt running over a pulley of 600 mm diameter at 200 r.p.m. The coefficient of friction between the belt and the pulley is 0.25, angle of lap is 160° and maximum tension in the belt is 2500 N.
5. State the laws of solid friction.
6. Explain the method of balancing of different masses revolving in the same plane.
7. Explain clearly the terms 'static balancing' and 'dynamic balancing'.
8. Construct the displacement and velocity diagram for uniform velocity motion of the follower.
9. Discuss briefly with neat sketches the longitudinal, transverse vibrations

PART-B   7x10=70 marks

10.   a) Explain with a neat sketch beam engine.   06

        b) Differentiate between machine and a structure.   04

11.   a)Explain With a neat sketch double crank mechanism.   05

        b)Sketch and describe Scotch-yoke mechanism.   05

12.   a)List the advantages & disadvantages of flat belt over v-belt drive.   04

         b)Develop the gear when Two parallel shafts, about 600 mm apart are to be connected by spur gears. One shaft is to runat360r.p.m. and the other at 120 r.p.m., if the circular pitch is to be 25 mm. 06

13.   Calculate the width of the belt taking centrifugal tension into account..A leather belt is required to transmit 7.5 kW from a pulley 1.2 m in diameter, running at 250 r.p.m. The angle embraced is 165° and the coefficient of friction between the belt and the pulley is 0.3. If the safe working stress for the leather belt is 1.5 MPa, density of leather 1 Mg/m^{3}and thickness of belt 1

        10 mm,   10

14.   a) Explain with a neat sketch, limiting angle of friction.   05

        b) A 60 mm diameter shaft running in a bearing carries a load of 2000 N. If the coefficient of friction between the shaft and bearing is 0.03, Calculate the power transmitted when it runs at 1440 r.p.m.
                                                                                          -05

15. Five masses A, B, C,D and E are attached to a shaft and revolve in the same plane. The masses of A is 200N, B is 100N, C is 160 N respectively and their radii of rotations are equal. The angular position of the masses B, C, D and E are 60°, 135°, 210⁰ and 270° from the mass A. Calculate the magnitude of D and E for complete balance. Solve graphically   -10

16. Four masses m1, m2, m3 and m4 are 200 kg, 300 kg, 240 kg and 260 kg respectively. The corresponding radii of rotation are 0.2 m, 0.15 m, 0.25 m and 0.3 m respectively and the angles between successive masses are 45°, 75° and 135°. Calculate the position and magnitude of the balance mass required, if its radius of rotation is 0.2m.(solve Analytically).   -10

17. Construct a cam profile to raise a valve with simple harmonic motion through 50 mm in 1/3 of a revolution, keep if fully raised through 1/12 revolution and to lower it with harmonic motion in 1/6 revolution. The valve remains closed during the rest of the revolution. The diameter of the roller is 20 mm and the minimum radius of the cam is 25 mm. The diameter of the camshaft is 25 mm. The axis of the   valve   rod   passes   through   the   axis   of   the   camshaft.   -10

18. Define the following terms.   -10
    (a) Base circle, (b) Pitch circle, (c) Pressure angle, and (d) Stroke of the follower.(e)Trace point

19. a)Explain the term 'whirling speed' or 'critical speed' of a shaft   05
    b) Discuss briefly with neat sketches the transverse and torsional free vibrations   05

    ****

MODEL QUESTION BANK

Diploma in Mechanical Engineering
IV Semester
Course title: MECHANICS OF MACHINES

CO1: ANALYZE AND APPLY THE KNOWLEDGE OF THESE MACHINES, MECHANISMS AND RELATED TERMINOLOGIES IN MECHANICAL ENGINEERING SCIENCE IN MAINTAINING SUSTAINABLE ENVIRONMENT AND ITS IMPACT ON SOCIETY

REMEMBERING

1. List the different types of constraint motion Explain any one.
2. Define kinematic link. Briefly explain its types.
3. Define following terms a) structure   b) mechanism.
4. Define kinematic chain? Name the different types of kinematic chains.
5. Define inversion of mechanism.

UNDERSTANDING

1. Explain kinematic chain. give its relation
2. Explain the following terms.
   a) Sliding pair b) turning pair c) screw pair d) spherical pair e) rolling pair
3. Explain lower pair and higher pairs
4. Explain self closed pair and force-closed pair
5. Differentiate between machine and a structure.

6. Classify different kinematic pairs.

1. Explain With a neat sketch completely constrained motion.
2. Explain with sketch four bar chain and mention its inversions.
3. Explain with sketch single slider crank chain and mention its inversions.
4. Explain with sketch double slider crank chain and mention its inversions.
5. Explain with a neat sketch beam engine
6. Explain with a neat sketch four bar chain.
7. Explain With a neat sketch double crank mechanism.
8. Explain With a neat sketch single slider crank chain.
9. Explain with a neat sketch bull engine.
10. Explain with a neat sketch crank and slotted lever quick return motion mechanism.
11. Explain with a neat sketch elliptical trammel.
12. Explain with a neat sketch Scotch yoke mechanism
13. Explain with a neat sketch Oldham's coupling.

CO2 : SELECT APPROPRIATE POWER TRANSMISSION MECHANISMS

REMEMBERING
1. Define the following terms.
2. List the advantages of flat belt over v-belt drive.
3. List the Advantages and Disadvantages of Belt over Rope Drive
4. Define the following terms
   A) Pitch circle. B). Addendum. C).Dedendum. D). Circular pitch.
   E) Diametral pitch. F) Module.

UNDERSTANDING

1. Explain open belt and cross belt drives.
2. Explain the following   a) Velocity ratio   b) slip c) creep.
3. Explain slip and creep of belt drive.
4. Explain centrifugal tension of flat belt.
5. Discuss the various types of gear trains.
6. Explain briefly the reverted gear train
7. Explain briefly the epicyclic gear train
8. Explain with neat diagram belt drive with idler pulley.
9. Explain with neat diagram stepped or cone pulley drive.
10. Explain with neat diagram fast and loose pulley drive.
11. Explain with neat diagram compound belt drive and write its velocity ratio.
12. Explain briefly the compound Gear train with diagram

APPLICATION

1. An engine, running at 150 r.p.m., drives a line shaft by means of a belt. The engine pulley is 750 mm diameter and the pulley on the line shaft being 450 mm. A 900 mm diameter pulley on the line shaft drives a 150 mm diameter pulley keyed to a dynamo shaft. Calculate the speed of the dynamo shaft, when 1. There is no slip, and 2. There is a slip of 2% at each drive.

2. The power is transmitted from a pulley 1 m diameter running at 200 r.p.m. to a pulley 2.25 m diameter by means of a belt. Calculate the speed lost by the driven pulley as a result of creep, if the stress on the tight and slack side of the belt is 1.4 MPa and 0.5 MPa respectively. The Young's modulus for the material of the belt is 100 MPa.

3. Calculate the power transmitted by a belt running over a pulley of 600 mm diameter at 200 r.p.m. The coefficient of friction between the belt and the pulley is 0.25, angle of lap is 160° and maximum tension in the belt is 2500 N.

4. Two pulleys, one 450 mm diameter and the other 200 mm diameter are on parallel shafts 1.95 m apart and are connected by a crossed belt. Calculate the length of the belt required and the angle of contact between the belt and each pulley. What power can be transmitted by the belt when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1 kN, and the coefficient of friction between the belt and pulley is 0.25 ?

5. A shaft rotating at 200 r.p.m. drives another shaft at 300 r.p.m. and transmits 6 kW through a belt. The belt is 100 mm wide and 10 mm thick. The distance between the shafts is 4m.The smaller pulley is 0.5 m in diameter. Calculate the stress in the belt, if it is an open belt drive, Take μ = 0.3.

6. A leather belt is required to transmit 7.5 kW from a pulley 1.2 m in diameter, running at 250 r.p.m. The angle embraced is 165° and the coefficient of friction between the belt and the pulley is 0.3. If the safe working stress for the leather belt is 1.5 MPa, density of leather 1 Mg/m3and thickness of belt 10 mm, determine the width of the belt taking centrifugal tension into account.

7. Determine the width of a 9.75 mm thick leather belt required to transmit 15 kW from a motor running at 900 r.p.m. The diameter of the driving pulley of the motor is 300 mm. The driven pulley runs at 300 r.p.m. and the distance between the centres of two pulleys is 3 metres. The density of the leather is1000 kg/m3. The maximum allowable stress in the leather is 2.5 MPa. The co-efficient of friction between the leather and pulley is 0.3. Assume open belt drive and neglect the sag and slip of the belt.

8. A pulley is driven by a flat belt, the angle of lap being 120°. The belt is 100 mm wide by 6 mm thick and density1000 kg/m3. If the coefficient of friction is 0.3 and the maximum stress in the belt is not to exceed 2 MPa, Calculate the greatest power which the belt can transmit and the corresponding speed of the belt.

9. In a flat belt drive the initial tension is 2000 N. The coefficient of friction between the belt and the pulley is 0.3 and the angle of lap on the smaller pulley is 150°. The smaller pulley has a radius of 200 mm and rotates at 500 r.p.m. Calculate the power in kW transmitted by the belt.

10. Two parallel shafts, whose centre lines are 4.8 m apart, are connected by open belt drive. The diameter of the larger pulley is 1.5 m and that of smaller pulley 1 m. The initial tension in the belt when stationary is 3 kN. The mass of the belt is 1.5 kg / m length. The coefficient of friction between the belt and the pulley is 0.3. Taking centrifugal tension into account, calculate the power transmitted, when the smaller pulley rotates at 400 r.p.m.

11. An open belt running over two pulleys 240 mm and 600 mm diameter connects two parallel shafts 3 metres apart and transmits 4 kW from the smaller pulley that rotates at 300 r.p.m. Co-efficient of friction between the belt and the pulley is 0.3 and the safe working tension is10N per mm width. Determine: 1**.** Minimum width of the belt, **2.** Initial belt tension and **3.** Length of the belt required.

12. Power is transmitted using a V-belt drive. The included angle of V-groove is 30°. The belt is 20 mm deep and maximum width is 20 mm. If the mass of the belt is 0.35 kg per meter length and maximum allowable stress is 1.4 MPa, determine the maximum power transmitted when the angle of lap is 140°. μ = 0.15.

13. A compressor, requiring 90 kW is to run at about 250 r.p.m. The drive is by V-belts from an electric motor running at 750 r.p.m. The diameter of the pulley on the compressor shaft must not be greater than 1 metre while the centre distance between the pulleys is limited to 1.75 metre. The belt speed should not exceed 1600 m/min. Determine the number of V-belts required to transmit the power if each belt has a cross-sectional area of 375 mm2, density 1000 kg/m3 and an allowable tensile stress of 2.5MPa. The groove angle of the pulley is 35°. The coefficient of friction between the belt and the pulley is 0.25.Calculate also the length required of each belt.

14. A rope drive transmits 600 kW from a pulley of effective diameter 4 m, which runs at a speed of 90 r.p.m. The angle of lap is 160° ; the angle of groove 45° ; the coefficient of friction 0.28 ; the mass of rope 1.5 kg / m and the allowable tension in each rope 2400 N. Calculate the number of ropes required.

15. A pulley used to transmit power by means of ropes has a diameter of 3.6 metres and has 15 grooves of 45° angle. The angle of contact is 170° and the coefficient of friction between the ropes and the groove sides is 0.28. The maximum possible tension in the ropes is 960 N and the mass of the rope is 1.5 kg per metre length. Calculate the speed of pulley in r.p.m. and the power transmitted if the condition of maximum power prevail

16. Two parallel shafts, about 600 mm apart are to be connected by spur gears. One shaft is to run at 360 r.p.m. and the other at 120 r.p.m. Develop the gears, if the circular pitch isto be 25 mm.

17. Two parallel shafts are to be connected by spur gearing. The approximate distance between the shafts is 600 mm. If one shaft runs at 120 r.p.m. and the other at 360 r.p.m. Calculate the number of teeth on each wheel, if the module is 8 mm. Also determine the exact distance apart of the shafts.

18. A flat belt is required to transmit 35 kW from a pulley of 1.5 m effective diameter running at 300 r.p.m. The angle of contact is spread over 11/24 of the circumference and the coefficient of friction between belt and pulley surface is 0.3. Determine, taking centrifugal tension into account, width of the belt required. It is given that the belt thickness is 9.5 mm, density of its material is 1.1 Mg/m3 and the related permissible working stress is 2.5 MPa.

CO3: ANALYZE THE EFFECT OF FRICTION ON MACHINE ELEMENTS

UNDERSTANDING

1. Explain the following terms:
   (i).Angle of response (ii).Angle of friction
2. Explain limiting angle of friction.

3. Explain coefficient of friction.
4. Explain with neat diagram limiting angle of friction.
5. Explain with neat diagram coefficient of friction.
6. Explain with neat diagram friction in a journal bearing.

APPLICATION

1. A 60 mm diameter shaft running in a bearing carries a load of 2000 N. If the coefficient of friction between the shaft and bearing is 0.03, Calculate the power transmitted when it runs at 1440 r.p.m.
2. Explain with neat sketch different types of pivot bearings.
3. Explain with neat sketch single and multiple flat collar bearing.
4. A vertical shaft 150 mm in diameter rotating at 100 r.p.m. rests on a flat end footstep bearing. The shaft carries a vertical load of 20 kN. Assuming uniform pressure distribution and coefficient of friction equal to 0.05, Calculate power lost in friction.
5. A conical pivot supports a load of 20 kN, the cone angle is 120º and the intensity of normal pressure is not to exceed 0.3 N/mm2. The external diameter is twice the internal diameter. Calculate the outer and inner radii of the bearing surface. If the shaft rotates at 200 r.p.m. and the coefficient of friction is 0.1, Calculate the power absorbed in friction. Assume uniform pressure.
6. A conical pivot bearing supports a vertical shaft of 200 mm diameter. It is subjected to a load of 30 kN. The angle of the cone is 120º and the coefficient of friction is 0.025. Calculate the power lost in friction when the speed is 140 r.p.m., assuming uniform pressure.
7. A thrust shaft of a ship has 6 collars of 600 mm external diameter and 300 mm internal diameter. The total thrust from the propeller is 100 kN. If the coefficient of friction is 0.12 and speed of the engine90 r.p.m., Calculate the power absorbed in friction at the thrust block, assuming l. uniform pressure only
8. A shaft has a number of a collars integral with it. The external diameter of the collars is 400 mm and the shaft diameter is 250 mm. If the intensity of pressure is 0.35 N/mm2 (uniform) and the coefficient of friction is 0.05, Calculate:1. Power absorbed when the shaft runs at 105 r.p.m. carrying a load of 150 kN ; and 2. Number of collars required.
9. Explain with a neat sketch single plate or disc clutch.
10. Explain with a neat sketch multi plate clutch.
11. A single plate clutch, with both sides effective, has outer and inner diameters 300 mm and 200 mm respectively. The maximum intensity of pressure at any point in the contact surface is not to exceed 0.1 N/mm2. If the coefficient of friction is 0.3, determine the power transmitted by a clutch at a speed 2500rpm.
12. A multiple disc clutch has five plates having four pairs of active friction surfaces. If the intensity of pressure is not to exceed 0.127 N/mm2, Calculate the power transmitted at 500 r.p.m. The outer and inner radii of friction surfaces are 125 mm and 75 mm respectively. Assume uniform wear and take coefficient of friction = 0.3.
13. Explain with a neat sketch internal expanding brake.

UNDERSTANDING

1. Explain the balancing of rotating parts necessary for high speed engines
2. Explain clearly the terms 'static balancing' and 'dynamic balancing'.
3. Discuss how a single revolving mass is balanced by a single mass revolving in same planes.
4. Explain the method of balancing of different masses revolving in the same plane.

APPLICATION

1. Four masses m_1, m_2, m_3 and m_4 are 200 kg, 300 kg, 240 kg and 260 kg respectively. The corresponding radii of rotation are 0.2 m, 0.15 m, 0.25 m and 0.3 m respectively and the angles between successive masses are 45°, 75° and 135°. Calculate the position and magnitude of the balance mass required, if its radius of rotation is 0.2 m.(Analytical method)
2. Four masses m_1, m_2, m_3 and m_4 are 250 kg, 350 kg, 290 kg and 310 kg respectively. The corresponding radii of rotation are 0.25 m, 0.20 m, 0.35 m and 0.4 m respectively and the angles between successive masses are 45°, 75° and 135°. Calculate the position and magnitude of the balance mass required, if its radius of rotation is 0.25 m. (Graphical method)
3. Four masses A, B, C and D are attached to a shaft and revolve in the same plane. The masses are 12kg, 10 kg, 18 kg and 15 kg respectively and their radii of rotations are 40 mm, 50 mm, 60 mm and 30 mm. The angular position of the masses B, C and D are 60°, 135° and 270° from the mass A. Calculate the magnitude and position of the balancing mass at a radius of 100 mm.
4. Five masses A, B, C,D and E are attached to a shaft and revolve in the same plane. The masses of A is 200N, B is 100N, C is 160 N respectively and their radii of rotations are equal. The angular position of the masses B, C, D and E are 60°, 135°, 210^0 and 270° from the mass A. Calculate the magnitude of D and E for complete balance. Solve graphically.
5. Five masses A, B, C,D and E are attached to a shaft and revolve in the same plane. The masses of A is 250N, B is 160 N, C is 210N respectively and their radii of rotations are equal. The angular position of the masses B, C, D and E are 60°, 135°, 210^0 and 270° from the mass A. Calculate the magnitude of D and E for complete balance. Solve by Analytical method.
6. Four masses m_1, m_2, m_3 and m_4 are 100 N, 150 N, 120 N and 130 N respectively. The corresponding radii of rotation are 0.225 m, 0.175 m, 0.25 m and 0.3 m respectively and the angles measured from A are 45°, 120^0 and 255°. Calculate the position and magnitude of the balance mass required, if its radius of rotation is 0.3 m.(Analytical method)
7. Four masses A, B, C and D are attached to a shaft and revolve in the same plane. The masses are 16kg, 14 kg, 22kg and 20 kg respectively and their radii of rotations are 40 mm, 50 mm, 60 mm and 30 mm. The angular position of

the masses B, C and D are 60°, 135° and 270° from the mass A. Calculate the magnitude and position of the balancing mass at a radius of 50 mm

CO5: CONSTRUCT CAM PROFILE FOR THE SPECIFIC FOLLOWER MOTION

REMEMBERING
1. Define the following terms.
   (a) Base circle, (b) Pitch circle, (c) Pressure angle, and (d) Stroke of the follower.(e)Trace point

UNDERSTANDING
1. Explain cam and follower
2. Classify different types of cams
3. Describe the types of follower.
4. Classify different types of followers.
5. Explain prime circle and pitch circle related to cam profile
6. Explain base circle and pitch point to cam profile
7. Explain pressure angle and lift or stroke related to cam profile
8. Interpret why a roller follower is preferred to that of a knife-edged follower.
9. Illustrate the different types of motion with which a follower can move.

APPLICATION

1. Construct the displacement diagram for uniform velocity and S.H.M motion of the follower
2. Construct the displacement and velocity diagram S.H.M motion of the follower
3. Construct the displacement and velocity diagram for uniform velocity motion of the follower
4. Construct the displacement and velocity diagram for uniform acceleration and retardation motion of the follower.
5. Explain with sketches the different types of cams and followers.

6. Construct a disc cam to give uniform motion to a knife edge follower during out stroke of 50 mm during the first half of the cam revolution. The follower again returns to its original position with uniform motion during the next half of the revolution. The minimum radius of the cam is 50 mm and the diameter of the cam shaft is 35 mm. Draw the profile of the cam when the axis of follower passes through the axis of cam shaft.
7. Construct a cam operating a knife-edged follower, has the following data :
   (a)   Follower moves outwards through 40 mm during 60° of cam rotation.
   (b)   Follower dwells for the next 45°.
   (c)   Follower returns to its original position during next 90°.
   (d)   Follower dwells for the rest of the rotation.
   (e)   The displacement of the follower is to take place with simple harmonic motion during both the outward and return strokes. The least radius of the

cam is 50 mm. Draw the profile of the cam when the axis of the follower is offset 20mm towards right from the cam axis.

8. Construct a disc cam rotating in a clockwise direction is used to move a reciprocating roller with simple harmonic motion in a radial path for the details given below:
   a) Outstroke with maximum displacement of 25 mm during 120° of cam rotation,
   b) Dwell for 60° of cam rotation,
   c) iii) Return stroke with maximum displacement of 25 mm during 90° of cam rotation, and
   d) Dwell during remaining 90° of cam rotation.
   e) The line of reciprocation of follower passes through the camshaft axis. The maximum radius of camis30 mm. The roller diameter is 8 mm. Draw the profile of the cam when the line of reciprocation of the follower is offset by 20 mm towards right from the cam shaft axis.

9. Construct a cam profile to raise a valve with simple harmonic motion through 50 mm in 1/3 of a revolution, keep if fully raised through 1/12 revolution and to lower it with harmonic motion in   1/6 revolution. The valve remains closed during the rest of the revolution. The diameter of the roller is   20 mm and the minimum radius of the cam is 25 mm. The diameter of the camshaft is 25 mm. The axis of the valve rod passes through the axis of the camshaft.

10. Construct a cam rotating clockwise with a uniform speed is to give the roller follower of 20 mm diameter with the   following motion:
   i.   Follower to move outwards through a distance of 30 mm during 120° of cam rotation ;
   ii. Follower to dwell for 60° of cam rotation ;
   iii. Follower to return to its initial position during 90° of cam rotation ; and
   iv. Follower to dwell for the remaining 90° of cam rotation.
        The minimum radius of the cam is 30 mm and the line of stroke of the follower is offset 15 mm from the   axis of the cam and the displacement of the follower is to take place with simple harmonic motion on   both   the outward and return strokes. Draw the cam profile.

11. Construct the profile of cam rotating clockwise at a uniform speed of 100 r.p.m. is required to give motion to knife-edge   follower   as   below, Follower to move outwards through 40 mm during 120° of cam rotation,
   (f) Follower to dwell for the next 60° of cam rotation,
   (g) Follower to return to its starting position during next 90° of cam rotation, and
   (h) Follower to dwell for the rest of the cam rotation.
   (i) The minimum radius of the cam is 30 mm and the line of stroke of the follower passes through the axis of the cam shaft. If the displacement of the follower takes place with uniform and equal acceleration and   retardation on both the outward and return strokes.

12. Construct a cam profile with 30 mm as minimum diameter is rotating clockwise at a uniform speed of 1200 r.p.m. and has   to give the   following motion to a roller follower 10 mm in diameter:

(a) Follower to complete outward stroke of 25 mm during 120° of cam rotation with equal   uniform acceleration and retardation ;

(b) Follower to dwell for 60° of cam rotation;

(c) Follower to return to its initial position during 90° of cam rotation with equal uniform   acceleration and retardation;

(d) Follower to dwell for the remaining 90° of cam rotation.
Draw the cam profile if the axis of the roller follower passes through the axis of the cam.

13. Construct a cam profile, rotating clockwise at a uniform speed of 200 r.p.m. is required to move an offset roller follower   with a uniform   and   equal acceleration and retardation on both the outward and return strokes. The   angle of   ascent, the angle of dwell (between ascent and descent) and the angle of descent is 120°, 60° and   90° respectively. The follower dwells for the rest of cam rotation. The least radius of the cam is 50   mm,   the lift of the follower is 25 mm and the diameter of the roller is 10mm. The line of stroke of the   follower is offset by 20 mm from the axis of the cam.

14. Construct the profile of a cam to suit the following specifications:
Cam shaft diameter = 25mm; Least radius of cam = 30 mm ; Diameter of roller = 20 mm;
Angle of lift = 120° ; Angle of fall = 150° ; Lift of the follower = 40 mm ; Number of pauses are two of   equal interval between motions. During the lift, the motion is S.H.M. During the fall the motion is   uniform acceleration and deceleration. The speed of the cam shaft is uniform. The line of stroke of the   follower is off-set 12.5 mm from the centre of the cam.

15. Construct the profile of a cam to give the following motion to a knife-edged follower:
Outstroke during 60° of cam rotation: 2. Dwell for the next 30° of cam rotation; Return stroke during next 60° of cam rotation, and 4. Dwell for the remaining 210° of cam   Rotation. The stroke of the follower is 40 mm and the minimum radius of the cam is 50 mm. The   follower moves with uniform velocity during the outstroke and return strokes. With uniform velocity. Draw the profile of the cam when the axis of the follower is offset by 20 mm from the axis of the cam shaft.

CO6: UNDERSTAND THE TERMINOLOGY AND TYPES ASSOCIATED WITH VIBRATION IN MACHINE ELEMENTS

REMEMBERING

1. Define free vibrations, forced vibrations.
2. Identify the causes and effects of vibrations?
3. Define free vibrations,. And damped vibrations.
4. Define forced vibrations,. And damped vibrations.

UNDERSTANDING

1. Discuss briefly with neat sketches the longitudinal, transverse vibrations.
2. Discuss briefly with neat sketches the transverse and torsional free vibrations.
3. Discuss briefly with neat sketches the longitudinal, and torsional free vibrations.
4. Explain the term 'whirling speed' or 'critical speed' of a shaft

	Course Title: **MECHANICAL MEASUREMENTS**		
	Scheme (L:T:P) : **4:0:0**	Total Contact Hours: **52**	Course Code: **15ME33T**
	Type of Course: **Lectures, Self Study & Quiz**	Credit :**04**	Core/ Elective: **Core**
CIE- 25 Marks			SEE- 100 Marks

Prerequisites: Knowledge of basic mathematics and Science. Basic Electrical and Electronics Engineering

Course Objectives:

1. Understand the advances in technology, measurement techniques, types of instrumentation devices, innovations, refinements.
2. To learn various flow measurement techniques.

On successful completion of the course, the students will be able to CO:

NOTE: The theory should be taught in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

Course Outcomes:

	Course Outcome	**CL**	**Linked PO**	**Teaching Hrs**
CO1	Know the terms of the measurements, and Understand the principle of operation of an instrument, Choose Suitable measuring instruments for a particular application and Apply ethical principles while measuring dimensions	*R/U/A*	1,2,3,10	**12**
CO2	Appreciate Measurement of strain by using a basic strain gauge and hence verify the stress induced and application of transducers in mechanical engineering applications for sustainable development	*R/U/A*	1,2,3,10	**10**
CO3	Apply the principles of instrumentation for transducers & measurement of non electrical parameters like temperature, pressure, flow, speed, force and stress in mechanical engineering applications for sustainable development	*R/U/A*	1,2,3,6, 10	**15**
CO4	Apply the principles of Miscellaneous measurements for humidity, density, level and blood pressure.	*U/A*	1,2,3,4,6, 10	**06**
CO5	Apply the principles of limits, fits, tolerance and Analyse the process alignment testing of machine tools for manufacturing field.	*R/U/A*	1,2,3,4,6, 10	**09**
		Total sessions		**52**

R-Remember; U-Understanding; A-Application

COURSE-PO ATTAINMENT MATRIX

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
MECHANICAL MEASUREMENTS	3	3	3	1	-	2	-	-	-	3

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.

Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.

If $\geq$40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3

If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2

If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1

If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

COURSE CONTENT AND BLUE PRINT OF MARKS FOR SEE

Unit No	Unit Name	Hour	Questions to be set for SEE			Marks weightage	weightage (%)
			R	U	A		
1	**Measuring instruments**	12	10	10	10	30	21
2	**Transducers and strain gauges**	10	5	10	15	30	21
3	**Measurement of force, torque, and pressure**	06	05	05	10	20	14
4	**Applied mechanical measurements**	09	05	05	15	25	17
5	**Miscellaneous measurements**	06	--	5	10	15	10
6	**Limits, Fits, Tolerance & Testing of Geometric Dimensions**	09	5	10	10	25	17
	Total	52	30	45	70	145	100

R-Remember; U-Understanding; A-Application

UNITI: MEASURING INSTRUMENTS   12Hrs

Measurement-definition-methods of measurement-Significance-Terms applicable to measuring instruments: Precision and Accuracy, Sensitivity and Repeatability, Range, Threshold, Hysteresis, calibration -Errors in Measurements-Systematic and Random error. Measuring instruments- Factors in selecting the measuring instruments -Thread measurements:-Bench micrometer- Thread gauge micrometer- Angle measurements- Bevel protractor, Sine Bar, Gauges: plain plug gauge, snap gauge, ring gauge-.Surface finish-Measurement of surface finish by Talysurf surface roughness tester-Co-ordinating measuring machine.

UNTII: TRANSDUCERS AND STRAIN GAUGES   10 Hrs

Transducers- concept-Characteristics, Transducers selection factors, classifications of Transducer, actuating mechanisms. Voltage and current generating analog transducers-Types-Piezoelectric transducer. Strain Measurements: Strain gauge, Classification, Berry-type mechanical strain gauge, optical strain gauges, mounting of strain gauges, Strain gauge rosettes-two and three elements, Gauge factor

UNITIII: MEASUREMENT OF FORCE, TORQUE, AND PRESSURE   06Hrs

Force measuring devices- Spring Balance, Proving ring, Strain guage type Load cell- Torque measuring devices- Prony brake, Hydraulic dynamometer-.pressure measuring devices- -Diaphragm type pressure gauge- Bourdon tube pressure gauge- Mcloed gauge, Construction, working and applications.

UNIT IV: APPLIED MECHANICAL MEASUREMENTS   09Hrs

Speed measurement- Classification of tachometers. Working principle, construction, working of Revolution counters and Eddy current tachometers. Displacement measurement- Working principle, construction, working of Linear variable Differential transformers (LVDT)-Flow measurement- Working principle, construction, working   of Rotometers-Temperature measurement. Principle, construction, working of Resistance thermometers and Optical Pyrometer, Thermocouples.

UNIT V: MISCELLANEOUS MEASUREMENTS   06 Hrs

Humidity measurement–construction, working of hair hygrometer-Density measurement-Measurement of density using hydrometer, Liquid level measurement –-Measurement of liquid level by using sight glass, Float gauge-Biomedical measurement- construction, working of Sphygmo monometer

UNITVI: LIMITS,FITS,TOLERENCE & TESTING OF GEOMETRIC DIMENSIONS
09 Hrs

Concepts- Interchangeability, Selective Assembly, Basic Definitions, Graphical illustration of limits and Tolerances. Fit-Classification of fits. Systems of fits-Hole Basis System and Shaft Basis system, Systems of tolerancing-Unilateral System and Bilateral System, Machine tools alignment testing-Checking Parallelism, Straightness, runout, alignment testing of machine tool during erection as per IS standard procedure

TEXT BOOKS

1. *Mechanical Engineering Measurement* - Thomas Beckwith, N.Lewis Buck, Roy Marangoni - *Narosa Publishing House, Bombay*

REFERENCES

1. *Mechanical Engineering Measurements* - A. K. Sawhney - *DhanpatRai& Sons, New Delhi.*
2. *" Metrology & Measurement"* by Anand K Bewoor,Vinay kulakarni ,Tata McGraw hill New delhi 2009
3. *"Principles of Engineering metrology"* by Rega Rajendra Jaico publishers-2008
4. *"Dimensional Metrology "*by Connie Dotson, DELMAR ,cenage learning,2007
5. *"Engineering Metrology"* by R.K.Jain, Khanna Publishers, 1994

LIST OF SOFTWARES/ LEARNING WEBSITES:

1. http://en.wikipedia.org/wiki/Metrology (metrology).
2. https://www.youtube.com/watch?v=4hlNi0jdoeQ (vernier).
3. https://www.youtube.com/watch?v=FNdkYIVJ3Vc(vernier).
4. https://www.youtube.com/watch?v=O8vMFFYNIfo (micrometer)
5. https://www.youtube.com/watch?v=h98HPVuWjLA (depth micrometer)
6. https://www.youtube.com/watch?v=SmXfGan_NXQ (telescopic gauge)
7. http://www.authorstream.com/Presentation/007sandeepks-1858141-angular-measurment/ (angular measurement).
8. http://askguru.net/t-Angular-Measurement-ppt
9. https://www.youtube.com/watch?v=aBzh6i5fQ70 (surface roughness)
10. https://www.youtube.com/watch?v=S7SXD6sKQ-I(surface roughness)
11. https://www.youtube.com/watch?v=eVpoJzLJa0U(surface roughness)
12. https://www.youtube.com/watch?v=3Od7vnoMwGg(surface roughness)
13. https://www.youtube.com/watch?v=XnLiTPGE6pk (three wire thread measurement)
14. https://www.youtube.com/watch?v=Gdvtw0pTAOs (thread pitch).
15. https://www.youtube.com/watch?v=qMgXGedDffw (dial indicator)
16. http://www.authorstream.com/Presentation/donzvasanth-1501139-unit-2-linear-angular-measurement/
17. http://en.wikipedia.org/wiki/List_of_gear_nomenclature#Addendum (gear nomenclature).

18. https://www.google.co.in/search?q=gear+tooth+vernier+caliper&tbm=isch&tbo=u&source=univ&sa=X&ei=MIuEUsqSOsiKrQeywIFQ&ved=0CCgQsAQ&biw=1600&bih=804 (gear tooth vernier).
19. http://www.youtube.com/watch?v=lc4dsNvm2Ks (principle of mech. meas).
20. http://www.youtube.com/watch?v=nv3GuJArjNU (Transducers).
21. http://www.youtube.com/watch?v=iMIzApq1CQ0 (pressure measurement).
22. http://www.youtube.com/watch?v=JKuoQ5FV2c8 (temperature meas.).
23. http://www.youtube.com/watch?v=GNOI_7ftbQ0(temperature meas.) .
24. http://www.youtube.com/watch?v=7xUdPVpafyI (flow measurement).
25. http://www.ignou.ac.in/upload/Unit-4-62.pdf (limit gauges).
26. http://www.scribd.com/doc/55242715/8/Types-of-limit-gauges
27. http://www.youtube.com/watch?v=v25PCV_IJCw (sensors)
28. http://www.youtube.com/watch?v=QItuf6lNvmI(sensors)
29. http://www.youtube.com/watch?v=pOvTyvBqzgM (displacement sensors)
30. http://www.youtube.com/watch?v=inLkCOwVgyM (force sensors)
31. http://www.youtube.com/watch?v=jxv0ITAr74A(force sensors)
32. http://www.youtube.com/watch?v=0MP_9n08urA(force sensors)
33. http://www.youtube.com/watch?v=zAddvPHfKnw(force sensors)
34. http://www.youtube.com/watch?v=_fQSMVf3hdM (calibration).
35. http://www.youtube.com/watch?v=HwSxBRaxn_4(calibration).
36. http://www.youtube.com/watch?v=ZymDMUuVuyY (geometrical Tol.)
37. http://www.gobookee.org/measurement-of-geometric-tolerances-in-manufacturing/
38. http://www.me.metu.edu.tr/courses/me410/exp1/410exp1theory.pdf
39. http://www.youtube.com/watch?v=5eaSkU6Ecik (flatness measurement)
40. http://www.youtube.com/watch?v=1tBnpzyhVXU (measuring straightness)

41. http://www.youtube.com/watch?v=1JNCe9fwRUw (measuring perpendicularity)
42. http://www.youtube.com/watch?v=eJ8a0k8kQIE(Roundness and cylindricity)

Course Delivery:
- The course will be delivered through lectures and Power point presentations/ Video
- Teachers can prepare or download ppt of different topic's measuring instruments usage in mechanical engineering application, can prepare alternative slides.

SUGGESTED LIST OF STUDENT ACTIVITYS
Note: the following activities or similar activities for assessing CIE (IA) for 5 marks (Any one)
1. Each student should submit any one of the following type activity or any other similar activity related to the course and before take up get it approved from concerned Teacher and HOD.
2. Each student should conduct different activity and no repeating should occur

1	Each student will select and bring at least one mechanical component. Sketch each component. Sketch and label main parts of instruments to be used. Calculate least count of the instrument/s to be used. Measure and record applicable dimensions of each

	component using suitable instrument
2	Sketch the part and setup, list the instruments used, list the steps followed and record the observations for checking straightness
3	Select appropriate limit gauge for given dimension/part and check the dimension with gauge.

- ## MODEL OF RUBRICS /CRITERIA FOR ASSESSING STUDENT ACTIVITY

RUBRICS MODEL

RUBRICS FOR ACTIVITY(5 Marks)						
Dimension	**Unsatisfactory**	**Developing**	**Satisfactory**	**Good**	**Exemplary**	**Student Score**
	1	**2**	**3**	**4**	**5**	
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	Ex: 4
Fulfill 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	5
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.	3
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	2
Average / Total marks=(4+5+3+2)/4=14/4=3.5=4						

Note: This is only an example. Appropriate rubrics/criteria may be devised by the concerned faculty (Course Coordinator) for assessing the given activity.

Course Assessment and Evaluation Scheme:

	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment	CIE	IA	Students	Three IA tests (Average of three tests will be computed)	20	Blue books	1,2,3,4,5
				Student Activities	05	activities sheets	
	SEE	End Exam		End of the course	100	Answer scripts at BTE	1,2,3,4,5
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	1 & 2,3 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3,4,5 Effectiveness of Delivery of instructions & Assessment Methods

Note: I.A. test shall be conducted for 20 marks. Average marks of three tests shall be rounded off to the next higher digit.

Note to IA verifier: *The following documents to be verified by CIE verifier at the end of semester*

1. Blue books (20 marks)
2. Student suggested activities report for 5 marks
3. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods.

FORMAT OF I A TEST QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code		Max Marks
Ex: I test/6 th weak of sem 10-11 Am	I/II SEM	**MECHANICAL MEASUREMENTS**		20
	Year:	Course code:15ME33T		

Name of Course coordinator :   Units:__

CO's:____

Question no	Question	MARKS	CL	CO	PO
1					
2					
3					
4					

Note: Internal choice may be given in each CO at the same cognitive level (CL).

MODEL QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks
Ex: I test/6 th weak of sem 10-11 Am	III SEM	**MECHANICAL MEASUREMENTS**	20
	Year: 2015-16	Course code:15ME33T	

Name of Course coordinator :   Units:1, Co: 1,2,3.

Note: Answer all questions

Question no	Question	CL	CO	PO
1	Explain Systematic and Random Errors. 4 MARKS	U	1	1,2, 3,4
2	Define i) Sensitivity, ii)Accuracy. iii)Calibration 3 MARKS	R	1	1,2, 3,4
3	Draw a neat sketch of Bevel Protractor and labels its parts. OR Explain with neat sketch Taysurf surface roughness tester 7 MARKS	A	1	1,2, 3,4, 10
4	Explain with neat sketch measurement of thread by Bench micrometer. 6 MARKS	A	1	1,2, 3,4, 10

3- Semester Diploma Examination
Course Title: MECHANICAL MEASUREMENTS

Time: **3 Hours**]   [Max Marks**: 100**

Note: Answer any <u>SIX</u> from **Part A** and any <u>SEVEN</u> from Part B

Time: 3 hrs   **Max :100marks:100**

PART-A   6x5=30 marks

1. Define Measurement and mention its requirements.   05
2. List the advantages of Resistance thermometer.   05
3. List the various types of testing equipment's used for machine tool   05
   alignment test
4. Explain the calibration procedure for measuring instrument   05
5. Explain the mounting of strain gauge.   05
6. Differentiate Resistance thermometer and thermocouple.   05
7. Compare Hole Basis System with Shaft Basis System.   05
8. Explain with a neat sketch the working of Rotameter.   05
9. Explain with a neat sketch Diaphragm type pressure gauge

PART-B
10. a)List the various factors in selection of measuring instruments.   05
    b)Explain with neat sketch measurement of thread by Bench micrometer.   05
11. a)Explain Strain Gauge Rosettes.   05
    b)Sketch the schematic diagram of the following transducer   05
       actuating   mechanisms.
    i) Circular bourdon tube   ii)Straight tube.
12.a)List the advantages of Resistance thermometer.   05
    b).Classify the various of tachometers.   05
13. Explain with a neat sketch the working principle Mcloed gauge.   10
14.a)Explain with a neat sketch Hydrometer.   05
    b)Explain with neat sketch the working of Proving ring   05
15.Explain with a neat sketch Hole Basis System and Shaft Basis System.   10
16.a)Explain Uni-lateral and Bi-lateral tolerance.   05
    b)Write short notes on sphygmomanometer.   05
17.a)Predict the advantages and disadvantages of LVDT.   05
    b)Explain with neat sketch progressive plug gauge.   05
18.Sketch a neat block diagram of Optical strain gauge and label its parts.   10
19.a)Write the classification of Strain gauge.   05
    b)Briefly explain the various classification of transducers.   05

3rd Semester Diploma in Mechanical Engineering
Course title: Mechanical Measurements

CO-I Know the terms of the measurements, and Understand the principle of operation of an instrument, Choose Suitable measuring instruments for a particular application and Apply ethical principles while measuring dimensions

Remember

1. Define Measurement and mention its requirements.
2. Define a) Precision b)Repeatability.
3. Define a) Calibration. b)Threshold
4. Define a) Hysteresis.   b)Range
5. Define a)Sensitivity   b)Accuracy.
6. Define i) Sensitivity, ii)Accuracy. iii)Calibration
7. Define error and mention types of errors.
8. Name the various types of error.
9. List the various factors in selection of measuring instruments.
10. State the advantages of CMM.
11. State the types of error.

Understand

1. Explain the signification of measurement.
2. Explain the various methods of measurements.
3. Explain the calibration procedure for measuring instrument
4. Explain Systematic and Random Errors.
5. Explain the various methods of measurements with suitable examples.
6. Explain Taysurf surface roughness testor.

Application

1. Explain with neat sketch thread gauge micrometer.
2. Explain with neat sketch measurement of thread by Bench micrometer.
3. Explain with neat sketch Bevel Protractor.
4. Draw a neat sketch of Bevel Protractor and labels its parts.
5. Explain with neat sketch the use of sine bar.
6. Explain with neat sketch progressive plug gauge.
7. Explain with neat sketch plain plug gauge.
8. Explain with neat sketch snap gauge.
9. Explain with neat sketch Ring gauge.
10. Explain with neat sketch of CMM.
11. Explain with neat sketch thread gauge micrometer. And its uses.
12. Explain with neat sketch Taysurf surface roughness tester

13.Explain with neat sketch CMM.and its use.
14.Write short notes on CMM.

CO-2: Appreciate Measurement of strain by using a basic strain gauge and hence verify the stress induced and application of transducers in mechanical engineering applications for sustainable development

Remember
1.Define transducer, list the uses of transducer.
2.List out the major transducer characteristics.
3.List the various classifications of transducers. With examples.
4.List out the any five typical transducer actuating mechanisms.
5.State the various types of self-generating transducers.
6.List the various piezo-electric materials that exhibit piezoelectric effect.
7. Define strain gauge and list its purposes
8. State the advantages and limitation of mechanical strain gauge..
9.State the various transducers selection factors.
10.List any four transducer characteristics
11.List the various classification of transducers with examples on each.
12.State the various typical transducer actuating mechanisms.
13.Name any four type of self-generating Analog transducers.
14.State various transducer characteristics
15.List the various piezo-electric materials.
16.Define gauge factor

Understanding
1.Explain the concept of variable and current generating analog transducers.
2. Explain the mounting of strain gauge.
3.Explain gauge factor.
4.Explain Strain Gauge Rosettes.
5. Explain briefly the working of optical strain gauge.
6.Explain the concept of variable and current generating analog
     transducers and mention its types.
7.Classify the Strain gauges.
8. Briefly explain the various classification of transducers.

Application
1.Explain with a neat sketch piezoelectric transducer.
2.Write the various transducers selection factors.
3.Sketch the schematic diagram of the following transducer actuating mechanisms.
        i)Corrugated diaphragm   ii)Bellows.
4.Sketch the schematic diagram of the following transducer actuating mechanisms.
        i) Capsule   ii) Twisted bourdon tube,
 5. Sketch the schematic diagram of the following transducer actuating mechanisms.
         i) Circular bourdon tube   ii)Straight tube.
6. Write the advantages and limitation of mechanical strain gauge..
7.Write short notes on gauge factor.
8.Write short notes on Strain Gauge Rosettes.
9.Explain with a neat sketch two element Rosette gauge.
10.Explain with a neat sketch three element Rosette gauge.
11.Sketch a neat block diagram of Optical strain gauge and label its parts.

12. Write various transducer characteristics
13. Explain with neat sketch Berry type strain gauge.
14. Explain with neat sketch piezoelectric transducer.
15. Write short notes on gauge factor.
16. Explain with a neat sketch the working principle of Optical strain gauge.
17. Write the classification of Strain gauge.

CO-3: Apply the principles of instrumentation for transducers & measurement of non electrical parameters like temperature, pressure, flow, speed, force and stress in mechanical engineering applications for sustainable development

Remember
1. Define force and List any three force measuring instruments.
2. Define is torque? What is the reason for measuring it.
3. Discribe dynamometer and list its applications.
4. Define pressure. List the pressure measuring instruments.
5. Define force and List any three force measuring instruments.
6. State the principle of thermocouple.
7. List the advantages of Resistance thermometer.
8. List the types of mechanical tachometers.

Understanding
1. Explain the working of Proving ring and its use.
2. Explain the principle working Optical pyrometer.
3. Classify tachometer.
4. Explain the working principle of thermocouple.
5. Explain Resistance thermometer.
6. Differenciate Resistance thermometer and thermocouple.
7. Describe tachometer and Mention types of mechanical tachometers.
8. Classify the various types of tachometers.
9. Predict the advantages and disadvantages of LVDT.
10. Express the advantages and disadvantages of the Rotameter.
11. Express the advantages of Resistance thermometer.
12. Identify the advantages and Disadvantages of the Resistance thermometer.
13. Distinguish between thermocouple and Resistance thermometer.
14. Explain thermocouple and mention any three commonly used thermocouple material.
15. Classify the various of tachometers.
16. Identify the advantages and disadvantages of LVDT.
17. Indicate the advantages of Resistance thermometer
18. Identify the advantages and disadvantages of the Rotameter.
19. Explain phenomena of piezo-electric effect.

Application
1. Explain with neat sketch Spring Balance.
2. Sketch and Explain the instrument commonly used for measurement
   of heavy loads in Industries.
3. Explain with a neat sketch the working of Hydraulic Dynamometer
4. Explain with neat sketch the construction and working of Proving ring.

5. Explain with a neat sketch working of Strain gauge type load cell..
6. Explain with neat sketch the working of Proving ring
7. Explain with neat sketch Prony Brake Dynamometer.
8. Explain with a neat sketch Diaphragm type pressure gauge.
9. Explain with neat sketch the working of Bourdon tube pressure gauge.
10. Explain with a neat sketch the working principle Mcloed gauge.
11. Explain with a neat sketch the working principle of Mcloed gauge and its use.
12. Explain with a neat sketch the working of Revolution counter.
13. Explain with a neat sketch the working of Eddy current tachometer.
14. Explain with a neat sketch of LVDT.
15. Explain with a neat sketch the working of Rotameter.
16. Write the advantages and disadvantages of the Rotameter.
17. Write the advantages of Resistance thermometer.
18. Explain with a neat sketch Resistance thermometer.
19. Write the advantages and Disadvantages of the Resistance thermometer.
20. Explain with neat sketch Optical pyrometer.
21 Explain with a neat sketch, the principle working of thermocouples.
22. Explain with a neat sketch of LVDT and show its characteristics.
23. With a neat sketch Explain the principle working of thermocouples.

CO-4: Apply the principles of miscellaneous measurements for humidity, density, level and blood pressure.

Understanding
1. Explain measurement of blood pressure using sphygmomanometer.
2. Explain the terms a)Humidity   b)Density

Applications
1. Explain the working of hair hygrometer with a neat sketch.
2. Explain with a neat sketch Hydrometer.
3. Explain with a neat sketch liquid level measurement by using sight glass.
4. Explain with a neat sketch the principle of float gauge for liquid level measurement .
5. Explain with sketch measurement of blood pressure using sphygmomanometer.
6. Write short notes on sphygmomanometer.

CO-5: Apply the principles of limits, fits, tolerance and Analyse the process alignment testing of machine tools for manufacturing field.

Remember
1. Define the following terms
   a)Limit   b)Allowance
2. Define the following terms
    a)Basic Size   b)Tolerance
3. Define the following terms
   a)Zero line   b)Fit
4. Define the following terms
   a)Deviation   b)Actual size
5. a)Define the following terms

i)Limit   ii)Allowance   iii)Basic size
6. Define tolerance and briefly explain its types.
7..Define deviation and explain types of deviation.
8.Define fit and mention its types of fits.
9. List the various types of testing equipment's used for machine tool
   Alignment test.
10. Define Interchangeability. State its importance.
   11.   Quote the reason for adopting hole basis system as the standard practice.

Understanding
1.Distinguish Hole Basis System and Shaft Basis System.
2.Explain Uni-lateral and Bi-lateral tolerance.
3.Differenciate between unilateral and Bilateral tolerance.
4.Express the reason for adopting hole basis system as the standard practice.
5.Explain the importance of Geometric test on machine tools.
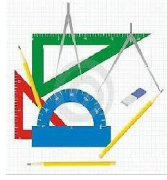6.Compare Hole Basis System with Shaft Basis System.

Applications
1.Explain with neat sketch clearance fit.
2. Explain with neat sketch interference fit.
3. Explain with neat sketch transition fit.
4. Explain with a neat sketch Hole Basis System and Shaft Basis System.
5.Write the reason for adopting hole basis system as the standard practice.
6.Write short note on Interchangeability.
7.Write short note on selective assembly.
8.Explain with neat sketch interference fit.
9.Write a neat sketch of Graphical illustration of limits and tolerances.
10.Explain with neat sketch he procedure for checking the parallelism of spindle axis to carriage movement in lathe.
11..Explain with neat sketch the procedure for checking the straightness of the carriage movement in lathe.
12..Explain with neat sketch checking of run out of axis of centre in lathe.
13.With neat sketch explain shaft basis system.
14.With neat sketch explain Hole Basis system.
.

Prerequisites: Engineering graphics-I and Engineering graphics-II and Sound pictorial

	Course Title: **MACHINE DRAWING**		
	Scheme (L:T:P) : **0:2:4**	Total Contact Hours: **78**	Course Code: **15ME34D**
	Type of Course: **Tutorial and practice**	Credit :**03**	Core/ Elective: **Core**
CIE- 25 Marks			SEE- 100 Marks

Course Objectives:

1. Understanding of drawing, which includes clear visualization of objects and the proficiency in reading and interpreting a wide variety of production and assembly drawings.
2. This course envisages reinforcing and enhancing the knowledge and skill acquired in the earlier two courses

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

	Course Outcome	**CL**	**Linked PO**	**Teaching Hrs**
CO1	Interpret Conventional symbols as per IS code SP46.	**R**	1,2,3,10	**04**
CO2	Understand the Conventional methods of representing threaded fasteners	**R**	1,2,3,10	**12**
CO3	Understand the Conventional representation of Riveted joints	**U/A**	1,2,3,10	**12**
CO4	Categorize attributes of Production Drawing and Limits, fits, tolerances	U	1,2,3,10	**06**
C05	Illustrate the significance & use of tolerances of size, forms & positions	*U*	1,2,3,10	**06**
C06	Visualize the assembly of a given set of details of machine components	*U/A*	1,2,3,8,9,10	**38**
		Total sessions		**78**

Legend: R; Remember, U: Understand A: Application

COURSE-PO ATTAINMENT MATRIX

Course	**Programme Outcomes**									
	1	2	3	4	5	6	7	8	9	10
MACHINE DRAWING	**03**	**03**	**03**	-	-	-	-	**2**	**2**	**3**
Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed. Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO. If ≥40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3 If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2 If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1 If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.										

COURSE CONTENT AND BLUE PRINT OF MARKS FOR SEE

Unit No	Unit Name	Hour	Questions to be set for SEE			Marks weightage	weightage (%)
			R	U	A		
1	CONVENTIONAL REPRESENTATION	04	15	--	---	15	11.5
2	THREADED FASTENERS	12	---	--	15	15	11.5
3	RIVETED JOINTS	12	--	---	15	15	11.5
4	LIMITS, FITS AND TOLERANCES	06	---	15	--	15	11.5
5	PRODUCTION DRAWINGS	06	--	---	---	---	------
6	DETAILS TO ASSEMBLY	38	--	---	70(*)	70(*)	54
	Total	78	15	15	100	130	100

Legend: R; Remember, U: Understand A: Application

(*): Compulsory question to be answered

Standard convention using SP – 46 (1988)-Materials C.I., M.S, Brass, Bronze, Aluminum, wood, Glass, Concrete and Rubber-Long and short break in pipe, rod and shaft.- Various sections- Half, removed,-Standard convention of Knurling, splined shafts, and chain wheels-Springs with square and flat ends, Gears, sprocket wheel-Countersunk &counter bore

UNTII: THREADED FASTENERS   12Hrs

Screw thread terminology-Conventional representation of External threads and internal threads-Draw the top and front view of hexagonal headed bolt with nut across flat and corner-Draw -square headed bolt across corner and flat-cylindrical headed bolt-Eye bolt-Locking devices-Draw the views of for standard dimensions-lock nut-castle nut-Studs-Tap bolt-Machine screws-washers-Keys-sunk key-Gib head key.(For a given standard diameter with proportions)

UNITIII: RIVETED JOINTS   12Hrs
Rivets-types-Types of riveted joints-Draw the sectional front view and top view of-single riveted lap joint, double riveted lap joint with chain riveting and zigzag riveting. Draw the sectional front view and top view of-single riveted butt joint with single and double cover plate - double riveted butt joint with chain riveting and zigzag riveting with double cover plate.

UNIT IV: LIMITS, FITS AND TOLERANCES   06Hrs

Concept of limits, fits & allowances--Introduction to ISO system of tolerance,-dimensional tolerances-Draw the working drawing plain step turned shaft of varying diameter, indicate the dimensional tolerances

UNIT V: PRODUCTION DRAWINGS   06Hr

Surface roughness-Indication of machining-symbol showing direction of lay, roughness grades, machining allowances, Machining symbols used in industry

(Suggested Practice:Disassembling of any Physical model having not less than five parts, sketch the minimum views required for each component, measure all the required dimensions of each component.)

UNIT VI: DETAILS TO ASSEMBLY   38Hrs

Introduction to the unit assembly drawing, steps involved in preparing assembly drawing from Details-Sequence in assembly-Preparation of details and Assembly of parts with Sectional views of- **Socket and Spigot joint Cotter Joint-- Knuckle joint- Protected Flanged coupling- Universal coupling-Plummer Block and Screw Jack (Front, side and top views)**

TEXT BOOKS

1. Machine drawing, -K.R. Gopala Krishna Subhas Publishers, Bangalore

REFERENCES
1. Machine Drawing**-** N.D.Bhatt, Charotar Publication, Anand
2. Machine Drawing-Sidheshwar-Tata McGraw Hill
3. Code of practice for general engineering-IS Code SP 46(1988)- Engineering Drawing Practice for School and colleges
4. Production Drawing-L.K.Narayanan,P.Kannaich,- New Age International Publication

SUGGESTED LIST OF STUDENT ACTIVITYS

Note: the following activities related to unit 5 and for assessing CIE(IA)
1. Each student should submit any one of the following type activity or any other similar activity related to the course and before take up get it approved from concerned Teacher and HOD.
2. *Each student should conduct different activity and no repeating should occur*

1	Select at least four simple mechanical components each made up of minimum 5-6 Manufacturing operations. Get them approved by teacher. Measure and sketch them in a drawing sheet with dimensions.
2	Select at least one simple mechanical assembly in group of 5-6 students, each made up of minimum 5-6 manufacturing operations. Get them approved by teacher. Measure and sketch them in a drawing sheet with dimensions. Example- assembly of any coupling, carburetor, machine vice, fuel pump, tail stock etc.
3	Bring Actual assembly from workshop/industry, measure dimensions, sketch it and make 2D production drawing for the same.

Course Delivery:

The course will be delivered through lectures and Demonstration and practices

NOTE:.
1. Students should use two separate A3 size sketchbooks, one for class work and another for assignment.
2. Students should solve assignment on each topic. The sessional marks will be awarded on the basis of Graded exercises and assignment
3. Use half imperial size drawing sheet for term work

MODEL OF RUBRICS /CRITERIA FOR ASSESSING STUDENT ACTIVITY

	RUBRICS FOR ACTIVITY(5 Marks)					
Dimension	Unsatisfactory	Developing	Satisfactory	Good	Exemplary	Student Score
	1	2	3	4	5	
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	Ex: 4
Fulfill 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	5
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.	3
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	2
Average / Total marks=(4+5+3+2)/4=14/4=3.5=4						

Note: This is only an example. Appropriate rubrics/criteria may be devised by the concerned faculty (Course Coordinator) for assessing the given activity.

Course Assessment and Evaluation Scheme:

	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment method	CIE	IA	Students	Graded Exercises- Average marks all graded exercises to be computed.	20	Drawing Sheets	1.2,3,4,5,6
	SEE End Exam			Student activities	05	Log of activity	1.2,3,4,5,6
				End of the course	100	Answer scripts at BTE	1.2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	1, 2,3 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3,4,5,6- Effectiveness of Delivery of instructions & Assessment Methods

*CIE – Continuous Internal Evaluation   ***SEE** – Semester End Examination

Note:
1. Rubrics to be devised appropriately by the concerned faculty to assess Student activities.

Note to IA verifier: ***The following documents to be verified by CIE verifier at the end of semester***

1. Drawing sheet files (Two /Three students)(20 marks)
2. Student suggested activities report for 5 marks
3. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods.

NOTE:THIS SUBJECT SHOULD THOUGHT IN A BATCH OF 15 TO 20 STUDENTS,TEACHER INCHARGE PER BATCH HAS TO MONITER, EVALUATE OR ASSESS THE STUDENTS.

III Semester Diploma in Mechanical Engineering
MACHINE DRAWING

Time: 4 **Hours**   [Max Marks**: 100]**

Note: Answer any ONE from **Part A** and **Part B, Part-C** is compulsory

Part A

1.a) Draw the conventional representation of the following materials.   -9M
i)) Wood   (ii) steel (iii) rubber
   b) Draw the conventional representation of the following sections.
      (i) Bottom-half in section (ii)Right - half in section   -6M
2.Draw the diagrammatic representation of the following   -15M
 (i)Clearance fit (ii) Interference fit (iii) Transition fit

Part B

2. Draw the front and top view of ISO threaded Square bolt and Nut of 100 mm   long with a threaded   length of   50mm. The diameter of the bolt is 20 mm across corner-15M
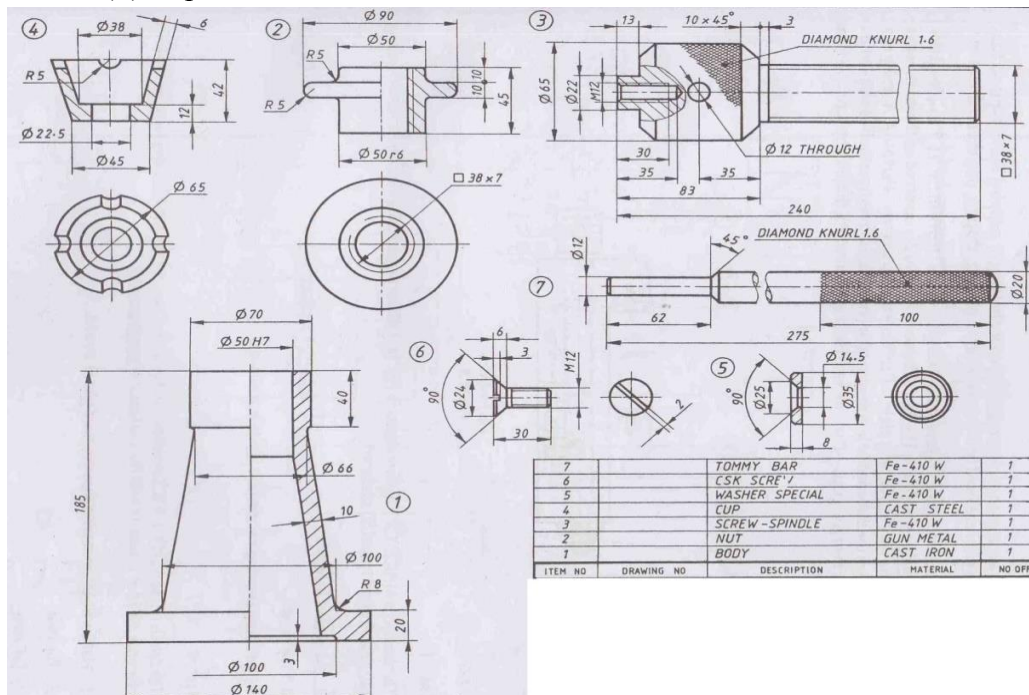
3.Draw to 1:1 scale the sectional front view and top view of a single riveted Butt joint with double cover plate. The thickness of the plate is 9 mm. Use snap head rivets and show at least three rivets. Indicate all the dimensions.   -15M

Part C

1. The detail parts of a SCREW JACK is given, Assemble the parts and show the following views to 1:1 scale. Show the important dimensions on the assembly Drawing

      (i)Front view in section   -45M
      (ii) Top view   - 25M

ITEM NO	DRAWING NO	DESCRIPTION	MATERIAL	NO OFF
7		TOMMY BAR	Fe – 410 W	1
6		CSK SCREW	Fe – 410 W	1
5		WASHER SPECIAL	Fe – 410 W	1
4		CUP	CAST STEEL	1
3		SCREW –SPINDLE	Fe –410 W	1
2		NUT	GUN METAL	1
1		BODY	CAST IRON	1

III Semester Diploma in Mechanical Engineering
MACHINE DRAWING
(15 MARKS QUESTIONS)
PART-A & PART-B

CO 01: INTERPRET CONVENTIONAL SYMBOLS AS PER IS CODE SP46.

LEVEL:REMEMBER

1.a) Draw the conventional representation of the following materials.   -9M
i) Lead (ii)Glass (iii) fibre
b)Draw the conventional representation of the following sections.
(i) Top-half in section (iv)Left - half in section-6M

2.a) Draw the conventional representation of the following materials.   -9M
i)) Wood   (ii)steel (iii) rubber
   b) Draw the conventional representation of the following sections.
      (i) bottom-half in section (ii)Right - half in section   -6M

3. a) Draw the conventional representation of the following materials.   -9M
i)) Cast iron   (ii)plywood (iii) rubber
   b) Draw the conventional representation of the following sections.
      (i) Top-half in section (ii)Right - half in section   -6M

4.Draw the conventional representation of the following sections.
   a) (i) Knurling operation (ii) splined shafts and -Springs with square and flat ends
 (iii) chain wheels -9M
 b) Draw the conventional representation of the following sections.
      (i) Top-half in section (ii)Right - half in section   -6M

5.Draw the conventional representation of the following sections.
a)(i)Knurling operation(ii)Counter sunk & counter bore(iii)Spur gear -9M
   b) Draw the conventional representation of the following sections.
      (i) Top-half in section (ii)Right - half in section   -6M

CO 02: UNDERSTAND THE CONVENTIONAL METHODS OF REPRESENTING THREADED FASTENERS

LEVEL:APPLICATION

1.Draw the front and top view of ISO threaded Hexagonal bolt and Nut of 120 mm long with a threaded length of 60 mm. The diameter of the bolt is 24mm across corner.

2.Draw the front and top view of ISO threaded Hexagonal bolt and Nut of 100 mm long with a threaded length of 50mm. The diameter of the bolt is 20 mm across Flat

3.Draw the front and top view of ISO threaded Square bolt and Nut of 100 mm long with a threaded length of 50mm. The diameter of the bolt is 20 mm across Flat

4. Draw the front and top view of ISO threaded Square bolt and Nut of 100 mm long with a threaded length of 50mm. The diameter of the bolt is 20 mm across corner

5. Draw the front and side view of a lifting Eye bolt of diameter 24mm and indicate all the proportions.

6.Draw the front and Top view of a split pin method of locking of an ordinary Nut of diameter 24mm and indicate all the proportions.

CO 03: UNDERSTAND THE CONVENTIONAL REPRESENTATION OF RIVETED JOINTS

LEVEL:APPLICATION

1.Draw to 1:1 scale the sectional front view and top view of a double riveted lap joint with chain riveting .The thickness of the plate is 10mm. Use snap head rivets and show at least three rivets. Indicate all the dimensions.

1. Draw to 1:1 scale the sectional front view and top view of a double riveted lap joint with Zig-zag riveting .The thickness of the plate is 10mm. Use snap head rivets and show at least three rivets. Indicate all the dimensions.

2. Draw to 1:1 scale the sectional front view and top view of a single riveted Butt joint with double cover plate. The thickness of the plate is 9 mm. Use snap head rivets and show at least three rivets. Indicate all the dimensions.

4.Draw to 1:2 scale the sectional front view and top view of a single riveted Butt joint. The thickness of the plate is 20 mm. Use snap head rivets and show at least three rivets. Indicate all the dimensions.

5.Draw to 1:1 scale the sectional front view and top view of a double riveted Butt joint with double cover plate with change riveting. The thickness of the plate is 12mm. Use snap head rivets and show at least three rivets. Indicate all the dimensions.

6.Draw to 1:1 scale the sectional front view and top view of a double riveted Butt joint with double cover plate with change Zig-zag riveting. The thickness of the plate is 12 mm. Use snap head rivets and show at least three rivets. Indicate all the dimensions.

CO 04:CATEGORIZE ATTRIBUTES OF PRODUCTION DRAWING AND LIMITS,FITS,TOLERANCES

LEVEL:UNDERSTANDING

1.Draw the diagrammatic representation of the following   -15M
  (i)Clearance fit (ii) Interference fit (iii) Transition fit

2. a)Draw the designation of shaft of basic size 20mm of grade 8 with upper deviation zero   --7M
b)Dimension a hole of base size 30mm grade 7 with lower deviation zero by using letters and numerals on a sketch.   –8M

Part B

(70 MARKS QUESTION WHICH IS COMPULSORY)
(FOR END EXAM ANY TWO VIEWS TO BE ASKED)

**CO 06:VISUALIZE THE ASSEMBLY OF A GIVEN SET OF DETAILS OF MACHINE COMPONENTS**

LEVEL:APPLICATION

1.The detail parts of a SOCKET AND SPIGOT JOINT COTTER JOINT is given, Assemble the parts and show the following views to 1:1 scale. Show the important dimensions on the assembly Drawing

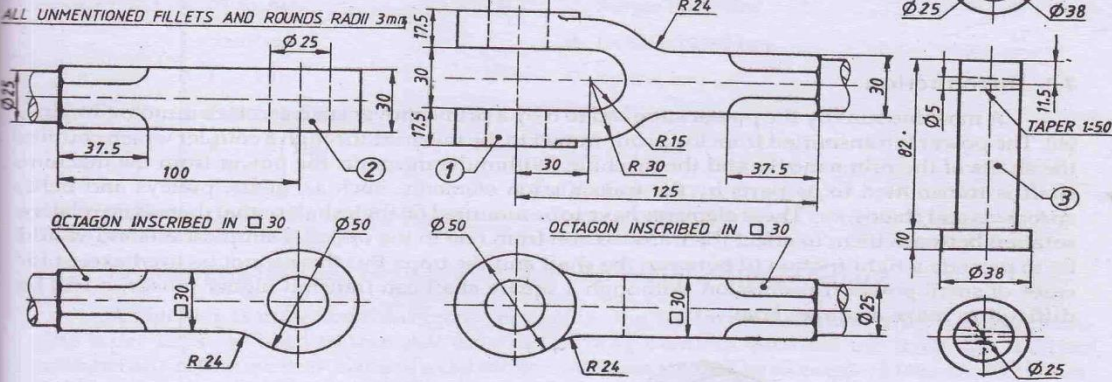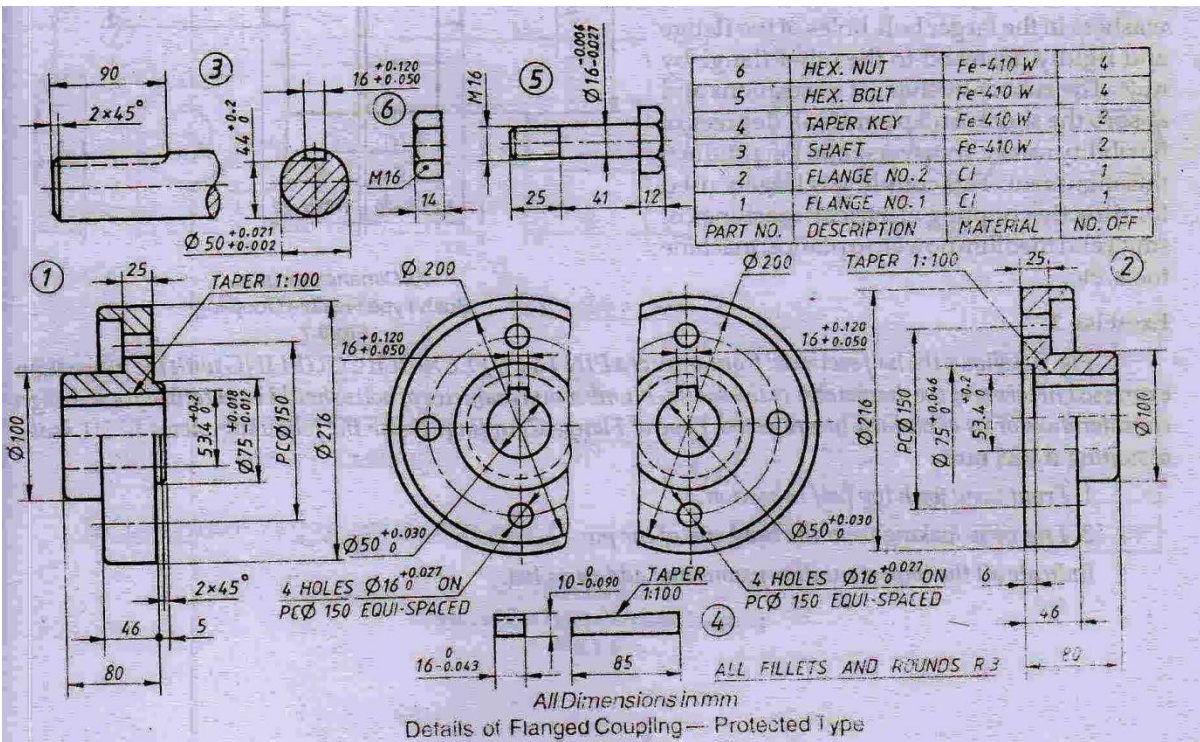 (i)Front view with Top-half in section.
  (ii) Top view
  (iii)Right view

Details of Socket and Spigot Cotter Joint
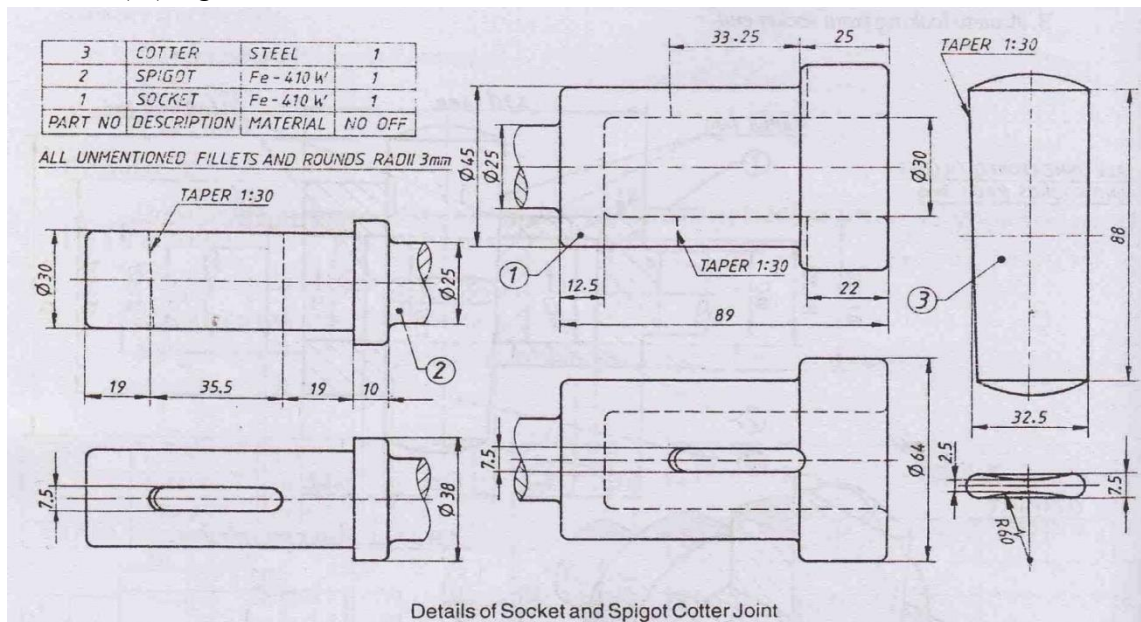
2.The detail parts of a KNUCKLE JOINT is given, Assemble the parts and show the following views to 1:1 scale. Show the important dimensions on the assembly Drawing

        (i)Front view in section
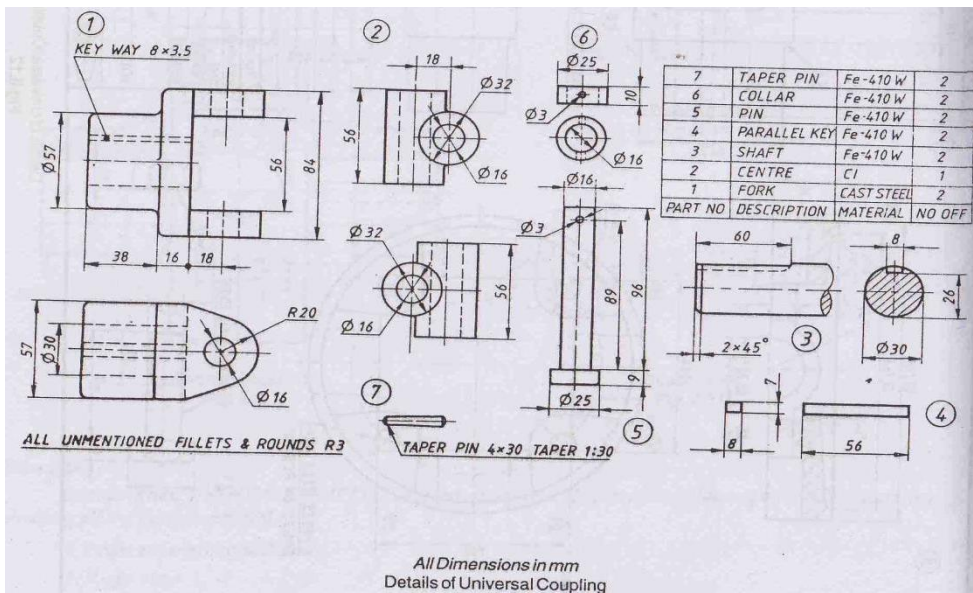   (ii) Top view
        (iii)Left view

PART NO	DESCRIPTION	MATERIAL	NO OFF
5	TAPER PIN	Fe-410W	1
4	COLLAR	Fe-410W	1
3	PIN	Fe-410W	1
2	EYE	Fe-410W	1
1	FORK	Fe-410W	1

ALL UNMENTIONED FILLETS AND ROUNDS RADII 3mm

Details of a Knuckle Joint

3. The detail parts of a PROTECTED TYPE FLANGED COUPLING is given, Assemble the parts and show the following views to 1:1 scale. Show the important dimensions on the assembly Drawing
(i)Front with Top-half in section
(ii) Top view
(iii)Left side view

PART NO.	DESCRIPTION	MATERIAL	NO. OFF
6	HEX. NUT	Fe-410 W	4
5	HEX. BOLT	Fe-410 W	4
4	TAPER KEY	Fe-410 W	2
3	SHAFT	Fe-410 W	2
2	FLANGE NO. 2	CI	1
1	FLANGE NO. 1	CI	1

All Dimensions in mm
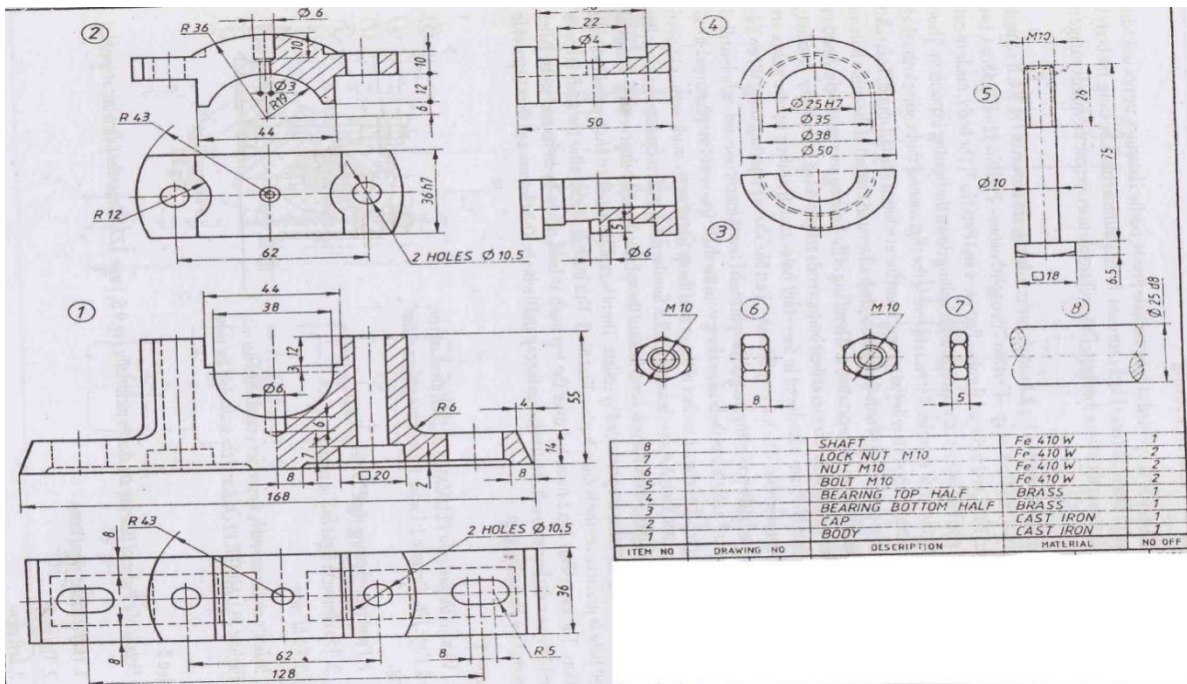Details of Flanged Coupling — Protected Type

4. The detail parts of a UNIVERSAL COUPLING is given, Assemble the parts and show the following views to 1:1 scale. Show the important dimensions on the assembly Drawing
(i)Front view
(ii) Top view
(iii)Left side view

All Dimensions in mm
Details of Universal Coupling

5. The detail parts of a PLUMMER BLOCK is given, Assemble the parts and show the following views to 1:1 scale. Show the important dimensions on the assembly Drawing
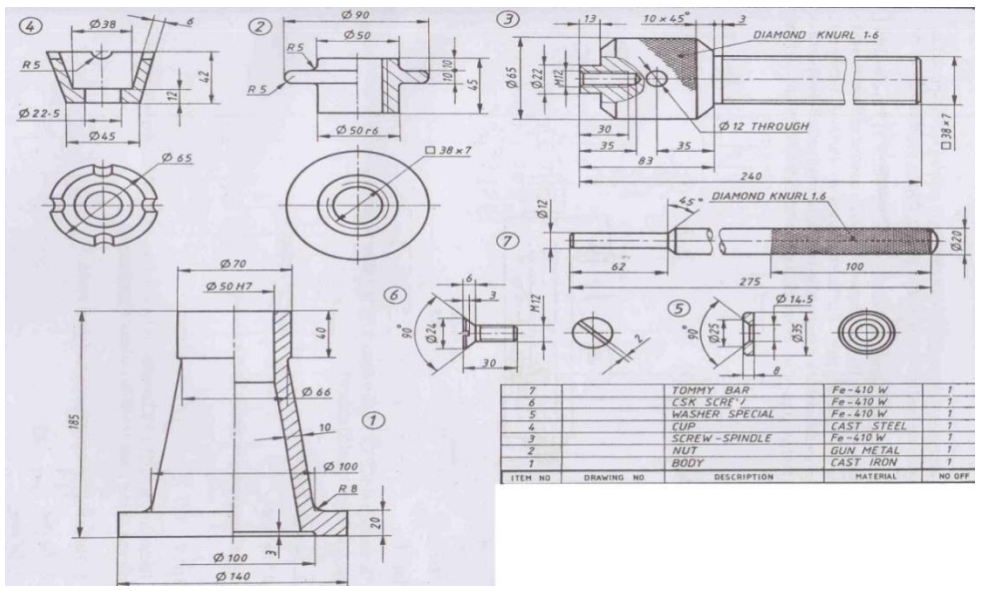 (i)Front view with Right half in section
 (ii) Top view

6.   The detail parts of a **SCREW JACK** is given, Assemble the parts and show the following views to 1:1 scale. Show the important dimensions on the assembly Drawing
 (i)Front view in section
 (ii) Top view
(iii)Side view

ITEM NO	DRAWING NO	DESCRIPTION	MATERIAL	NO OFF
7		TOMMY BAR	Fe – 410 W	1
6		CSK SCREW	Fe – 410 W	1
5		WASHER SPECIAL	Fe – 410 W	1
4		CUP	CAST STEEL	1
3		SCREW – SPINDLE	Fe – 410 W	1
2		NUT	GUN METAL	1
1		BODY	CAST IRON	1

	Course Title: **MECHANICAL COMPUTER AIDED DRAFTING (MCAD)**		
	Scheme (L:T:P) : **0:2:4**	Total Contact Hours: **78**	Course Code: **15ME35P**
	Type of Course: **Tutorial and practice**	Credit :**03**	Core/ Elective: **Core(practice)**
CIE- 25 Marks			SEE- 50 Marks

Prerequisites: Basic computer Skills and Practice concepts of Machine drawing

Course Objectives:

1. Now a day a manual drafting is obsolete in industry. Computers being the inevitable part in an engineer's life due to its inbuilt characteristics which helps him to do various task with acceleration.
2. Using computers and CAD software it is easy to create and modify drawings ultimately it saves time. It also may be useful to generate assembly and manufacturing drawings.
3. In mechanical industry operating skills are required for computer aided drafting operations of machine components, handling of printers & plotters. This subject is also useful to apply concepts in 3 D modeling.

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

	Course Outcome	**CL**	**Linked excises**	**Linked PO**	**Teaching Hrs**
CO1	Interpret and Draw, edit and modify 2D	**U/A**	Basics	1,2,3,9,10	**08**
CO2	Give dimensions, tolerances and geometrical tolerances	**U/A**	Basic commands	1,2,3,9,10	**08**
CO3	Create Isometric 2D Views and 3D drawing ,when orthographic views of simple machine parts/Threaded fasteners /Riveted Joints	**U/A**	Models from question bank (Sl.no 01 to 16)	1,2,3,9,10	**18**
CO4	Plot Assembly 2D drawings and Create their respective 3D Assembled views	U/A	Part drawings from question bank (Sl.no 01 to 05)	1,2,3,9,10	**44**
				Total sessions	**78**

Legend: U- Understand   A- Application

COURSE-PO ATTAINMENT MATRIX

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
MECHANICAL COMPUTER AIDED DRAFTING (MCAD)	03	03	03	-	-	-	-	-	03	03

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.
Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.
If ≥40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3
If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2
If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1
If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

COURSE CONTENT

Unit No	Unit Name	Hour	Questions to be set for (10marks) PART - A	Questions to be set for (40marks) PART - B	Marks weightage (%)
1	**CAD COMMANDS FAMILIARIZATION**	08	-----	------	-
2	**PRACTICE ON COMMANDS**	08	01	----	17
3	**CREATION OF 3D MODELS /THREADED FASTENERS/ RIVETED JOINTS**	18	01	-----	17
4	**DETAILS TO ASSEMBLY**	44	----	01(*)	66
	Total	78	02	01	100

Note: (*): Compulsory Question to be asked in end exam

UNITI: CAD COMMANDS FAMILIARIZATION   **08Hrs**

Introduction to MCAD(parametric modelling) software-Understanding parametric modelling technique, knowing the software interface, co-ordinate systems supported- Planes and their creation, reference axis, Sketch, Profile, constraints-geometrical and dimensional, need for constraining, fully constrained, under constrained, over constrained.

UNTII: PRACTICE ON COMMANDS   **08Hrs**

Practice 2D and 3D drawing commands
Hands on Exercises.
    Create2DDrawing for the ISOMETRIC OBJECT given by selecting from model question bank
    Create 3D Drawings for the ORTHOGRAPHIC VIEWS given by selecting from model question bank

UNIT III: ASSEMBLY   MODELING   **44Hrs**

Know the assembly environment, setting the assembly environment, types of assembly design approach-bottom-up and top-down assembly. Creating assembly Editing and modifying assembly relationships -Creating exploded view of the assembly –Create 3DAssemblymodels of- **Socket and Spigot type Cotter Joint-Knuckle joint—Plummer Block- Screw Jack**

UNIT IV:MODELS BY USING EQUSTIONS   18Hrs

Hexagonal nut and bolt, Solid muff coupling and journal bearing

TEXT BOOKS

1. Sham Tickoo- Autocad: A Problem-Solving Approach Thomson Learning EMEA, Limited
2. Machine Drawing**-** K.R.Gopala Krishna   Subhas Publications Bangalore
3. George Omura- Mastering Auto CAD BPB Publication
4. T Jeyapoovan- Engineering Graphics Using AutoCAD Vikas Publishing House Pvt. Ltd. Fifth Edition

REFERENCES

1. Machine Drawing**-** N.D.Bhatt, Charotar Publication, Anand
2. Machine Drawing-Sidheshwar-Tata McGraw Hill
3. Code of practice for general engineering-IS Code SP 46(1988)- Engineering Drawing Practice for School and colleges
4. Production Drawing-L.K.Narayanan,P.Kannaich,- New Age International Publication

SUGGESTED LEARNING WEB SITES

http://www.we-r-here.com/cad/tutorials/index.htm
http://www.cadtutor.net/tutorials/autocad/
http://www.caddprimer.com/AutoCAD_training_tutorial/AutoCAD_training_lessons.htm
http://www.autocadmark.com/
http://www.autocadtutorials.net/

SUGGESTED LIST OF STUDENT ACTIVITYS

1. Each student should submit any one of the following type activity or any other similar activity related to the course and before take up get it approved from concerned Teacher and HOD.
2. *Each student should conduct different activity and no repeating should occur*

1	Bring actual industrial production drawings from nearby industry and distribute them among group of students for self study and interpretation. Ask students to practice these drawings using any modeling software.
2	Bring small real components like Nut-Bolt, Washers, Cotter-knuckle Joints, Couplings, and Pulleys in the class. Ask students to use Vernier caliper to measure the dimensions and formulate relations between them. Practice same relations with AutoCAD/Pro-E software/Solid edge/catia to draw 2D/3D models of these components.
3	Take the students for industrial visit. Hands-on practice with drafting software to create a production drawing of an assembly.

Course Delivery:

The course will be delivered through lectures and Demonstration and CAD practices. This Lab can be performed using <u>ANY ONE</u> of the following software's:

1) Solid edge
2) Iron CAD
3) CATIA
4) ProE
5) Solid Works
6) INVENTOR
7) Any equivalent or open source software's

Course Assessment and Evaluation Scheme:

	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment meth	CIE	IA	Students	Student activities	10	CAD drawing	1,2,3,4
				Record- Average marks of all graded exercises to be computed.	15	CAD exercises	1,2,3,4
	SEE	End Exam		End of the course	50	Answer scripts at BTE	1,2,3,4
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	1,2,3 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3, 4 Effectiveness of Delivery of instructions & Assessment Methods

*CIE – Continuous Internal Evaluation   ***SEE** – Semester End Examination

Note:
1. Rubrics to be devised appropriately by the concerned faculty to assess Student activities.

- **MODEL OF RUBRICS /CRITERIA FOR ASSESSING STUDENT ACTIVITY**

RUBRICS MODEL

RUBRICS FOR ACTIVITY(10 Marks)						
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	Ex: 4
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=(4+6+8+8)/4=26/4=6.5=7						

Note: This is only an example. Appropriate rubrics/criteria may be devised by the concerned faculty (Course Coordinator) for assessing the given activity.

Questions for CIE and SEE will be designed to evaluate the various educational components (Bloom's taxonomy) such as:

Sl. No	**Bloom's Category**	**% Weightage**
1	**Understanding**	**45**
2	**Applying the knowledge acquired from**	**40**
3	**Analysis**	**05**
4	**Evaluation& Creating new knowledge**	**10**

Note to IA verifier: *The following documents to be verified by CIE verifier at the end of semester*
1. Student suggested activities report for 10 marks
2. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods.

Scheme of Valuation for End Examination

Sl no	Questions	Marks

1	Create the model and drawing views(any 3) along with dimensions and annotations as per sketch given	10
	OR	
	Create the model and drawing views(any 3) along with dimensions and annotations using equations	10
2	Create the assembly model and drawing with dimension, BOM, - as per the given sketch**(*): Compulsory Question to be asked in end exam**	40
	Total	**50**

EQUIPMENT LIST:
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.)-20 no
2. Any latest Authorized Computer Aided Drafting Software (20 copies
3. Plotter of size A2/A3
4. LCD Projector

MODEL QUESTION PAPER
III Semester Diploma in Mechanical Engineering
MECHANICAL COMPUTER AIDED DRAFTING (MCAD)

Time: 3 **Hours**   [Max Marks**: 50]**

Note: Answer any ONE from **Part A** and **Part B** is compulsory

Part A

1.Create front , top and side view for the given 3D Drawing   -10M

OR

Create the 3D Part model for the given 2D Drawing-10M
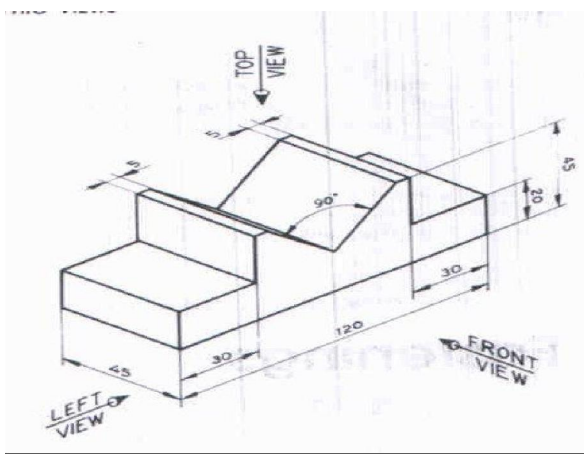
Part B
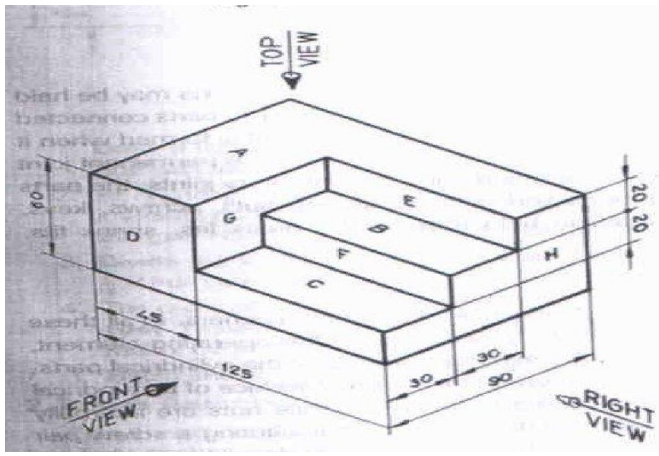1.Create3D Assembly models of a **PLUMMER BLOCK** for the given

detailparts.-40M
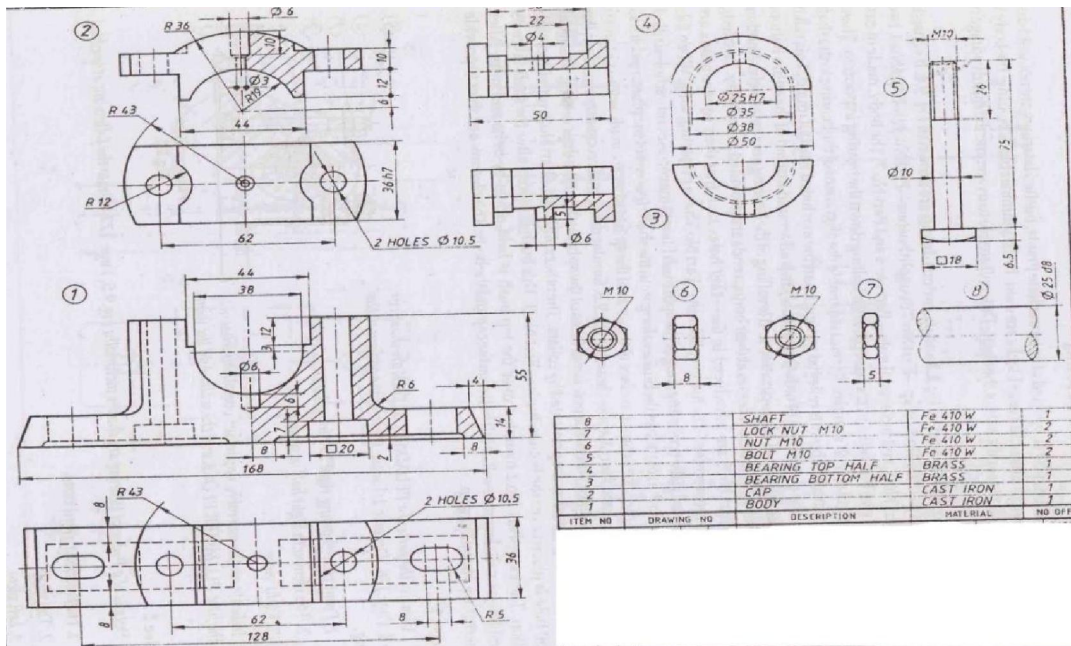
MODEL QUESTION BANK

III Semester Diploma in Mechanical Engineering
MECHANICAL COMPUTER AIDED DRAFTING (MCAD)
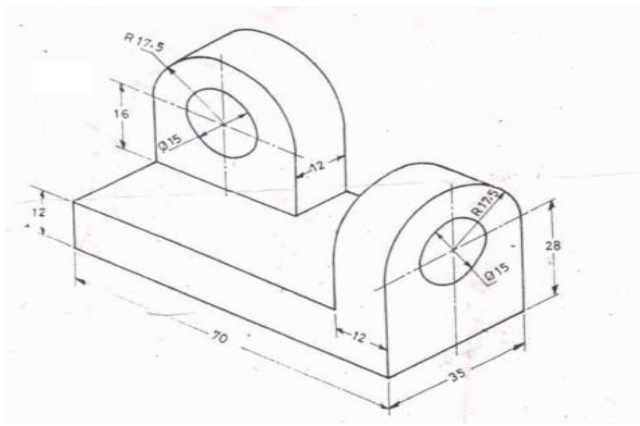### PART-A
(10 MARKS QUESTIONS)
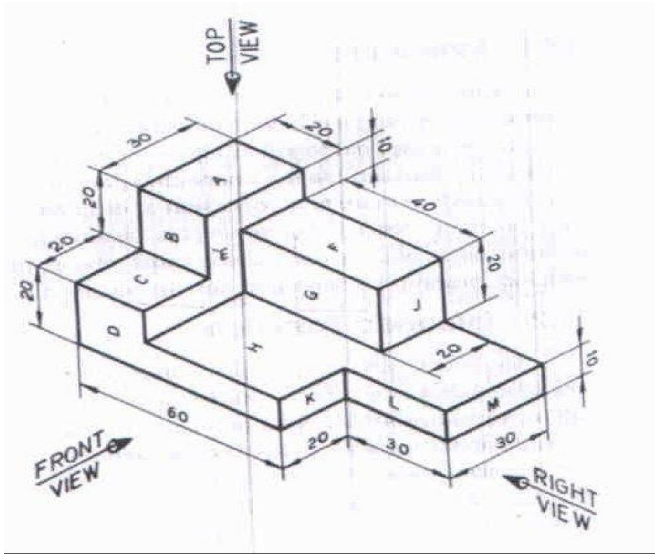
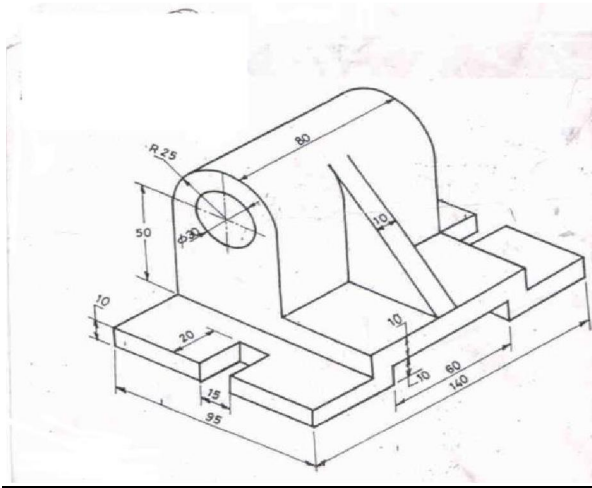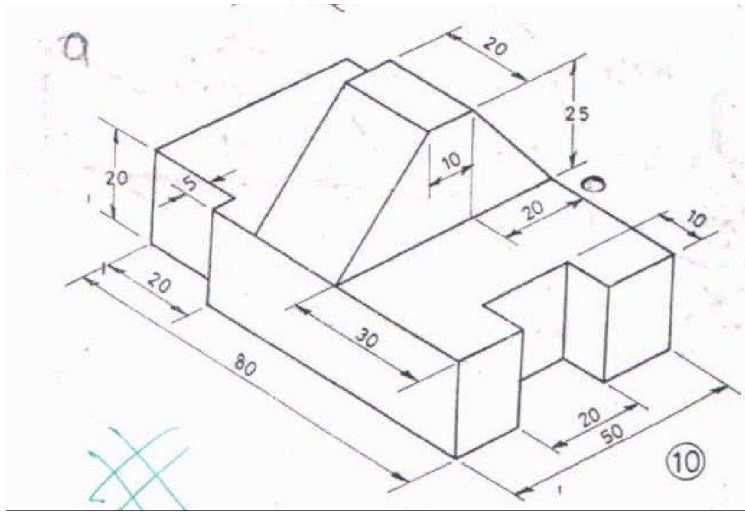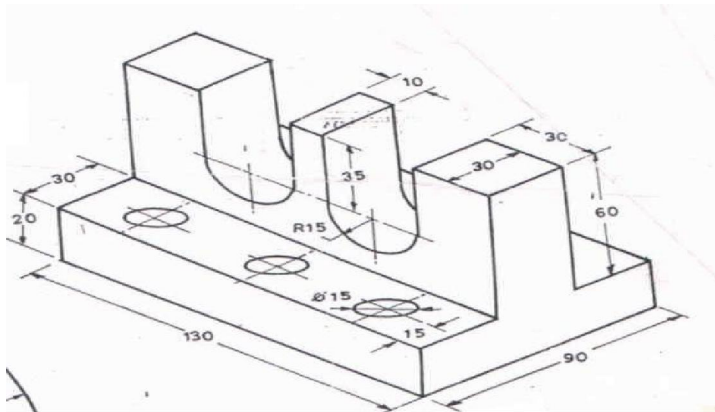1. Create front, top and side view for the given 3D Drawing.

Directorate Of Technical Education   Karnataka State   **15ME35P MECH**

2.

3.

4.

5.

6.

7.

8.
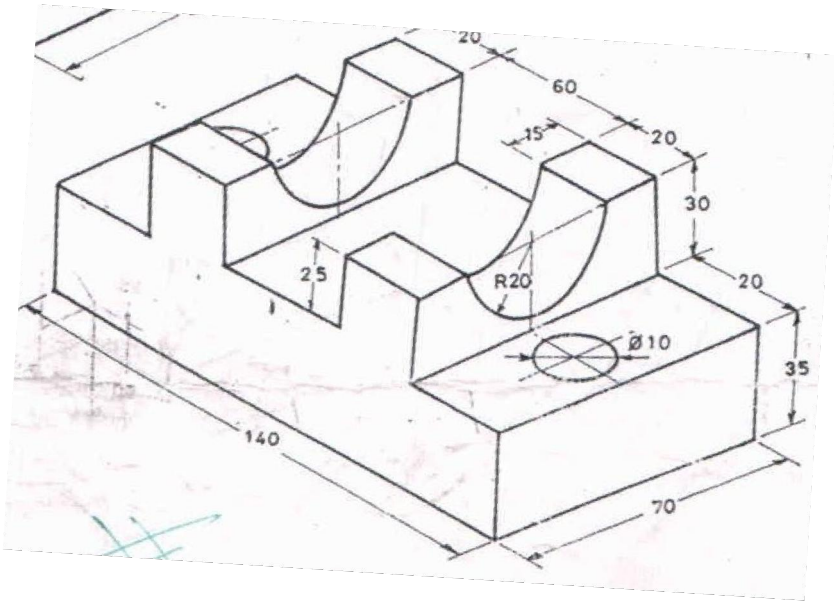
9.
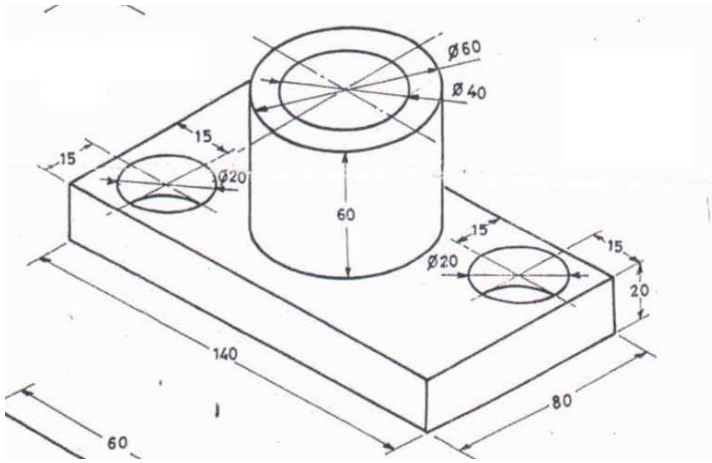
10.

11. Create the 3D Part model for the given 2D Drawing

12.

13.

Ø 20 R 20
50
15
20 50
70
All dimensions in mm

14.

55 20 Ø 20
R 20
2 HOLES Ø 16
40
20
8
15 15
35 60 35 40

15.

30 7,5 7,5 15 7,5
12
12
12
30
60
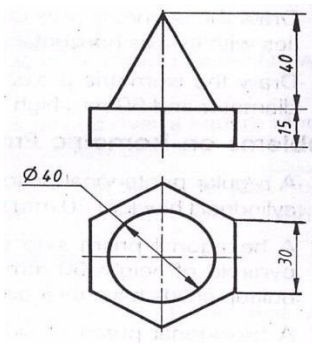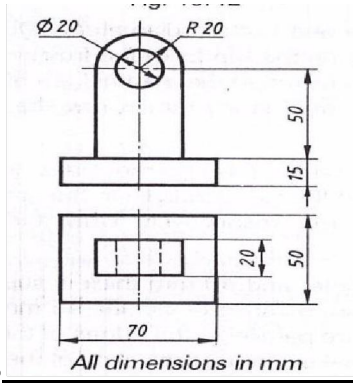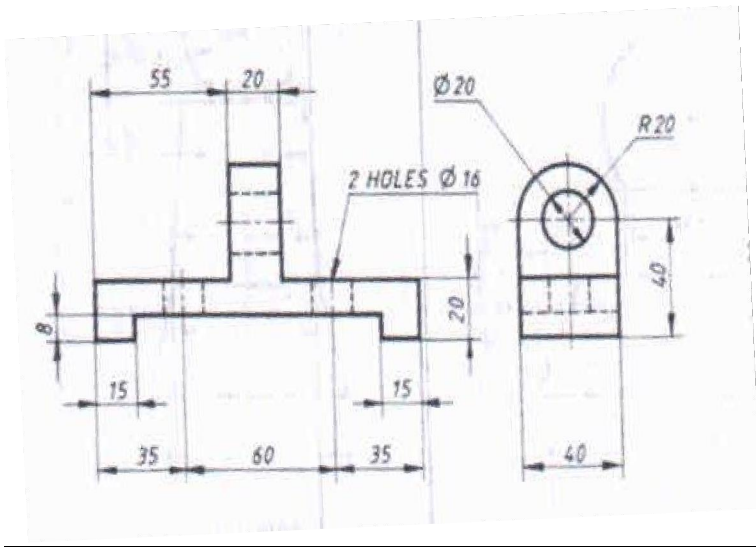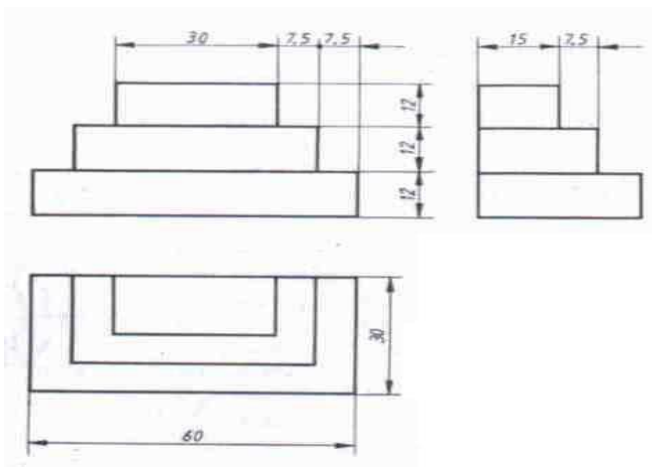
16.
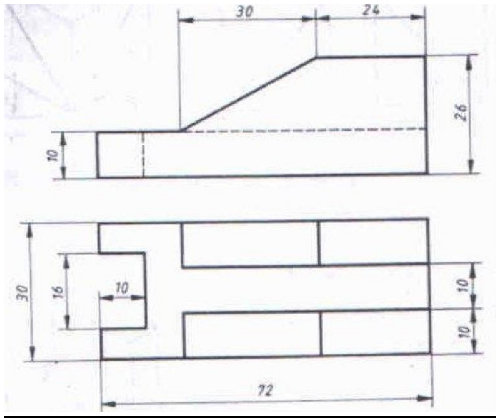
Part B

1. Create 3D Assembly models of a **SCREW JACK** for the given detail parts.

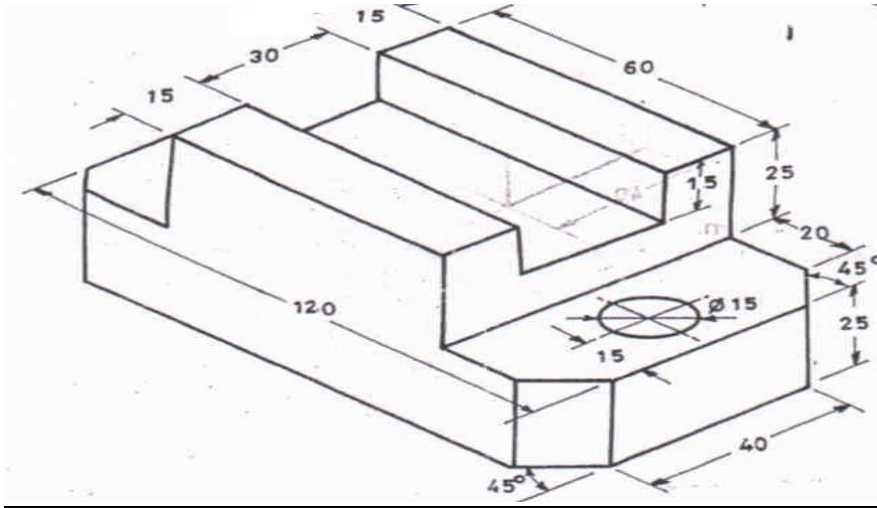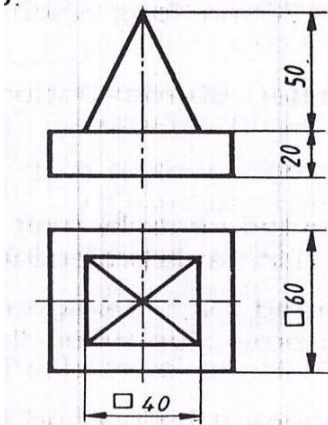| ITEM NO	DRAWING NO	DESCRIPTION	MATERIAL	NO OFF
7		TOMMY BAR	Fe-410 W	1
6		CSK SCREW	Fe-410 W	1
5		WASHER SPECIAL	Fe-410 W	1
4		CUP	CAST STEEL	1
3		SCREW-SPINDLE	Fe-410 W	1
2		NUT	GUN METAL	1
1		BODY	CAST IRON	1

2. Create 3D Assembly models of a **PLUMMER BLOCK** for the given detail parts.

Part 1 drawing (Item numbers ① ② ③ ④ ⑤ ⑥ ⑦ ⑧)

ITEM NO	DRAWING NO	DESCRIPTION	MATERIAL	NO OFF
8		SHAFT	Fe 410 W	1
7		LOCK NUT M10	Fe 410 W	2
6		NUT M10	Fe 410 W	2
5		BOLT M10	Fe 410 W	2
4		BEARING TOP HALF	BRASS	1
3		BEARING BOTTOM HALF	BRASS	1
2		CAP	CAST IRON	1
1		BODY	CAST IRON	1
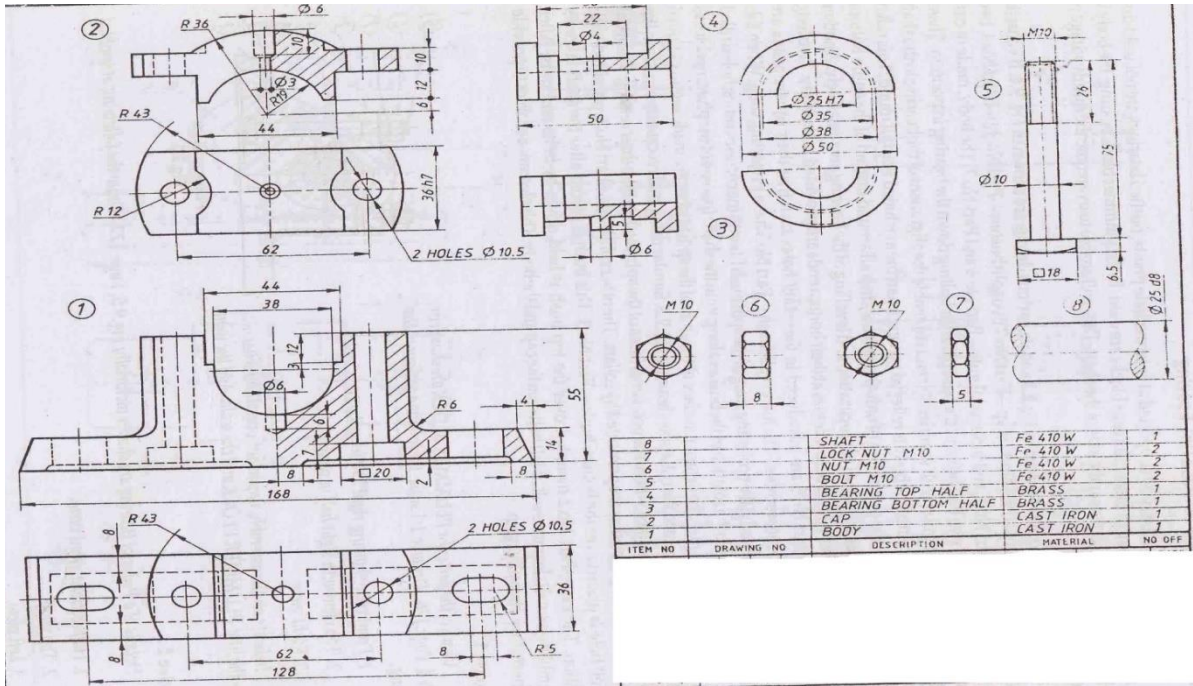
3. Create 3D Assembly models of **KNUCKLE JOINT** for the given detail parts.

5	TAPER PIN	Fe-410W	1
4	COLLAR	Fe-410W	1
3	PIN	Fe-410W	1
2	EYE	Fe-410W	1
1	FORK	Fe-410W	1
PART NO	DESCRIPTION	MATERIAL	NO OFF

ALL UNMENTIONED FILLETS AND ROUNDS RADII 3mm.

Details of a Knuckle Joint

Directorate Of Technical Education   Karnataka State   15ME35P MECH
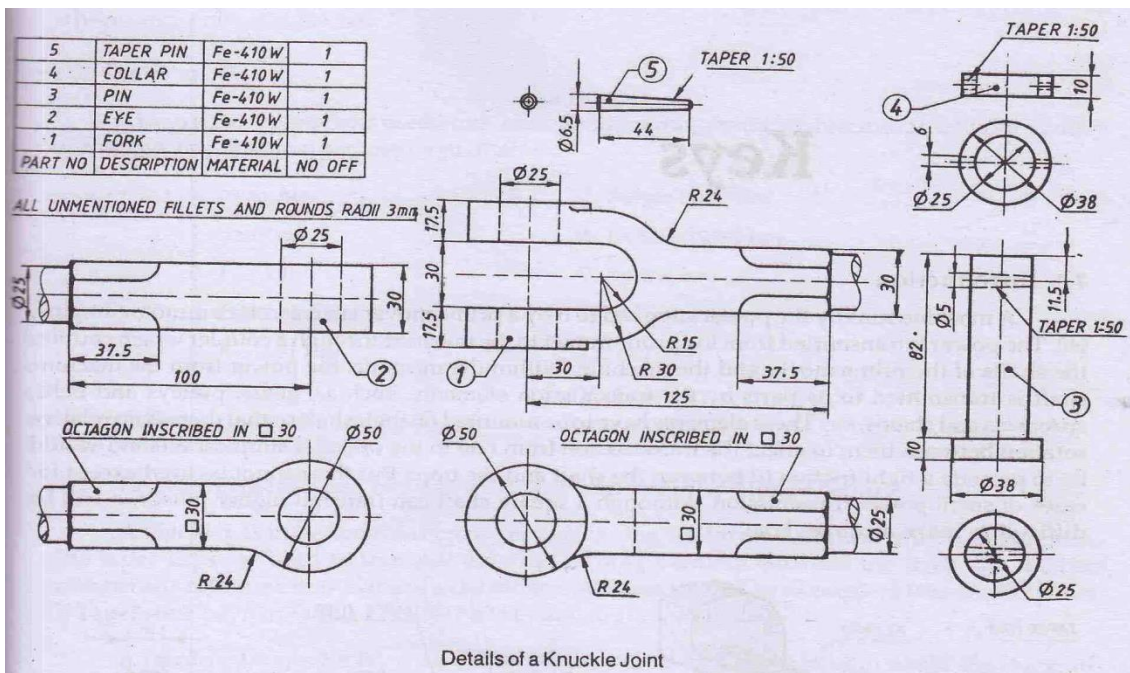
4. Create 3D Assembly models of a **SOCKET AND SPIGOT COTTER JOINT** for the given detail parts.

3	COTTER	STEEL	1
2	SPIGOT	Fe-410 W'	1
1	SOCKET	Fe-410 W'	1
PART NO	DESCRIPTION	MATERIAL	NO OFF

ALL UNMENTIONED FILLETS AND ROUNDS RADII 3mm

Details of Socket and Spigot Cotter Joint
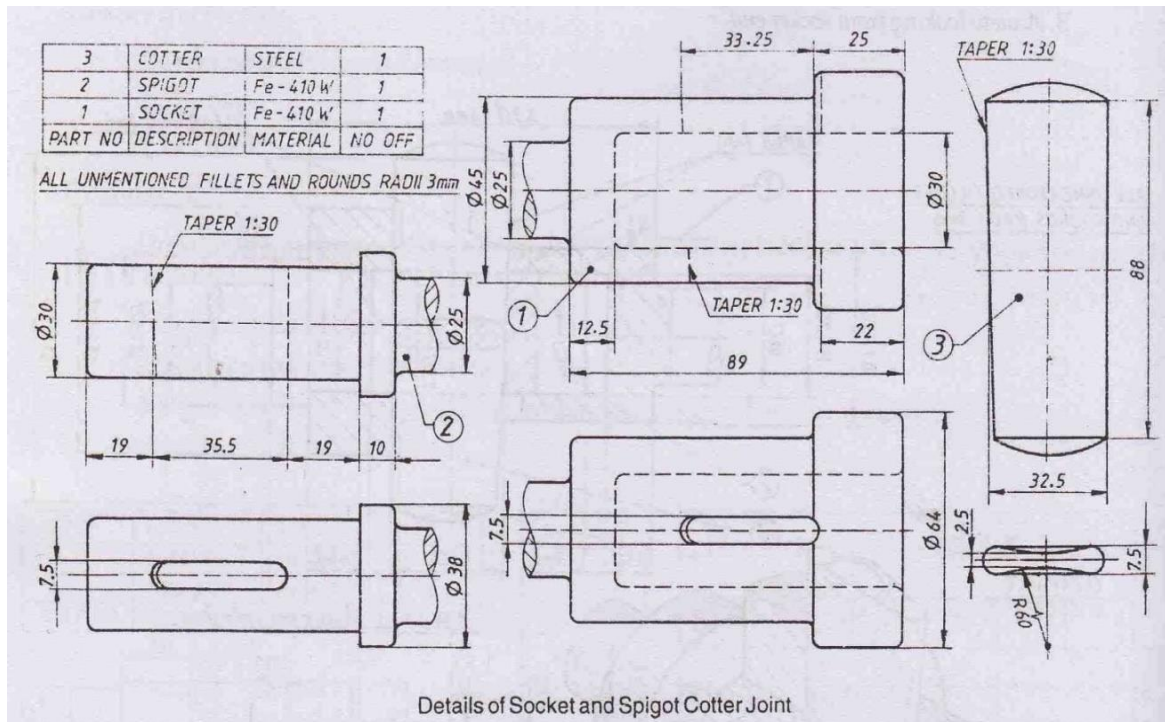
5. Create 3D Assembly models of a **BUSHED BEARING** for the given detail parts.
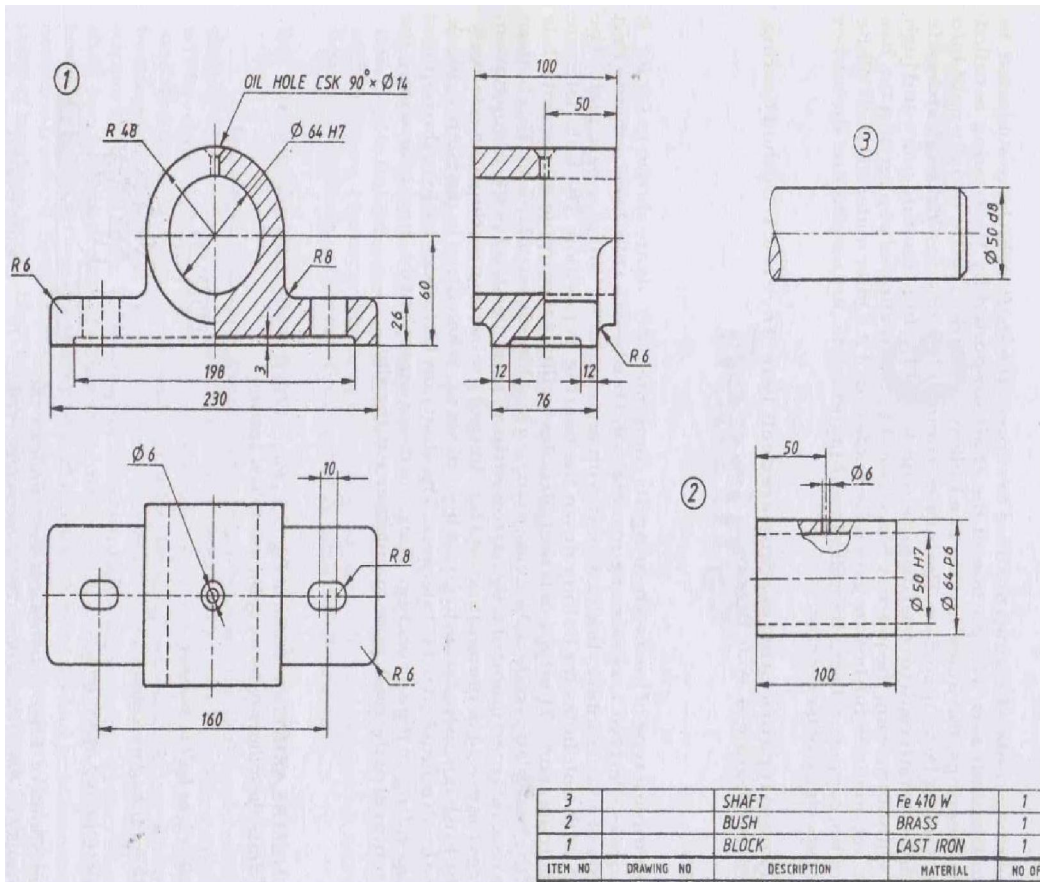
3		SHAFT	Fe 410 W	1
2		BUSH	BRASS	1
1		BLOCK	CAST IRON	1
ITEM NO	DRAWING NO	DESCRIPTION	MATERIAL	NO OFF

Course Title: **BASIC WORK SHOP PRACTICE-II**		
Scheme (L:T:P) : **0:2:4**	Total Contact Hours: **78**	Course Code: **15ME36P**
Type of Course: **Tutorial and practice**	Credit :**03**	Core/ Elective: **Core(practice)**
CIE- 25 Marks		SEE- 50 Marks

Prerequisites: Theoretical concepts Work shop technology

Course Objectives:

1. To understand basic Metal shaping processes
2. To understand various Metal shaping operations and Procedure protocols.

On successful completion of the course, the students will be able to attain CO:

	Course Outcome	**CL**	**Linked practices**	**Linked PO**	**Teaching Hrs**
CO1	Acquire metal shaping process skill by Forging for a given job	*U/A*	ALL forging shop exercises	1,2,3,4,5,6 8,9,10	**26**
CO2	Prepare various sheet metals joint for required applications /Utility items	*U/A*	ALL sheet metal exercises	1,2,3,4,8,9, 10	**26**
CO3	Demonstrate and prepare various Foundry operations for required applications	*U/A*	ALL foundry exercises	1,2,3,4,5,6, 8,9,10	**26**
				Total sessions	**78**

COURSE-PO ATTAINMENT MATRIX

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
BASIC WORK SHOP PRACTICE-II	**03**	**03**	**03**	**03**	**02**	**02**	**-**	**3**	**3**	**03**
Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed. *Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.* *If ≥40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3* *If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2* *If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1* *If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.*										

COURSE CONTENT

Unit No	Unit Name	Hour
1	**FORGING PRACTICE**	26
2	**SHEET METAL PRACTICE**	26
3	**FOUNDRY SHOP**	26
	Total	78

UNITI: FORGING PRACTICE   26Hrs

Demonstration and detailed explanation of tools and equipment used-Description and specification of anvils, swage blocks, hammers, tongs, fullers, swages -Forging operations in smithy shop-Bending operation, upsetting operation,-Safety measures to be observed in the smithy shop

Hands on Experience
Job 1. To forge from Round to Square
Job 2. To forge from Round to Hexagon
Job 3: To forge a L-hook or L-nail.
Job 4: To prepare a job involving upsetting process
Job 5: To forge a chisel

UNTII: SHEET METAL PRACTICE   26Hrs

Introduction and demonstration of hand tools used in sheet metal shop.- different types of hammers, hard and soft mallet, sheet and wire gauge,- demonstration of various raw materials used in sheet metal shop e.g. M.S. sheet, galvanized-iron plain sheet, galvanized corrugated sheet, aluminum sheets etc.

Hands on Experience
Job I: Practice on making single riveted lap joint/double riveted lap Joint.
Job II: Practice on making single cover plate chain type, seam joint and Preparation of any one utility articles like Tray , Cylinder, container and Funnel.

UNITIII: FOUNDRY SHOP   26Hrs

Study of Foundry Tools and Equipment-Sand Mixing, Study of cope and drag-Practice in a single box-Cutting Practice by double box

Hands on Experience
Preparation of moulds-
Job I:Hexagon, Square and Circular Mould
Job II: Combination of Hexagon with Square or Circular Mould
Job III: Flange coupling – Pulley/ Gear pulley by using patterns

Elements of Workshop Technology (Vols. 1 and II) by Hajra Chaudhary

Note: the following activities or similar activities for assessing CIE (IA) for 10 marks (Any one)

1. Each student should do any one of the following type activity or any other similar activity related to the course and before conduction, get it approved from concerned Instructor and Foreman with an intimation to HOD
2. Each student should conduct different activity and no repeation should occur

1	Take the students for local body building works observe the sheet metal practices followed in body building works .Submit hand written report of 500 words
2	Ask the students to observe the forging operations carried out in local vicinity and submit hand written report of 500 words
3	Take the students for industrial visit for a nearby foundry; observe the safety practices followed and foundry operational activities. Submit and written report of 500 words

Course Delivery:

The course will be delivered through Demonstration and Shop practices

Course Assessment and Evaluation Scheme:

	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment meth	CIE	IA	Students	Activities	10	Report	1,2,3
				Record- Average marks of all graded exercises to be computed.	15	Graded exercises	1,2,3
	SEE	End Exam		End of the course	50	Answer scripts at BTE	1,2,3,
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	1,2 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3, Effectiveness of Delivery of instructions & Assessment Methods

Note: 1. The activity related exercises shall be evaluated as per the Rubrics developed by the concerned department related to the course.
2. The course related graded exercises to be evaluated as per performance mentioned in SEE scheme of evaluation.

Questions for CIE and SEE will be designed to evaluate the various educational components (Bloom's taxonomy) such as:

Sl. No	Bloom's Category	% Weightage
1	Understanding	40
2	Applying the knowledge acquired from	45
3	Analysis	10
4	Evaluation& Creating new knowledge	05

Note to IA verifier: *The following documents to be verified by CIE verifier at the end of semester*

1. Student suggested activities report for 10 marks
2. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods.

Scheme of Valuation for End Examination

Note: Any one model from forging or sheet metal or foundry

Serial no	Description	Marks
1	Listing of tools & operations required for performing	05
2	Marking of job	05
3	Operation performed	10
4	Dimensional accuracy of job	10
5	Finishing of job	10
6	Viva	10
	TOTAL	50

EQUIPMENT LIST:

FOR FORGING PRACTICE

SL.NO	NAME OF THE EQUIPMENT	NO. OF STUDENTS/BATCH	NO.OF EQUIPMENT REQUIRED
01	Open hearth furnace	**20**	**04**
02	Flat tongs	20	20
03	Round tongs	20	20
04	Anvil	20	05
05	Sledge hammer	20	20
06	Flatener	20	20
07	Swage block	20	05

FOR SHEET METAL PRACTICE

SL.NO	NAME OF THE EQUIPMENT	NO. OF STUDENTS/BATCH	NO.OF EQUIPMENT REQUIRED
01	Steel Rule	20	20
02	Try square	20	20

03	Scriber	20	20
04	Shearing machine	20	04
05	Snip	20	20
06	Mallet	20	20
07	Bench vice	20	10
08	Stacks	20	04

FOR FOUNDRYPRACTICE

SL.NO	NAME OF THE EQUIPMENT	NO. OF STUDENTS/BATCH	NO.OF EQUIPMENT REQUIRED
01	Moulding boxes	20	20
02	Rammer	20	20
03	Flateners	20	20
04	Steel rule	20	20
05	Try square	20	20
06	Trowel	20	20
07	Strike off bar	20	20
08	Showel	20	05

MODEL QUESTIONS FOR FINAL EXAM
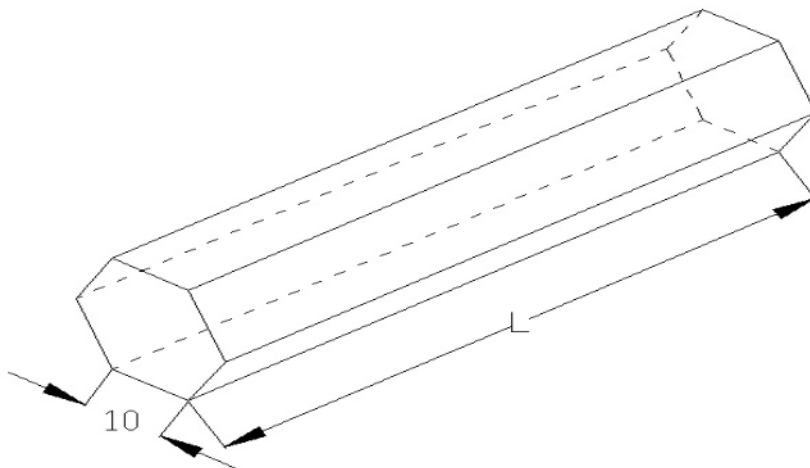
COURSE TITTLE: **BASIC WORK SHOP PRACTICE-II**

TIME: 3 HOURS   MARKS:50

FOR FORGING PRACTICE

1.Prepare the model as per the given sketch

2.Prepare the model as per the given sketch

□10

1.Prepare the model as per the given sketch

□12
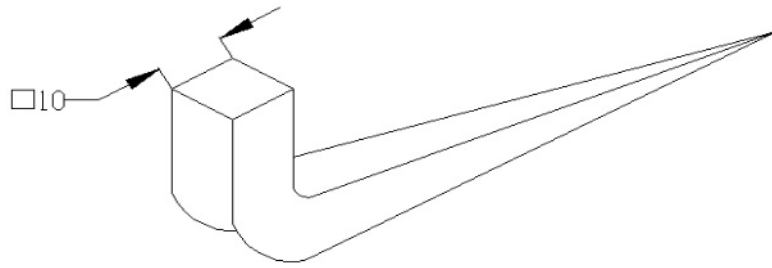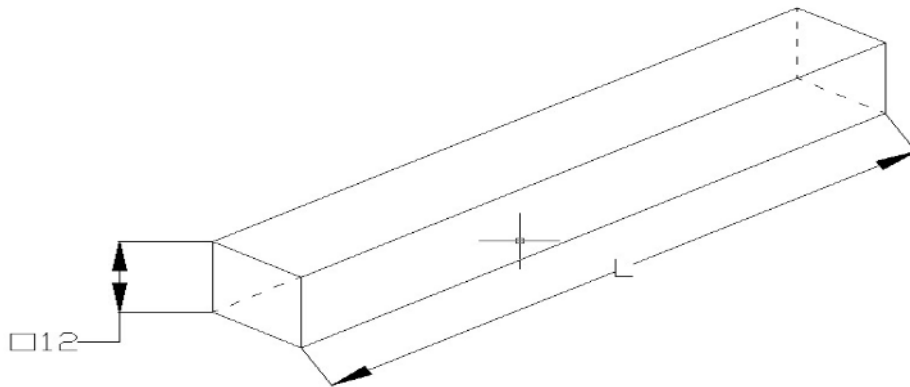
FOR SHEET METAL PRACTICE

1.Prepare the model as per the given sketch
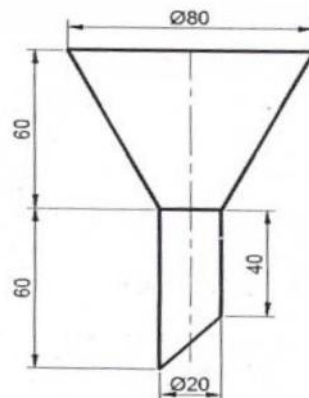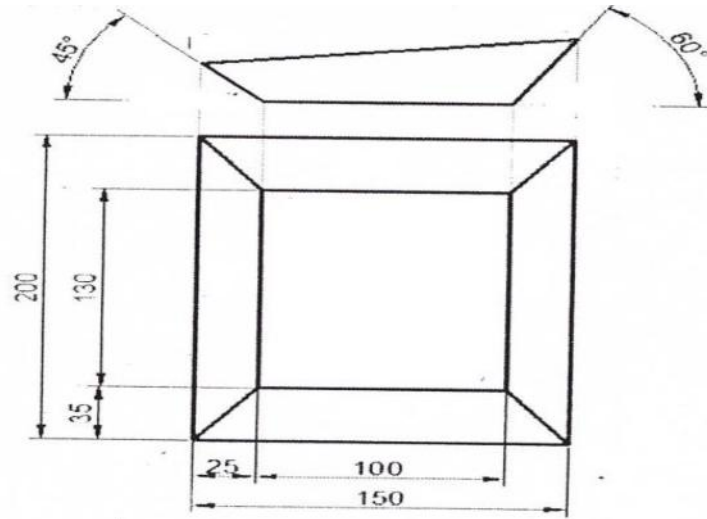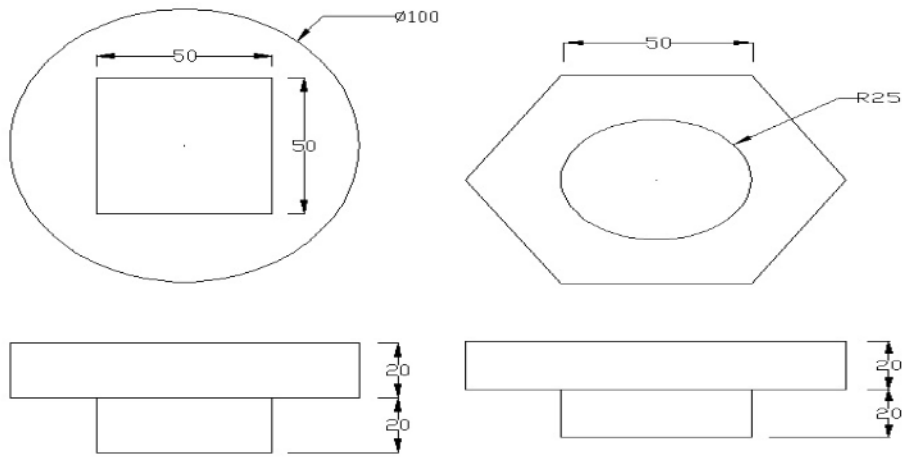

Ø80

60

60

40

Ø20

1.Prepare the model as per the given sketch

FOR FOUNDRYPRACTICE

1.Prepare the model as per the given sketch   2..Prepare the model as per the given sketch
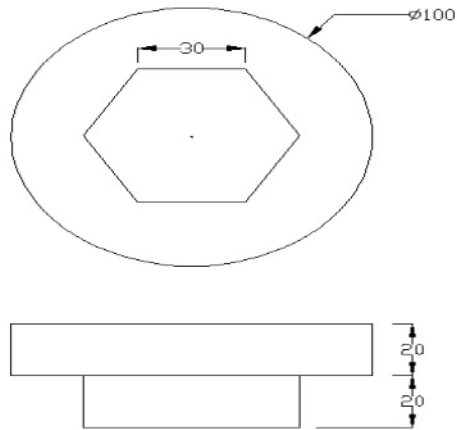
Ø100
50
50
R25
20
20
50
20
20

3..Prepare the model as per the given sketch

Ø100
30
20
20

	Course Title: **MECHANICAL TESTING AND QUALITY CONTROL LAB**		
	Scheme (L:T:P) : **0:2:4**	Total Contact Hours: **78**	Course Code: **15ME37P**
	Type of Course: **Tutorial and practice**	Credit :**03**	Core/ Elective: **Core(practice)**
CIE- 25 Marks			SEE- 50 Marks

Prerequisites: Learning concepts of Strength of Materials and Mechanical Measurements

1. Evaluate the Mechanical Properties and quality of the materials used in engineering applications.

On successful completion of the course, the students will be able to attain CO:

	Course Outcome	**CL**	**Linked experiments**	**Linked PO**	**Teaching Hrs**
CO1	Examine the Quality of lubricant by finding the properties of lubricants	*U/A*	1,2,3	1,2,3,6,8,10	**18**
CO2	Enumerate hardness and impact resistance of the materials before and after heat treatment	*U/A*	4,5	1,2,3,8,9,10	**15**
CO3	Evaluate the behavior of different materials experimentally subjected to tensile, compressive, shear and bending loads	*U/A*	6,7,8,9	1,2,3,8,9,10	**27**
CO4	Analyze the measuring dimension with specified dimensions on components	*U/A*	10,11,12,13	1,2,3,8,10	**15**
C05	Know about Weld defects/surface cracks	*U*	14	1,2,3,8,10	**03**
				Total sessions	**78**

COURSE-PO ATTAINMENT MATRIX

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
MECHANICAL TESTING AND QUALITY CONTROL LAB	03	03	03	-	-	1	-	03	02	03

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.

Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.

If ≥40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3

If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2

If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1

If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

LIST OF GRADED PRACTICAL EXERCISES

The practical/Graded exercises should be properly designed and implemented with an attempt to develop different types of learning out comes in affective domain and psychomotor domain, so that students are able to acquire the necessary skills. Following is the list of experiments to be carried out.

Exercise No.	Practical/Exercise	Apprx. Hrs. Required
PART A. MECHANICAL TESTING		
1	Determine co efficient of friction of ant two oil by using Thurston oil tester and compare their results	06
2	Determine flash and fire point of any two lubricants of different grade and compare their results	06
3.	Determine viscosity of given oil by using Redwood viscometer/Saybolt viscometer.	06
4	Calculate Impact Value of Mild Steel, COPPER using CHARPY/ IZOD Impact Test & compare	06
5	Calculate hardness number by Brinell /Rockwell method Using hardness testing machine	09
6	Determination of yield stress, ultimate stress, breaking stress, percentage reduction in area, percentage elongation, Young's modulus by conducting tension test on Ductile Materials like Mild Steel, Aluminium in Universal testing machine. Draw Stress Strain Curve for both and compare	12
7	Find out Compressive Strength of C.I , M.S using Compression Testing Machine	06
8	Conducting bending test on wood specimen by UTM and evaluate the results	06
9	Conducting Shear test on mild steel specimen by UTM and evaluate the results	03
PART- B. QUALITY CONTROLL		
10	Standard use of basic measuring instruments: Surface plate, v-block, sprit level, combination set, filler gauge, plate gauge, wire gauge, screw pitch gauge, radius gauge, vernier caliper, micrometer and slip gauges, vernier height gauge, Vernier depth gaugeto measure dimension of given jobs.	06
11	Determine unknown angle of component using sine bar and slip gauges.	03
12	Measurement of screw thread elements by using screw thread micrometer, screw pitch gauge.	03
13	Measurement of gear tooth elements by using gear tooth vernier caliper	03
14	Study on surface defects by Dye penetrant test/ ultrasonic portable equipment(Not for conduction)	03
	TOTAL	**78**

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SUGGESTED LIST OF STUDENT ACTIVITYS

1. Each student should submit any one of the following type activity or any other similar activity related to the course and before take up get it approved from concerned Teacher and HOD.

2. *Each student should conduct different activity and no repetition should occur*

1	Ask the students to bring two replaced Automobile/ Mechanical components, ask to select the instruments and measure the at least three dimensions. Record it in a sheet
2	Market Survey specific to properties of Various type of Materials used in Mechanical/Automobile industry or Any Engineering industries in local vicinity
3	Take the students for industrial visit for a nearby industry Select any two materials used for various mechanical engineering applications. Compare their mechanical properties

Course Delivery:

The course will be delivered through Demonstration and Shop practices

Course Assessment and Evaluation Scheme:

Method	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
DIRECT ASSESSMENT	**CIE** (Continuous Internal Evaluation)	**IA** Tests	Students	Two Tests (Average of two tests to be computed)	10	Blue books	1,2,3,4,5
				Record Writing (Average marks of each exercise to be computed)	10	Record Book	1,2,3,4,5
				Student Activity	05	Report	1,2,3,4,5
				TOTAL	25		
	SEE (Semester End Examination)	End Exam		End of the course	50	Answer scripts at BTE	1,2,3,4,5
INDIRECT ASSESSMENT	Student Feedback on course		Students	Middle of the course		Feedback forms	1, 2,3, Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3, 4,5 Effectiveness of Delivery of instructions & Assessment Methods

*CIE – Continuous Internal Evaluation   ***SEE** – Semester End Examination

Note:
1. I.A. test shall be conducted as per SEE scheme of valuation. However obtained marks shall be reduced to 10 marks. Average marks of two tests shall be rounded off to the next higher digit.
2. Rubrics to be devised appropriately by the concerned faculty to assess Student activities.

- **MODEL OF RUBRICS /CRITERIA FOR ASSESSING STUDENT ACTIVITY**

RUBRICS MODEL

			RUBRICS FOR ACTIVITY(5 Marks)			
Dimension	**Unsatisfactory**	**Developing**	**Satisfactory**	**Good**	**Exemplary**	**Student Score**
	1	**2**	**3**	**4**	**5**	
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	Ex: 4
Fulfill 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	5
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.	3
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	2
			Average / Total marks=(4+5+3+2)/4=14/4=3.5=4			

Note: This is only an example. Appropriate rubrics/criteria may be devised by the concerned faculty (Course Coordinator) for assessing the given activity.

Note to IA verifier: *The following documents to be verified by CIE verifier at the end of semester*
1. Blue books (10 marks)
2. Student suggested activities report for 5 marks
3. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods

Serial no	Description	Marks
1	**Writing procedure** a) One experiment on (Mechanical testing) One experiment on (Quality control)	05+05=10
2	**Conducting of Experiment** a) One experiment on Mechanical testing(Group of five)+ One experiment on Quality control (Individual)	10+10=20
3	**Calculation and results,(Both experiments)**	15+5=20
	TOTAL	50

EQUIPMENT LIST: Quantity : 01 Each

1. Hardness Testing Machine
2. Impact Testing Machine
3. Thurston Oil Tester
4. Pensky Martin Flash & Fire point Equipment
5. Redwood and Saybolt viscometer.
6. Universal Testing Machine – (20 ton – 40 ton range)
7. Surface plate, v-block, sprit level, combination set, filler gauge, screw pitch gauge, radius gauge, verniercaliper, micrometer and slip gauges,vernier height gauge, Vernier depth gauge
8. Gear Tooth Vernier
9. Universal Bevel Protractor
10. Digital Micrometer
11. Digital Screwgauge
12. Sine Bar & Slip Gauges
13. Spirit Level
14. Surface Plate (Granite)
15. Wire and plate gauge.

3ನೇ ಸೆಮಿಸ್ಟರ್ ಕನ್ನಡ–1 (ಕನ್ನಡೇತರರಿಗೆ ಕನ್ನಡ ಪರಿಚಯ)

3rd Semester	Course: Kannada Kali-1	Course Code:15KA3NT (2016-17)
	No. of Credits:02	No. of teaching hours/week:02 No. of teaching hours/Semester:26
	Mode of Assessment and Evaluation: Continuous Internal Evaluation (CIE)only. I.A Tests:30 Marks (3 Tests) Student activities: 20 Marks	Maximum Marks: 50 (CIE only) Minimum Passing marks:20 (IA Tests + Student activities)

ಉದ್ದೇಶ:

1. ಕೇಳುವುದು, ಗ್ರಹಿಸುವುದು, ನಿರರ್ಗಳವಾಗಿ ಮತ್ತು ಸ್ಪಷ್ಟವಾಗಿ ಓದುವ ಮತ್ತು ಮಾತನಾಡುವ (ಅಭಿವ್ಯಕ್ತಿಸುವ) ಸಾಮರ್ಥ್ಯವನ್ನು ಬೆಳೆಸುವುದು.

2. ಜ್ಞಾನಾರ್ಜನೆ, ಸಾಹಿತ್ಯಾಭಿರುಚಿ, ಚಿಂತನೆ ಮತ್ತು ಆನಂದಕ್ಕಾಗಿ ಸ್ವತಂತ್ರವಾಗಿ ಓದಲು, ಬರೆಯಲು ಮತ್ತು ಮಾತನಾಡಲು ಸಮರ್ಥರಾಗುವಂತೆ ಮಾಡುವುದು.

3. ಪದ ಸಂಪತ್ತನ್ನು ಹೆಚ್ಚಿಸಿಕೊಂಡು ಸ್ಪಷ್ಟ ಉಚ್ಚಾರಣೆಯೊಡನೆ ಲಿಖಿತ ಮತ್ತು ಮೌಖಿಕ ಚಟುವಟಿಕೆಗಳನ್ನು ಮಾಡಿಸಿ, ಸ್ವತಂತ್ರವಾಗಿ ಭಾಷೆಯ ಬಳಕೆ ಮಾಡುವುದು.

4. ನಾಡು–ನುಡಿ, ಸಂಸ್ಕೃತಿ ಮತ್ತು ಸಾಹಿತ್ಯಗಳ ಪರಿಚಯ ಮತ್ತು ಆತ್ಮೀಯ ಭಾವಾಭಿಮಾನವನ್ನು ಬೆಳೆಸುವುದು.

5. ಕ್ರಿಯಾತ್ಮಕ ಚಟುವಟಿಕೆಗಳಿಂದ ಭಾಷಾ ಕೌಶಲ್ಯದ ಸರಳ ಪ್ರಯೋಗ ಮಾಡಿಸುವುದು./ಕಲಿಸುವುದು. (ಕ್ರಿಯಾತ್ಮಕ ಚಟುವಟಿಕೆ ಎಂದರೆ, ವರ್ಣಮಾಲೆ ಪರಿಚಯ, ವ್ಯಾಕರಣದ ಸರಳ ಪರಿಚಯ, ಗುಣಿತಾಕ್ಷರ, ಸಂಯುಕ್ತಾಕ್ಷರಗಳು, ನಾಮಪದ, ಲಿಂಗ, ವಚನ, ಪ್ರತ್ಯಯಗಳು, ವಾಕ್ಯರಚನೆ (ಕತೃ, ಕರ್ಮ, ಕ್ರಿಯಾಪದ) ಇತ್ಯಾದಿ)

ಪಠ್ಯಕ್ರಮ ಮತ್ತು ಸರಳ ಭಾಷಾ ಕೌಶಲ್ಯ
(ಕನ್ನಡ ಕಲಿ–ಪಠ್ಯಪುಸ್ತಕ –ಶ್ರೀ ಲಿಂಗದೇವರು ಹಳೇಮನೆ – ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ ಪ್ರಕಾಶನ)
ಭಾಗ–1

ಪಾಠಗಳ ಕ್ರಮಾಂಕ Lesson No	ಪಠ್ಯವಸ್ತುವಿನ ವಿವರ – Curriculum Content	ಸೆಮೆಸ್ಟರ್ ಬೋಧನ ಆವಧಿ Total no.of Classes /Sem
	ಕನ್ನಡ ಭಾಷೆಯ ಪರಿಚಯ/ವರ್ಣಮಾಲೆ/'ಕನ್ನಡ ಕಲಿ'ಯುವ ವಿಧಾನ ಕುರಿತ ಮಾಹಿತಿ	**02**
1	Introducing each other Personal Pronouns, Possessive forms and Interrogative words 1. ನಾವು ಮತ್ತು ಭಾಷೆ 2. ಅಕ್ಷರಗಳಿಂದ ಪದಗಳು	03
2	Introducing each other Personal Pronouns, Possessive forms – Yes/No Type Interrogative	02
3	About Ramayana. Possessive forms of nouns, dubitive question, Relative nouns. ಪದಗಳಿಂದ ವಾಕ್ಯಗಳು	02
4	Enquiring about college. Qualitative and quantitative adjectives.	02
5	Enquiring about room. Predicative forms,	02

	locative case.	
6	Vegetable Market. Dative case, basic numerals.	02
7	About Medical college. Ordinal numerals, plural markers.	02
8	In a cloth shop. Color adjectives, defective verbs	02
9	Plan to go for picnic - imperative, permissive and hortative	02
10	Enquiring about one's family, Verb iru, and corresponding negation ಕನ್ನಡ ಚಿತ್ರಪಟಗಳಲ್ಲಿನ ಅಕ್ಷರಗಳನ್ನು ಗುರುತಿಸಿ ಓದಿ ದಿನಪತ್ರಿಕೆ ಓದುವ ಹವ್ಯಾಸ––ಸಂವಹನ ಮಾಧ್ಯಮದ ಬಗ್ಗೆ ಪರಿಚಯ	02
	ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ ಪರೀಕ್ಷೆಗಳು	03
	ಒಟ್ಟು ಗಂಟೆಗಳು	**26**

ಸೂಚನೆಗಳು:

• ಈ ಪತ್ರದ ಮೂಲ ಉದ್ದೇಶ ಕನ್ನಡೇತರ ವಿದ್ಯಾರ್ಥಿಗಳು ಸರಳ ಕನ್ನಡ ಭಾಷೆಯಲ್ಲಿ ವ್ಯವಹರಿಸುವಂತೆ ಮಾಡುವುದಾಗಿದೆ. "ಕನ್ನಡ ಕಲಿ" ಪುಸ್ತಕದ ಮೇಲಿನ ಪಾಠಗಳ ಜೊತೆಗೆ "ಕ್ರಿಯಾತ್ಮಕ ಚಟುವಟಿಕೆ"ಯಿಂದ ಗಳಿಸುವ ಅಕ್ಷರ ಜ್ಞಾನದಿಂದ ಪದ ಸಂಪತ್ತು ಹೆಚ್ಚಿಸಿ, ಪದಗಳಿಂದ ಸ್ವಂತ ವಾಕ್ಯಗಳ ರಚನೆ ಮಾಡಿಸುವುದು. (ಅಮ್ಮ, ಮೊಬೈಲ್, ಕನ್ನಡ ಭಾಷೆ, ಕವಿಗಳು, ನಾಟಕ, ಜನಪದ ಕಲೆ, ನಾಡಿನ ಪ್ರಸಿದ್ಧ ವ್ಯಕ್ತಿಗಳು, ಸಹೋದರ, ಸ್ನೇಹಿತ, ತರಕಾರಿ, ದೋಸೆ, ತಿಂಡಿ, ನಿದ್ದೆ, ಬಿಸಿ, ಚಳಿ, ಆಕಾಶ, ಓದು, ಇತ್ಯಾದಿ ನಿತ್ಯ ಬಳಕೆಯ ಸರಳ ಪದಗಳಿಂದ ವಾಕ್ಯರಚನೆ ಮತ್ತು 25–50 ಪದಗಳ ಕಿರು ಲೇಖನ ರಚನೆ).

• ತರಗತಿ ಚಟುವಟಿಕೆಗಳ ಪುಸ್ತಕದಲ್ಲಿ (ಕ್ಲಾಸ್ ಅಸೈನ್‌ಮೆಂಟ್) ಕನ್ನಡ ವರ್ಣಮಾಲೆಯ ಸ್ವರ, ವ್ಯಂಜನಗಳ ಅಕ್ಷರಗಳ ಬರವಣಿಗೆ ಅಭ್ಯಾಸ, ವ್ಯಂಜನಗಳಿಗೆ ಸ್ವರಗಳನ್ನು ಸೇರಿಸುವಿಕೆ, ಅಕ್ಷರಗಳಿಂದ ಪದರಚನೆ, ಪದಗಳಿಗೆ ಪ್ರತ್ಯಯಗಳನ್ನು ಸೇರಿಸುವುದು(ಗೆ, ಯಿಂದ, ಅನ್ನು, ಅಲ್ಲಿ, ಗಳು, ಎಂದು.....ಇತ್ಯಾದಿ ಪತ್ರದಲ್ಲಿ ಬರುವ ಪದಗಳಿಗೆ ನಿತ್ಯ ಬಳಕೆಯ ಪ್ರತ್ಯಯಗಳನ್ನು ಸೇರಿಸುವುದು) ಪದಗಳಿಂದ ವಾಕ್ಯ ರಚನೆ. ಮಾಡುವುದು. ಮತ್ತು ಪಾಠ 1–10ರ ಪತ್ಯಾಂತ್ಯದಲ್ಲಿ ಬರುವ ಅಭ್ಯಾಸಗಳಲ್ಲಿ ಆರಿಸಿದ ಅಭ್ಯಾಸ ಭಾಗಗಳನ್ನು ಬರೆಸುವುದು. ಮತ್ತು ಪಾಠ–20 ರ ಕ್ರಿಪ್ಟ್– ಅನ್ನು ಆಧಾರವಾಗಿಟ್ಟುಕೊಂಡು ಅಭ್ಯಾಸ ಮಾಡಿಸುವುದು.

ಆಕರ ಗ್ರಂಥಗಳು:

1. ಕನ್ನಡ ಕಲಿ–ಶ್ರೀ ಲಿಂಗದೇವರು ಹಳೇಮನೆ – ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.
2. ಪ್ರಾಥಮಿಕ ಶಾಲೆಯ ಕನ್ನಡ ಪಠ್ಯಪುಸ್ತಕಗಳು
3. ಸರಳ ಕನ್ನಡ ವ್ಯಾಕರಣ ಪುಸ್ತಕಗಳು– ಎಂ.ವಿ ನಾಗರಾಜರಾವ್/ಇತರೆ ಲೇಖಕರು.
4. ಪ್ರಯೋಗ ಪ್ರಣತಿ–ಪ್ರಥಮ ಪಿಯುಸಿ ಪೂರಕ ಪಠ್ಯ.
5. ಸರಳ ಪತ್ರವ್ಯವಹಾರದ ಪುಸ್ತಕಗಳು

ಪರೀಕ್ಷೆ ಮತ್ತು ಮೌಲ್ಯಮಾಪನ ವಿಧಾನ (3ನೇ ಸೆಮಿಸ್ಟರ್)

ನಿರಂತರ ಅಂತರಿಕ ಮೌಲ್ಯಮಾಪನ– Continuous Internal Evaluation (CIE) only.

ಕ್ರ.ಸಂ.	ಚಟುವಟಿಕೆಗಳು	ವಿವರ	ಗರಿಷ್ಠಾಂಕ	ಉತ್ತೀರ್ಣತೆಗೆ ಕನಿಷ್ಠಾಂಕ
01	ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ (I A Tests)	ಮೂರು ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ ಪರೀಕ್ಷೆಗಳು (ಸರಾಸರಿ ಅಂಕಗಳನ್ನು ಪರಿಗಣಿಸುವುದು)	30	
02	ಕನ್ನಡ ಭಾಷಾ ಕೌಶಲ್ಯಾಭಿವೃದ್ಧಿ ಚಟುವಟಿಕೆಗಳು (Student Activities)	ಮೂರು ಚಟುವಟಿಕೆಗಳು (ಸರಾಸರಿ ಅಂಕಗಳನ್ನು ಪರಿಗಣಿಸುವುದು)	20	
		ಒಟ್ಟು ಅಂಕಗಳು	50	20

Course outcome:
1. Developing listening and speaking skills.
2. Easy Interaction with peers.
3. Students can use the language at ease in daily life situations

ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ ಪರೀಕ್ಷೆಗಳ ಮಾದರಿ ಪ್ರಶ್ನೆಪತ್ರಿಕೆಗಳು:

ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ ಪರೀಕ್ಷೆಗಳಿಗೆ ಈ ಕೆಳಗಿನ ಮಾದರಿಯಲ್ಲಿ ಪ್ರಶ್ನೆಪತ್ರಿಕೆಯನ್ನು ಸಿದ್ಧಪಡಿಸಿ ನಡೆಸುವುದು ಮತ್ತು "ಕನ್ನಡ ಕಲಿ" ಪಠ್ಯದ ಕಲಿಕೆ ವಿವರಣೆ (ಭಾಷಾಭ್ಯಾಸ) ಸಂಭಾಷಣಾ ಭಾಗಗಳು ಮತ್ತು ಅಂತ್ಯದಲ್ಲಿ ಅಭ್ಯಾಸ ಪುಸ್ತಕದಲ್ಲಿ ಬರುವ ಪ್ರಶ್ನೆಗಳ ವಿಧಾನವನ್ನು ಪರ್ಯಾಯವಾಗಿ ಬಳಸಿಕೊಂಡು ಪ್ರಶ್ನೆಪತ್ರಿಕೆಗಳನ್ನು ತಯಾರಿಸಿಕೊಳ್ಳಬಹುದು.

ಡಿಪ್ಲೋಮಾ 3ನೇ ಸೆಮಿಸ್ಟರ್–ಕನ್ನಡ ಕಲಿ–1 (ಕನ್ನಡೇತರರಿಗೆ ಕನ್ನಡ ಪರಿಚಯ)

ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ ಪರೀಕ್ಷೆ

ಸಮಯ: 60 ನಿಮಿಷಗಳು   ಅಂಕ: 30
_____

I.   Fill in the blanks using the appropriate words.(Any FOUR)   1X4=04
     i)   nimma raajya.......................?
     ii)   adu..............pustaka?
     iii)   avana .... hesaru suratkal injiniyaring kaaleju.
     iv)   ondu ruupaayige..............paise.
     v)   aval.ige hindustaani sanita tumba..................
     vi)   nanage ninna sahavaasa khanDitaa.................
     vii)   avanu nimma ....?

II. Use the following words (any FOUR) in your own sentences.   1X4=04
     1.adhyaapaki 2.snehita 3. Vyaapaara 4.keTTa 5. Hasiru 6.angadi 7.taaja

III. Answer the following questions (any FOUR)   1X4=04
     (a) nimma uuru yaavudu?
     (b) nivu diploma vidyaarthinaa?
     (c) nimma pennige estu ruupaaye?
     (d) nimma maatrubhaashe yaavudu?
     (e) nimage tingalige eshtu ruupaayi beeku?
     (f) nimma mane/ruumu elli ide?

IV. Translate the following sentence in Kannada.   (any FOUR)   4X2=08
     1. Kannada is the language of Karnataka.
     2. My book is in my house.
     3. We have two houses in Bangalore.
     4. How much is this Pumpkin weighs?
     5. I want two packets of biscuits.
     6. How much do you pay rent for your room?
     7. What else do you want?

V.   ಕೆಳಗಿನವುಗಳನ್ನು ಹೊಂದಿಸಿ ಬರೆಯಿರಿ.   (Match the following)   1X4=04

1. ನೀವು ಯಾವಾಗ ಮನೆಯಲ್ಲಿ	1.ಇದೆ
2. ಪುಸ್ತಕ ಮೇಜಿನ ಮೇಲೆ	2.eldest son
3. Jaaga-ಜಾಗ	3.ಇತೀರಿ
4. Hiri maga	4.space

VI.   (1) Change into interragative using the underlined word. (Any Three)   1X3=03

    1. Ivattu guruvaara.
    2. evattu hattanee taariku
    3. Aval hesaru liila.
    4. Avara maatrabhaashe telagu alla.
    5. Vavige ippttaydu ruupaayei beeku.
    6. Adu maalatiya mane.

     (2) change into Interrogate.   (Any THREE)   1X3=03

    1.ಹೌದು, ಇದು ಪುಸ್ತಕ.
    2. ಆಗಲಿ, ಹೋಗೋಣ.
    3. ಈಗ ಒಂದೂವರೆ ಗಂಟೆ.
    4. ಅವರು ಮನೆಗೆ ಬರುತ್ತಾರೆ.
    5.ನಾವಿ ಮನೆಗೆ ಹೋಗೋಣ.
    6. ಅವರು ಮನೆಗೆ ಹೋಗಲಿ.

ಕನ್ನಡ ಪಠ್ಯಕ್ರಮ ರಚನಾ ಸಮಿತಿ

* **ಸಂಪಾದಕೀಯ ಸಮಿತಿ:**

1. ಶ್ರೀ ಟಿ ಎಲ್ ರವೀಂದ್ರ, ಉಪನ್ಯಾಸಕರು, ಸರ್ಕಾರಿ ಜಿ.ಆರ್.ಐ.ಸಿ.ಪಿ ಬೆಂಗಳೂರು.
2. ಶ್ರೀ ಟಿ. ತಿಮ್ಮಪ್ಪ, ಉಪನ್ಯಾಸಕರು(ಆಯ್ಕೆ ಶ್ರೇಣಿ), ಯಾಂತ್ರಿಕ ವಿಭಾಗ, ಸರ್ಕಾರಿ ಪಾಲಿಟೆಕ್ನಿಕ್, ತುಮಕೂರು.

* **ಸಲಹಾ ಸಮಿತಿಯ ಬಾಹ್ಯ ಸಂಪನ್ಮೂಲ ವ್ಯಕ್ತಿಗಳು.**

1. ಪ್ರೊ. (ಡಾ.) ಡಿ. ಪಾಂಡುರಂಗ ಬಾಬು, ಕುಲಸಚಿವರು, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.
2. ಪ್ರೊ. (ಡಾ.) ಅಶೋಕ್ ಕುಮಾರ್ ರಂಜರೆ, ಪ್ರಾಧ್ಯಾಪಕರು, ಪ್ರಸಾರಾಂಗ ವಿಭಾಗ,
   ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.
3. ಪ್ರೊ. (ಡಾ.) ಕೆ ವೈ ನಾರಾಯಣ ಸ್ವಾಮಿ, ಸಹ ಪ್ರಾಧ್ಯಾಪಕರು, ಸ್ನಾತಕೋತ್ತರ ವಿಭಾಗ,
   ಸರ್ಕಾರಿ ಕಲಾ ಕಾಲೇಜು, ಬೆಂಗಳೂರು.
4. ಪ್ರೊ. (ಡಾ.) ಜೆ ಬಾಲಕೃಷ್ಣ, ಪ್ರಾಧ್ಯಾಪಕರು ಹಾಗು ಮುಖ್ಯಸ್ಥರು, ಕನ್ನಡ ಭಾಷಾ ಅಧ್ಯಯನ ವಿಭಾಗ,
   ಕೃಷಿ ವಿಶ್ವವಿದ್ಯಾಲಯ, (ಜಿಕೆವಿಕೆ) ಹೆಬ್ಬಾಳ, ಬೆಂಗಳೂರು.

KARNATAKA STATE BOARD OF TECHNICAL EXAMINATION, BENGALURU.

KARNATAKA STATE BOARD OF TECHNICAL EXAMINATION, BENGALURU.

TEACHING AND EXAMINATION SCHEME FOR KANNADA COURSE IN DIPLOMA PROGRAME

| SEMESTER: III | COMMON TO ALL DIPLOMA PROGRAMMES | | | | | | | | | C-15 Curriculum | |

SL.N0	COURSE NAME	Teaching Department	COURSE /QP CODE	Teaching scheme — Contact hours					Examination scheme			
				TH	TU	PR	TOTAL	Credit	Exam paper duration in Hrs	End exam		Maximum CIE Marks (IA+SA)	Minimum Marks for passing. (IA + SA)
										Max marks	Min marks		
	THEORY												
1	KANNADA KALI-1	KA	15KA3NT	2	-	-	2	2	-	-	-	50	20
2	TANTRIKA KANNADA -1	KA	15KA3KT	2	-	-	2	2	-	-	-	50	20

CIE- Continuous Internal Examination: SEE-Semester End Examination: IA-Internal Assessment Tests: SA- Student Activity.

Note: 1. Candidates studied Kannada as one subject in 10th standard shall take Tantrika Kannada 1 &2. Others may take "Kannada Kali-1&2".

2. In 3rd Semester- Assessment is only by CIE and no SEE. Average marks of three I A tests shall be rounded off to the next higher digit. Rubrics to be devised appropriately to assess student activity.

KARNATAKA STATE BOARD OF TECHNICAL EXAMINATION, BENGALURU.

TEACHING AND EXAMINATION SCHEME FOR KANNADA COURSE IN DIPLOMA PROGRAME

| SEMESTER: IV | COMMON TO ALL DIPLOMA PROGRAMMES | | | | | | | | | C-15 Curriculum | |

SL.N0	COURSE NAME	Teaching Department	COURSE /QP CODE	Teaching scheme — Contact hours					Examination scheme			
				TH	TU	PR	TOTAL	Credit	Exam paper duration in Hrs	Sem End Exam		Maximum CIE Marks (IA+SA)	Minimum Marks for passing. (IA + SA)
										Max Exam Marks	Min Passing Marks		
	THEORY												
1	KANNADA KALI-2	KA	15KA4NT	2	-	-	2	2	2	50	20	-	-
2	TANTRIKA KANNADA -2	KA	15KA4KT	2	-	-	2	2	2	50	20	-	-

CIE- Continuous Internal Examination: SEE-Semester End Examination: IA-Internal Assessment Tests: SA- Student Activity.

Note: In 4th Semester- Assessment is only by SEE and no CIE. To award diploma certificate, passing in Kannada course is mandatory. However Kannada course is not included in the eligibility criteria for promotion to the higher semester.

ಡಿಪ್ಲೋಮಾ–ತಾಂತ್ರಿಕ ಕನ್ನಡ–1 (ಕನ್ನಡ ಬಲ್ಲವರಿಗಾಗಿ)

3ನೇ ಸೆಮಿಸ್ಟರ್ – ತಾಂತ್ರಿಕ ಕನ್ನಡ –1 (ಸಾಹಿತ್ಯ ಮತ್ತು ಭಾಷಾ ಕೌಶಲ್ಯ ಪ್ರಯೋಗ)

ಪಠ್ಯಕ್ರಮ

3rd Semester	Course: ತಾಂತ್ರಿಕ ಕನ್ನಡ –1	Course Code:15KA3KT (2016-17)
	No. of Credits:02	No. of teaching hours/week:02 No. of teaching hours/Semester:26
	Mode of Assessment and Evaluation: Continuous Internal Evaluation (CIE)only. I.A Tests:30 Marks (3 Tests) Student activities: 20 Marks	Maximum Marks: 50 (CIE only) Minimum Passing marks:20 (IA Tests + Student activities)

ಪಠ್ಯ ಪ್ರಕಾರ	ಪಾಠ	ಪಠ್ಯದ ಹೆಸರು/ಲೇಖಕರು/ಪ್ರಕಟಣೆ	ಸೆಮಿಸ್ಟರ್ ಬೋಧನಾವಧಿ ಗಂಟೆಗಳು
ಇತಿಹಾಸ	1	'ಸಂಸ್ಕೃತಿ'– ದೇ.ಜೆ.ಗೌ (ನಾಟ್ಯ ಸಂಸ್ಕೃತಿ–ದೇ.ಜೆ.ಗೌ)	02
ಸಂಸ್ಕೃತಿ	2	ನಮಗೆ ಬೇಕಾಗಿರುವ ಇಂಗ್ಲಿಷ್– ಕುವೆಂಪು	02
ಪರಿಸರ	3	ಆನೆ ಹಳ್ಳದಲ್ಲಿ ಹುಡುಗಿಯರು – ಬಿ ಜಿ ಎಲ್ ಸ್ವಾಮಿ	02
ಕ್ರೀಡೆ/ಜೀವನಕಲೆ	4	ಸೋಲೆಂಬುದು ಅಲ್ಪವಿರಾಮ – ನೇಮಿಚಂದ್ರ	02
ಯಶೋಗಾಥೆ/ವ್ಯಕ್ತಿಚಿತ್ರಣ	5	ಬದುಕನ್ನು ಪ್ರೀತಿಸಿದೆ ಸಂತ – ಎಚ್.ಆರ್.ರಾಮಕೃಷ್ಣ (ಕಲಾಂರ ವ್ಯಕ್ತಿ ಚಿತ್ರ)	02
ತಂತ್ರಜ್ಞಾನ	6	ಮಂಗಳನ ಅಂಗಳದಲ್ಲಿ – ಜೆ.ಬಾಲಕೃಷ್ಣ	02
ಭಾಷಾ ಕೌಶಲ್ಯ ಚಟುವಟಿಕೆಗಳು	7	*ಮೌಖಿಕ ಅಭಿವ್ಯಕ್ತಿ: ಸಹಜ ಭಾಷಾ ಬಳಕೆ: .ಆಶು ಭಾಷಣ> ವಿವಿಧ ರಚನಾತ್ಮಕ/ದೈನಂದಿನ ಬಳಕೆ ವಸ್ತು, ವ್ಯಕ್ತಿ, ಭಾವನೆಗಳ ಮೇಲೆ. ಒಂದು ಸಣ್ಣ ಏಕಾಂಕ (5–10 ನಿಮಿಷ) ನಾಟಕ. ಮಾದರಿ ಸಂದರ್ಶನ (ನೇಮಕಾತಿಗಾಗಿ ಸಂದರ್ಶನ)	06
ಲಿಖಿತ ಚಟುವಟಿಕೆಗಳು	8	ವಿಸ್ತರಣೆ: ನುಡಿಗಟ್ಟುಗಳು–ಪದಗಳನ್ನು ಬಳಸಿಕೊಂಡು ಸಣ್ಣ ವಾಕ್ಯಗಳ ರಚನೆ ಪರ್ಯಾಯ ಪದಗಳನ್ನು ಬರೆಯುವುದು(ಉದಾ: ಬಳಸು=ಉಪಯೋಗಿಸು, ಕಾಯು= ನಿರೀಕ್ಷಿಸು, ಚಿಂತಿಸು=ಯೋಚಿಸು, ಕೂಡಿಸುವಿಕೆ=ಸೇರಿಸುವಿಕೆ.......ಇತ್ಯಾದಿ)	06
		ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ ಪರೀಕ್ಷೆಗಳು	02
		ಒಟ್ಟು ಗಂಟೆಗಳು	26

ತಾಂತ್ರಿಕ ಕನ್ನಡ–1

3ನೇ ಸೆಮಿಸ್ಟರ್ ಡಿಪ್ಲೋಮಾದ ಕನ್ನಡ ಪಠ್ಯ (ಕನ್ನಡ ಬಲ್ಲವರಿಗಾಗಿ)

1. ಪಠ್ಯರಚನಾ ಸಮಿತಿ
2. ನಿರ್ದೇಶಕರ ಮುನ್ನುಡಿ
3. ಪಠ್ಯ ರಚನಾ ಸಮಿತಿ ಮಾತುಗಳು
4. ಪಠ್ಯಕ್ರಮ

ಪರಿವಿಡಿ

ಗದ್ಯ ವಿಹಾರ

1. ನಾಟ್ಯ ಸಂಸ್ಕೃತಿ (ಇತಿಹಾಸ)   – ದೆ.ಜೆ.ಗೌ
2. ನಮಗೆ ಬೇಕಾಗಿರುವ ಇಂಗ್ಲಿಷ್ (ಸಂಸ್ಕೃತಿ)   _ ಕುವೆಂಪು
3. ಸೋಲೆಂಬುದು ಅಲ್ಪವಿರಾಮ (ಕ್ರೀಡೆ/ಜೀವನಕಲೆ)   – ನೇಮಿಚಂದ್ರ
4. ಆನೆ ಹಳ್ಳದಲ್ಲಿ ಹುಡುಗಿಯರು (ಪರಿಸರ)   _ ಬಿ.ಜಿ.ಎಲ್.ಸ್ವಾಮಿ
5. ಬದುಕನ್ನು ಪ್ರೀತಿಸಿದ ಸಂತ (ಯಶೋಗಾಥೆ/ವ್ಯಕ್ತಿಚಿತ್ರಣ) – ಎಚ್.ಆರ್.ರಾಮಕೃಷ್ಣ
6. ಮಂಗಳನ ಅಂಗಳದಲ್ಲಿ.....   – ಡಾ:ಜೆ.ಬಾಲಕೃಷ್ಣ

ಭಾಷಾ ಕೌಶಲ್ಯ–ಚಟುವಟಿಕೆಗಳು

7. ಮೌಖಿಕ ಅಭಿವ್ಯಕ್ತಿ ಚಟುವಟಿಕೆಗಳು
8. ಲಿಖಿತ ಅಭಿವ್ಯಕ್ತಿ ಚಟುವಟಿಕೆಗಳು

Course outcome:
1. Developing listening and speaking skills.
2. Easy Interaction with peers.
3. Students can use the language at ease in daily life situations

ಪರೀಕ್ಷೆ ಮತ್ತು ಮೌಲ್ಯಮಾಪನ ವಿಧಾನ (3ನೇ ಸೆಮಿಸ್ಟರ್)

ನಿರಂತರ ಅಂತರಿಕ ಮೌಲ್ಯಮಾಪನ– Continuous Internal Evaluation (CIE) only.

ಕ್ರ.ಸಂ.	ಚಟುವಟಿಕೆಗಳು	ವಿವರ	ಗರಿಷ್ಠಾಂಕ	ಉತ್ತೀರ್ಣತೆಗೆ ಕನಿಷ್ಠಾಂಕ
01	ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ (I A Tests)	ಮೂರು ಆಂತರಿಕ ಮೌಲ್ಯಮಾಪನ ಪರೀಕ್ಷೆಗಳು (ಸರಾಸರಿ ಅಂಕಗಳನ್ನು ಪರಿಗಣಿಸುವುದು)	30	
02	ಕನ್ನಡ ಭಾಷಾ ಕೌಶಲ್ಯಾಭಿವೃದ್ಧಿ ಚಟುವಟಿಕೆಗಳು (Student Activities)	ಮೂರು ಚಟುವಟಿಕೆಗಳು (ತಾಂತ್ರಿಕ ಪ್ರಬಂಧ/ಅಭುಭಾಷಣ/ಚರ್ಚೆ/ತಾಂತ್ರಿಕ ಕ್ಷೇತ್ರಗಳಲ್ಲಿನ ಅವಿಷ್ಕಾರಗಳ ಬಗ್ಗೆ ವಿಶ್ಲೇಷಣೆ ಇತ್ಯಾದಿ.) (ಸರಾಸರಿ ಅಂಕಗಳನ್ನು ಪರಿಗಣಿಸುವುದು)	20	
		ಒಟ್ಟು ಅಂಕಗಳು	50	20

ಸೂಚನೆ:

ಭಾಷಾ ಚಟುವಟಿಕೆಗಳಿಗಾಗಿ   ತರಗತಿ ಚಟುವಟಿಕೆಗಳ ಪುಸ್ತಕದಲ್ಲಿ   (ತರಗತಿಯ ಪ್ರಗತಿಪರ ಮೌಲ್ಯಮಾಪನ). ಗಾದೆಗಳ ವಿಸ್ತರಣೆ, ನುಡಿಗಟ್ಟುಗಳು, ಸಂಭಾಷಣೆ ಮಾದರಿಗಳು ಮತ್ತು ಪಠ್ಯದ ಸಾಹಿತ್ಯ ಭಾಗದ ಪಾಠಗಳ ಮೇಲೆ ಪ್ರಶ್ನೆಗಳಿಗೆ ಉತ್ತರ–ಟಿಪ್ಪಣಿ ಮತ್ತು ಶಬ್ದಾರ್ಥದಲ್ಲಿ ಬರುವ ಪದಗಳಿಂದ ವಾಕ್ಯ ರಚನೆ ಮಾಡಿಸುವುದು.

- ## ಮಾದರಿ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ

3ನೇ ಸೆಮಿಸ್ಟರ್– ತಾಂತ್ರಿಕ ಕನ್ನಡ–1 (ಕನ್ನಡಬಲ್ಲ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ)

ಸಮಯ: 1.00 ಗಂಟೆ   ಅಂಕಗಳು:30

ಸೂಚನೆ: ಕೆಳಗಿನ ಪ್ರಶ್ನೆಗಳಿಗೆ ಸೂಚನೆಗಳ ಪ್ರಕಾರ ವ್ಯಾಕರಣದೋಷವಿಲ್ಲದಂತೆ ಉತ್ತರಿಸಿ.

****

1. ಈ ಕೆಳಗಿನ 04 ಪ್ರಶ್ನೆಗಳಿಗೆ ಒಂದು ಪೂರ್ಣ ವಾಕ್ಯದಲ್ಲಿ ಉತ್ತರಿಸಿ.   1*4=04

(ಅ) ನಾಟ್ಯ ಯಾವಾಗ ಹುಟ್ಟಿಕೊಂಡಿತು?

(ಆ) ಆನೆ ಹಳ್ಳದ ಕಾಡಿನಲ್ಲಿ ನಾಪತ್ತೆಯಾದ ಹುಡುಗಿಯರ ಹೆಸರುಗಳನ್ನು ತಿಳಿಸಿ.

(ಇ) ರಾಷ್ಟ್ರಪತಿಯಾಗಿ ಆಯ್ಕೆಯಾದಾಗ ಕಲಾಂ ಅವರು ಮೊದಲು ಹೇಳಿದ ಮಾತುಗಳೇನು?

(ಈ) ಮಂಗಳನ ಅಂಗಳ ತಲುಪಿದ ಮೊದಲ ಅಂತರಿಕ್ಷ ನೌಕೆ ಯಾವುದು?

(ಉ) 'ಹಗಲುಗನಸು' ನುಡಿಗಟ್ಟನ್ನು ಬಳಸಿ ಸ್ವಂತ ವಾಕ್ಯವನ್ನು ರಚಿಸಿ.

(ಊ) 'ಸಿಹಿಕಹಿ' ಜೋಡುಪದವನ್ನು ಒಂದು ವಾಕ್ಯದಲ್ಲಿ ಬಳಸಿ.

2. ಕೆಳಗಿನ ಯಾವುದೇ ನಾಲು ಪ್ರಶ್ನೆಗಳಿಗೆ ಕನಿಷ್ಟ ಐದಾರು ವಾಕ್ಯಗಳಲ್ಲಿ ಉತ್ತರಿಸಿ.   4*4=16

(1) ಕುವೆಂಪು ಅವರು ಇಂಗ್ಲಿಷ್ ಕಲಿಯುವವರನ್ನು ಎಷ್ಟು ವಿಭಾಗವಾಗಿ ಹೇಗೆ ವಿಂಗಡಿಸಿದ್ದಾರೆ?

(2) ಕಲಾಂ ಅವರ ಯಶಸ್ಸಿನ ಮಂತ್ರಗಳೇನು?

(3) ಗಾದೆಗಳ ಮಹತ್ವವೇನು? ನಿಮಗೆ ಗೊತ್ತಿರುವ ಯಾವುದೇ ಎರಡು ಗಾದೆಗಳನ್ನು ಹೆಸರಿಸಿ.

(4) ಸಂವಹನ ಸಂದರ್ಭದಲ್ಲಿ ಬಳಸುವ ಭಾಷೆ ಹೇಗಿರಬೇಕು?

(5) ನೇಮಿಚಂದ್ರರ 'ಸಾವಿನತ್ತ ಒಂದು ಹೆಜ್ಜೆ ' ಕತೆ ಓದಿದ ಹುಡುಗ ತನ್ನ ಸೋಲಿನಿಂದ ಹೊರಗೆ ಬಂದದ್ದು ಹೇಗೆ?

(6) ಸಂದರ್ಶನ ಎಂದರೇನು? ವಿವರಿಸಿ.

3. ಯಾವುದೆ ಎರಡು ಪ್ರಶ್ನೆಗಳಿಗೆ ಉತ್ತರಿಸಿ.   2*5=10

(1) ನಾಟ್ಯಕಲೆಯಲ್ಲಿ ಯಕ್ಷಗಾನ ಕಲೆ ಪ್ರಮುಖವಾದುದು. ಇದರ ಹುಟ್ಟು ಮತ್ತು ವ್ಯಾಪ್ತಿ ಬಗ್ಗೆ ತಿಳಿಸಿ.

(2) ಮಂಗಳಯಾನದ ಮುಖ್ಯ ಉದ್ದೇಶಗಳೇನು?

(3) 'ಮಾನವೀಯ ಮೌಲ್ಯಗಳು', ಅಂತರಜಾಲ – ಎರಡರಲ್ಲಿ ಒಂದಕ್ಕೆ ಸುಮಾರು ಒಂದು ಪುಟದಷ್ಟು ಪ್ರಬಂಧ   ಬರೆಯಿರಿ.

(4) ಉದ್ಯೋಗದ ಸಂದರ್ಶನಕ್ಕೆ ಹೋಗುವಾಗ ಮಾಡಿಕೊಳ್ಳಬೇಕಾದ ಪೂರ್ವಸಿದ್ಧತೆಗಳೇನು?.

ಕನ್ನಡ ಪಠ್ಯಕ್ರಮ ರಚನಾ ಹಾಗು ಪಠ್ಯಪುಸ್ತಕ ಸಮಿತಿ

- ## ಸಂಪಾದಕೀಯ ಸಮಿತಿ:

1. ಶ್ರೀ ಟಿ ಎಲ್ ರವೀಂದ್ರ, ಉಪನ್ಯಾಸಕರು, ಸರ್ಕಾರಿ ಜಿ.ಆರ್.ಐ.ಸಿ.ಪಿ ಬೆಂಗಳೂರು.

2. ಶ್ರೀ ಟಿ. ತಿಮ್ಮಪ್ಪ, ಉಪನ್ಯಾಸಕರು(ಆಯ್ಕೆ ಶ್ರೇಣಿ), ಯಾಂತ್ರಿಕ ವಿಭಾಗ, ಸರ್ಕಾರಿ ಪಾಲಿಟೆಕ್ನಿಕ್, ತುಮಕೂರು.

- **ಸಲಹಾ ಸಮಿತಿಯ ಬಾಹ್ಯ ಸಂಪನ್ಮೂಲ ವ್ಯಕ್ತಿಗಳು.**

1. ಪ್ರೊ. (ಡಾ.) ಡಿ. ಪಾಂಡುರಂಗ ಬಾಬು, ಕುಲಸಚಿವರು, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.
2. ಪ್ರೊ. (ಡಾ.) ಅಶೋಕ್ ಕುಮಾರ್ ರಂಜರೆ, ಪ್ರಾಧ್ಯಾಪಕರು, ಪ್ರಸಾರಾಂಗ ವಿಭಾಗ, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.
3. ಪ್ರೊ. (ಡಾ.) ಕೆ ವೈ ನಾರಾಯಣ ಸ್ವಾಮಿ, ಸಹ ಪ್ರಾಧ್ಯಾಪಕರು, ಸ್ನಾತಕೋತ್ತರ ವಿಭಾಗ, ಸರ್ಕಾರಿ ಕಲಾ ಕಾಲೇಜು, ಬೆಂಗಳೂರು.
4. ಪ್ರೊ. (ಡಾ.) ಜೆ ಬಾಲಕೃಷ್ಣ, ಪ್ರಾಧ್ಯಾಪಕರು ಹಾಗು ಮುಖ್ಯಸ್ಥರು, ಕನ್ನಡ ಭಾಷಾ ಅಧ್ಯಯನ ವಿಭಾಗ, ಕೃಷಿ ವಿಶ್ವವಿದ್ಯಾಲಯ, (ಜಿಕೆವಿಕೆ) ಹೆಬ್ಬಾಳ, ಬೆಂಗಳೂರು.

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

	Course Title: **HYDRAULICS & PNEUMATICS**		
	Scheme (L:T:P) : **4:0:0**	Total Contact Hours: **52**	Course Code: **15ME41T**
	Type of Course: **Lectures, Self Study & Quiz**	Credit :**04**	Core/ Elective: **Core**
CIE- 25 Marks			SEE- 100 Marks

Prerequisites: Knowledge of basic mathematics and Science.

Course Objectives:

1. To gain knowledge on the fundamental aspects of fluid flow physics and properties of fluid flow and selection of hydraulic machinery for relevant applications.
2. To learn various flow measurement techniques.

Course Outcomes:

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

	Course Outcome	**CL**	**Linked PO**	**Teaching Hrs**
CO1	Understand fluid dynamics	*R/U/A*	1,2,3,10	**07**
CO2	Analyze the application of mass, momentum and energy equation in fluid flow.	*R/U/A*	1,2,3,10	**09**
CO3	Calculate and compare flow rates, pressure changes, minor and major head losses for viscous flows through pipes	*R/U/A*	1,2,3,6, 10	**06**
CO4	Evaluate the performance of Hydraulic turbines and operation and performance of centrifugal and reciprocating pumps	*U/A*	1,2,3,4,6, 10	**10**
CO5	Apply knowledge and Select, operate and maintain various hydraulic elements for a particular low cost automation application in sustainable manufacturing system and its impact on society	*R/U/A*	1,2,3,4,6, 10	**10**
CO6	Apply knowledge and Select, operate and maintain various pneumatic elements for a particular low cost automation application in sustainable manufacturing system and its impact on society.	*R/U/A*	1,2,3,4,10	**10**
			Total sessions	**52**

Directorate Of Technical Education   **Karnataka State**   **15ME41T MECH**

COURSE CONTENT AND BLUE PRINT OF MARKS FOR SEE

Unit No	Unit Name	Hour	Questions to be set for SEE/MARKS			Marks weightage	weightage (%)
			R	U	A		
1	INTRODUCTION TO HYDRAULICS	07	5	10	5	20	14
2	DYNAMICS OF FLUIDS	09	5	5	15	25	17
3	FLOW THROUGH PIPES	06	5	5	5	15	12
4	HYDRAULIC MACHINES	10	--	10	20	30	19
5	HYDRAULIC SYSTEMS	10	5	10	15	30	19
6	PNEUMATIC SYSTEMS	10	5	10	10	25	19
	Total	52	25	50	70	145	100

R-Remember; U-Understanding; A-Application

COURSE-PO ATTAINMENT MATRIX

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
MECHANICAL MEASUREMENTS	3	3	3	2	-	2	-	-	-	3
Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.										
Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.										
If ≥40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3										
If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2										
If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1										
If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.										

COURSE CONTENTS

UNITI: INTRODUCTION TO HYDRAULICS   07Hrs

Fluid- Concept and classification of fluid-Newton's law viscosity-Properties of fluid-Density, Specific gravity, Specific Weight, Specific Volume- Dynamic Viscosity, Kinematic Viscosity, Surface tension, Capillarity, Vapour Pressure, Compressibility-Fluid pressure, Pressure head, Pressure intensity-Concept of absolute vacuum, gauge pressure, atmospheric Pressure-pressure,- Simple and differential manometers, Bourdon pressure gauge.

UNTII: DYNAMICS OF FLUIDS   09Hrs

Fluid flow-Types of fluid flows-Continuity equation-Bernoulli's theorem-Venturi meter–Construction, principle of working, Coefficient of discharge, Discharge through venture meter.- Orifice meter-Pitot tube – Construction, Principle of working,- hydraulic coefficients -Numerical on Bernoulli's theorem, venturi meter, orifice meter.

UNITIII: FLOW THROUGH PIPES   06Hrs

Concepts of fluid friction- Loss of head due to friction- Minor losses in pipes -Darcy's equation and Chezy's equation for frictional losses.- -Hydraulic gradient and total gradient line.- Hydraulic power transmission through pipe- Numerical to estimate Loss of head due to friction and major and minor losses- Power transmission. Concept of water hammer in pipes.

UNIT IV: HYDRAULIC MACHINES   10Hrs

Hydraulic turbines- Classification of turbine -Construction and working principle of Pelton wheel, Francis and Kaplan turbine.-Use of Penstock, Anchor Block, Surge tank and Draft tube. Concept of cavitations in turbines- Simple Numerical on Calculation of Discharge, Work done, Power, efficiency of turbine(Exclude Francis turbine)
Pumps- classification of pumps – construction and working of Centrifugal pump- Need for priming of centrifugal pump–multistage centrifugal pump. Reciprocating pump-types-construction and working- Air Vessel-Slip-Simple Numerical on Calculation of discharge, Work done, Power, efficiency of pumps-construction and working Submersible pump

UNIT V: HYDRAULIC SYSTEM   10Hrs

Hydraulic systems- layout of oil hydraulic systems-. Advantages of hydraulic systems-Components of Hydraulic systems- Pumps– Vane pump, gear pump, screw pump,-Valves – working and symbols of Pressure control valves – pressure relief valve, Direction control valves - 3/2, 5/2 valves,-Sequence valves.-Flow control valves–Actuators- Linear Actuators – Cylinders - single acting, double acting - Hydraulic motors-Accumulators-Types.

UNIT VI: PNEUMATICSYSTEM   10Hrs

Pneumatic system- General layout of pneumatic system-Advantages of pneumatic systems-Components of pneumatic system- Compressor – Reciprocating.-construction and working of FRL unit- working and symbols of-Control Valves – Pressure regulating valves, Flow Control valves, Direction Control Valves.-Actuators - Cylinders- single acting and double acting - Air motors,- piston motor-unit- - Pneumatic Symbols- ports and positions

TEXT BOOKS

1. Bansal. R.K.,*"Fluid Mechanics and Hydraulics Machines",* 9th Edition, LaxmiPublicationsPrivate Limited, New Delhi. 2011.
2. R.S.Khurmi, *"Fluid Mechanics and Machinery",*S.Chand and Company, 2nd Edition, 2007.
3. *Hydraulics & Pneumatics* – Andrew Parr, Jaico Publishing House New Delhi.
4. *Hydraulic and Pneumatic Controls Understanding Made Easy*- K.S.Sundaram,-S.chand Company Delhi

REFERENCES
1. Ramamritham. S, *"Fluid Mechanics, Hydraulics and Fluid Machines",* DhanpatRai&Sons,Delhi, 2004.
2. Kumar. K.L., *"Engineering Fluid Mechanics",* 7th Edition, Eurasia Publishing House PrivateLimited, New Delhi, 1995.
3. P. N Modi and S. M. Seth*, "Hydraulics and Fluid Mechanics Including Hydraulics Machines",* 19th Edition, Standard Book House, 2013
4 Bansal R. K, *"Strength of Materials",*Laxmi Publications, New Delhi, 2012.
5. *Oil Hydraulic Systems*- Majumdar, S.R. -Tata McGraw-Hill Publication, 3/e, 2013
6. *Hydraulic and Pneumatic Controls*- Srinivasan, R.- Vijay Nicole Imprints Private Limited, 2/e, 2008
7. *Pneumatic And Pneumatics Controls* -Understanding Made Easy - K.S.Sundaram,-S.chand Company Delhi
8. *Pneumatic Systems* - Majumdar, S.R. -Tata McGraw-Hill Publication, 3/e, 2013

LIST OF SOFTWARES/ LEARNING WEBSITES:

1. www.youtube.com/watch?v=VyR8aeioQrU
2. http://www.youtube.com/watch?v=R6_q5gxf4vs
3. www.howstuffworks.com
4. . http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT- KANPUR/machine/ui/TOC.htm
5. https://www.youtube.com/watch?v=F_7OhKUYV5c&list=PLE17B519F3ACF9376
6. https://www.youtube.com/watch?v=zOJ6gWDMTfE&list=PLC242EBB626D5FFB5
7. http://www.youtube.com/watch?v=0p03UTgpnDU
8. http://www.youtube.com/watch?v=A3ormYVZMXE
9. http://www.youtube.com/watch?v=TjzKpke0nSU
10. http://www.youtube.com/watch?v=vl7GteLxgdQ
11. http://www.youtube.com/watch?v=cIdMNOysMGI
12. www.boschrexroth.co.in
13. http://www.automationstudio.com/
14. http://www.howstuffworks.com/search.php?terms=hydraulics
15. http://hyperphysics.phy-astr.gsu.edu/hbase/fluid.html#flucon
16. http://www.youtube.com/watch?v=FVR7AC8ExIM
17. http://www.youtube.com/watch?v=iOXRoYHdCV0
18. http://www.youtube.com/watch?v=qDinpuq4T0U
19. http://www.youtube.com/watch?v=xxoAm3X4iw0
20. www.festo.com
21. www.boschrexroth.co.in
22. www.nptel.iitm.ac.in
23. http://www.howstuffworks.com/search.php?terms=pneumatics

24. http://www.youtube.com/watch?v=MbKrIieogNc
25. http://www.youtube.com/watch?v=7JuNbHb5NrQ
26. http://www.youtube.com/watch?v=NakOoD-G0IY
27. http://www.youtube.com/watch?v=bG2mCiQgbwE
28. http://www.youtube.com/watch?v=cB3OCPqmUDQ
29. http://www.youtube.com/watch?v=5q7YasmwXCs
30. http://www.youtube.com/watch?v=a5Ebx__l5-g

Course Delivery:
- The course will be delivered through lectures and Power point presentations/ Video
- Teachers can prepare or download ppt of different topic's Hydraulic power engineering application, can prepare alternative slides.

- Prepare/Download a dynamic animation to illustrate the following:
  • Working principle of hydraulic pumps/Hydraulic devices
  • Working principle of hydraulic valves and actuators/ Pneumatic valves and actuators

SUGGESTED LIST OF STUDENT ACTIVITYS

Note: the following activities or similar activities for assessing CIE (IA) for 5 marks (Any one)
- Each student should do any one of the following type activity or similar activity related to the course and before take up, get it approved from concerned Teacher and HOD.
- Each student should conduct different activity and no repeating should occur

1	Each student will give an activity to prepare a tabulated summary for types of fluid which is available around city (Summary includes properties of fluid indicated in chapter-1)
2	List out any five pressure measuring devices available in market with its specifications and current market price.
3	Each student will give an activity to prepare a tabulated summary for types of pipes available in market. (Summary includes type, specification, size range, material, rate and applications).
4	Identify any one hydraulic pump and one prime mover available in market in a group of five students with detail specifications and current price.
5	Visit a nearby related Earth moving equipments service centre and prepare a summary of hydro-pneumatic devices used along with their specifications
6	Motivate student to take case study on Low Cost Automation to inculcate self and continuous learning

- **MODEL OF RUBRICS /CRITERIA FOR ASSESSING STUDENT ACTIVITY**

RUBRICS FOR ACTIVITY(5 Marks)					
Dimension	**Unsatisfactory**	**Developing**	**Satisfactory**	**Good**	**Exemplary**	**Student Score**
	1	**2**	**3**	**4**	**5**	
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	Ex: 4

5

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	5
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.	3
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	2
Average / Total marks=(4+5+3+2)/4=14/4=3.5=4							

Note: This is only an example. Appropriate rubrics/criteria may be devised by the concerned faculty (Course Coordinator) for assessing the given activity.

Course Assessment and Evaluation Scheme:

	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment	CIE	IA	Students	Three IA tests(Average of three tests will be computed)	20	Blue books	1,2,3,4,5,6
				Student Activities	05	Activity sheets	
	SEE	End Exam		End of the course	100	Answer scripts at BTE	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	1 & 2,3 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3,4,5,6 Effectiveness of Delivery of instructions & Assessment Methods

Note: I.A. test shall be conducted for 20 marks. Average marks of three tests shall be rounded off to the next higher digit.

Questions for CIE and SEE will be designed to evaluate the various educational components (Bloom's taxonomy) such as:

Sl. No	**Bloom's Category**	**% Weightage**
1	**Understanding**	**45**
2	**Applying the knowledge acquired from**	**25**
3	**Analysis**	**20**
4	**Evaluation& Creating new knowledge**	**10**

Directorate Of Technical Education   Karnataka State   15ME41T MECH

FORMAT OF I A TEST QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks
Ex: I test/6 th weak of sem 10-11 Am	I/II SEM	**HYDRAULICS & PNEUMATICS**	20
	Year:		

Name of Course coordinator :				Units:__		
CO's:____						

Question no	Question	MARKS	CL	CO	PO
1					
2					
3					
4					

Note: Internal choice may be given in each CO at the same cognitive level (CL).

MODEL QUESTION PAPER
4- Semester Diploma Examination
HYDRAULICS AND PNEUMATICS

Time: **3 Hours**]   [Max Marks**: 100**

Note: Answer any <u>SIX</u> from Part A and any <u>SEVEN</u> from Part B

Part A   6x5=30 marks

1. List the different properties of the fluid.
2. Define the following
i) Laminar flow   ii)   Turbulent flow,
iii)Steady flow   iv) Uniform flow
3. Identify major energy losses and minor energy losses.
4. State the applications of Hydraulics system.
5. Explain manometer and classify.
6. Classify of control valves.

7. Explain the general layout of pneumatic system.
8. The water is flowing through a pipe having diameters 200 mm and 100 mm at sections 1 and 2 respectively. The rate of flow through pipe is 35 litres/sec. The section 1 is 6 m

above datum and section 2 is 4 m above datum. If the pressure at section 1 is 39.24 X 10^4 N/m^2 ,find the intensity of pressure at section 2.

9.APelton wheel develops 2000KW under a head of 100meters, and with an overall efficiency of 85%. Find the diameter of the nozzle, if the coefficient of velocity for the nozzle is 0.98.

Part-B

10. a)Explain with neat sketch the pitot tube. 04

b)An oil of specific gravity 0.8 is flowing through a venturi meter having inlet 06diameter 200mm and throat diameter 100mm .The oil-mercury differential manometer shows a reading of 250 mm. Calculate the discharge of oil through the horizontal venturi meter. Take C$_d$ = 0.98.

11.a)Indicate the factors for selection of Hydraulic turbine.   04

b)A Pelton wheel develops 2000KW under a head of 100meters, and with an overall efficiency of 85%. Find the diameter of the nozzle, if the coefficient of velocity for the nozzle is 0.98.

12. a)Write short on air motors.

b)Explain with neat sketch, the double-acting cylinder.

13.a)Sketch and explain the gear pump.

b)Sketch and explain the Spring loaded Accumulator.

14.a)Explain hydraulic gradient and total energy lines.

b)Find the loss of head, due to friction, in a pipe of 500 mm diameter and 1.5 kilometres long. The velocity of water in the pipe is 1m/s. Take co-efficient of friction as 0.005.

15.a)Classify of control valves.   4

b)Sketch and explain the 5/2 DC valve.   6

16.a) Explain the terms with units.   4

i) Dynamic viscosity   ii)kinematic viscosity.

b)Illustrate the relationship between different pressure with diagram.   6

17.a)Explain the continuity equation and Bernoulli's equation.   5

b)Explain with neat sketch the working of multistage pump for high head.   5

18.a)Explain slip, negative slip and Percentage Slip of Reciprocating pump.   5

b)Explain briefly FRL unit.

19.Distinguish between :   10.

i) Steady flow and unsteady flow   ii) Uniform and non uniform flow

iii) Compressible and incompressible flow   iv) Rotational and irrotational flow

MODEL QUESTION BANK

4- Semester Diploma Examination

HYDRAULICS AND PNEUMATICS

CO-1:UNDERSTAND FLUID DYNAMICS

Remembrance

1. Define the following properties:

a)Density   b) Weight density   c) Specific volume

d)Specific gravity   e) Viscosity

2. Define the following properties

a) Dynamic viscosity   b)kinematic viscosity.

c)Surface tension.

3.Define Newtonian and non Newtonian fluids

4.Defineand explain Newton's law of viscosity.

5.Describe manometer. How are they classified.

6.List the different properties of the fluid.

7.Define a)Atmospheric pressure, b)Gauge pressure   c)Absolute pressure.

Understanding

1. Explain the terms with units.

   a) Dynamic viscosity   b)kinematic viscosity.

2. Explain surface tension.

3. Explain the phenomenon of capillary tube.

4. Distinguish between ideal fluids and real fluid.

5. Distinguish between manometers and mechanical gauges and list different types

Of mechanical pressure gauges.

6.Explain manometer and classify.

Application

1 .Explain with a neat sketch explain Bourdon's tube pressure gauge.

2. Explain with a neat sketch Simple monometer.

3. Explain with a neat sketch Differential manometer.

4. Illustrate the relationship between different pressure with diagram.

5. Write different advantages and disadvantages of manometer.

CO-2:ANALYZE THE APPLICATION OF MASS, MOMENTUM AND ENERGY EQUATION IN FLUID FLOW.

Remembrance

1. Define equation of continuity.

2. Define the following
   i) Laminar flow   ii) Turbulent flow,
   iii)Steady flow   iv) Uniform flow
3. Define the following
   i) Compressible fluid   ii) Incompressible flow
4. State Bernoulli's theorem for steady flow of an incompressible fluid.
5. State the Bernoulli's theorem. Mention the assumptions made.
6. Define continuity equation and Bernoulli's equation.
7. List the different applications of Bernoulli's theorem .
8. Define hydraulics co-efficient.

Understanding
9. Explain equation of continuity.
10. Distinguish between :
    i) Steady flow and unsteady flow   ii) Uniform and nonuniform flow
    iii) Compressible and incompressible flow   iv) Rotational and irrotational flow
    v) Laminar and Turbulent flow
11. Explain pitot tube.
12. Explain the continuity equation and Bernoulli's equation.
Application
13. Explain with neat sketch the pitot tube.
14. Explain the working orifice meter with neat sketch.
15. Explain the principal of venturi meter with a neat sketch.
16. Water is flowing through a pipe of 50 mm diameter under a pressure of $29.43 \times 10^4 N/m^2$ and with mean velocity of 2.0m/s. Find the total head or total energy per unit weight of the water at a cross-section, which is 5m above the datum line.
17. A pipe through which water is flowing, is having diameters 200mm and 100mm at the cross-sections 1 and 2 respectively. The velocity of water at section 1 is given 4.0m/s. Find the velocity head at sections 1 and 2 and also rate of discharge.
18. The water is flowing through a pipe having diameters 200 mm and 100 mm at sections 1 and 2 respectively. The rate of flow through pipe is 35 litres/sec. The section 1 is 6 m above datum and section 2 is 4 m above datum. If the pressure at section 1 is 39.24×10^4 N/m^2 ,find the intensity of pressure at section 2.
19. Water is flowing through a pipe having diameter 300 mm and 200 mm at the bottom and upper end respectively. The intensity of pressure at the bottom end is $24.525 \times 10^4 N/m^2$ and the pressure at the upper end is $9.81 \times 10^4 N/m^2$ .Determine the difference in datum head if the rate of flow through pipe is 40 lit/sec.
20. The water is flowing through a taper pipe of length 100 m having diameters 600 mm at the upper end and 300 mm at the lower end, at the rate of 50 litres/sec. The pipe has a slope of   1 in 30. Find the pressure at the lower end if the pressure at the higher level is $19.62 \times 10^4 N/m^2$

21. A horizontal venture meter with inlet and throat diameters 300mm and 150mm respectively is used to measure the flow of water. The reading of differential manometer connected to the inlet and throat is 200mm mercury. Determine the rate of flow. Take C_d = 0.98.

22. An oil of specific gravity 0.8 is flowing through a venturi meter having inlet diameter 200mm and throat diameter 100mm .The oil-mercury differential manometer shows a reading of 250 mm. Calculate the discharge of oil through the horizontal venturi meter. Take C_d = 0.98.

23. A horizontal venturi meter with inlet diameter 200mm and throat diameter 100mm is used to measure the flow of oil of specific gravity 0.8. The discharge of oil through venturi meter is 60 litres/sec. Find the reading of the oil-mercury differential manometer. Take C_d = 0.98.

24. A pipe through which water is flowing is having diameters 400mm and 200mm at the cross-sections 1 and 2 respectively. The velocity of water at section 1 is given 5.0 m/s. Find the velocity head at section 1 and 2 and also rate of discharge.

25. An oil of specific gravity 0.9 is flowing through a venturi meter having inlet diameter 200mm and throat diameter 100mm. The oil-mercury differential manometer shows a reading of 200mm. Calculate the discharge of oil through the horizontal venturi meter. Take C_d = 0.98.

26. The water is flowing through a pipe having diameters 200 mm and 150mm at section 1 and section 2 respectively. The rate of flow through pipe is 40 liters/sec. The section 1 is 6m above the datum line and section 2 is 3m above the datum. If the pressure at section 1 is $29.43 \times 10^4 N/m^2$, find the intensity of pressure at section 2.

27. A horizontal venturi meter with inlet and throat diameters 300mm and 150mm respectively is used to measure the flow of water. The reading of differential manometer connected to inlet throat is 100mm of mercury. Determine the rate of flow. Take C_d = 0.98 .

28. The water is flowing through a taper pipe of length 50m having diameters 400mm at the upper end and 200mm at the lower end, at the rate of 60 liters/sec. The pipe has a slope of 1 in 40. Find the pressure at the lower end if the pressure at the higher level is $24.525 \times 10^4 N/m^{2.}$.

29. An orifice meter with orifice diameter 100mm is inserted in a pipe of 200mm diameter. The pressure gauges fitted upstream and downstream of orifice meter given readings of $19.62 \times 10^4 N/m^2$ and $9.81 \times 10^4 N/m^2$ respectively. Co-efficient of discharge for the meter is given as 0.6. Find the discharge of water through pipe.

30. An orifice meter with orifice diameter 150mm is inserted in a pipe of 300mm diameter. The pressure difference measured by mercury oil differential manometer on the two sides of the orifice meter gives a reading of 500mm of mercury. Find the rate of flow of oil of specific gravity 0.9 when the co-efficient of discharge of meter = 0.64.

CO-3: CALCULATE AND COMPARE FLOW RATES, PRESSURE CHANGES, MINOR AND MAJOR HEAD LOSSES FOR VISCOUS FLOWS THROUGH PIPES

Remembrance

1. Define loss of head in pipes due to friction.
2. Identify major energy losses and minor energy losses.
3. Describe hydraulic gradient and total energy lines.
4. State Darcy's and Chezy's formula for fluid flow through pipes.
5. Describe different types of losses in fluid flow through pipes.
6. State the condition for maximum transmission of power.
7. Describe water hammer in pipes.

Understanding

8. Explain major energy losses and minor energy losses.
9. Explain hydraulic gradient and total energy lines.
10. Explain Darcy's and Chezy's formula for fluid flow through pipes.
11. Explain different types of losses in fluid flow through pipes.
12. Explain with the help of a line diagram
    a) Hydraulic gradient line
    b) Total energy line.
13. Explain the maximum efficiency of transmission of power.
14. Explain water hammer in pipes.

Applications

1. Write short notes water hammer.
2. Write short notes on power transmission through pipes.
3. Write short notes on losses of head due to friction through pipes.
4. Find the loss of head, due to friction, in a pipe of 500 mm diameter and 1.5 kilometres long. The velocity of water in the pipe is 1m/s. Take co-efficient of friction as 0.005.
5. Water is flowing through a pipe of 1500 m long with a velocity of 0.8 m/sec. What should be the diameter of the pipe, if the loss of head due to friction is 8.7m. Take f for the pipe as 0.01.
6. It was observed that the difference of heads between the two ends of a pipe 250 metres long and 300 mm diameter is 1.5 metres. Taking Darcy's coefficient as 0.01 and neglecting minor losses, calculate the discharge through the pipe.
7. A pipe of 60 metres long and 150 mm in diameter is connected to a water tank at one end and flows freely into the atmosphere at the other end. The height of water level in the tank is 2.6 metres above the centre of the pipe. The pipe is horizontal and f = 0.01. Determine the discharge through the pipe in litres/sec., if all the minor losses are to be considered.
8. A reservoir has been built 4 km away from a college campus having 5000 inhabitants. Water is to be supplied from the reservoir to the campus. It is estimated that each inhabitant will consume 200 litres of water per day, and that half of the daily supply is pumped within 10 hours. Calculate the size of the supply main, if the loss of head due to friction in pipeline is 20 m. Assume f = 0.008.
9. Find the head lost due to friction in a pipe 1 m in diameter and 1.5 km long when the water is flowing with a velocity of 1 m/sec., by using Darcy's equation with f = 0.020.
10. Water is supplied to a town of 4,00,000 inhabitants. The reservoir is 6.4 kilometres away from the town and loss of head due to friction in pipeline is measured as 1.5 m. Calculate the size of the supply main, if each inhabitant consumes 180 litres of water per day and half of the daily supply is pumped in 8 hours. Take the frictional factor for pipeline is 0.030.

11. Calculate the discharge through a pipe of diameter 200 mm when the difference of pressure head between the two ends of a pipe 500 m apart is 4 m of water. Take the value of f = 0.009.
12. Determine the rate of flow of water through a pipe of diameter 200mm and length 50 m. When one end of the pipe is connected to a tank and other end of the pipe is open to the atmosphere. The pipe is horizontal and the height of the water in the tank is 4 m above the centre of the pipe. Consider all minor losses and take f = 0.009.
13. Water is flowing through a pipe of diameter 200mm with a velocity of 3 m/sec. Find the head lost due to friction for a length of 5 m if the coefficient of friction f = 0.021.
14. Find the head lost due to friction in a pipe of diameter 300mm and length 50 m, through which water is flowing at a velocity of 3 m/sec. Using i) Darcy formula for which f = 0.0026, ii) Chezy's formula for which C = 60.
15. Find the diameter of a pipe of length 2000 m when the rate of flow of water through the pipe is 200 litres/sec. and the head lost due to friction is 4 m. Take the value of C = 50 in Chezy's formulae.
16. A pipe of 300 m long with a diameter of 0.3 m is supplying water. Calculate the discharge of water through the pipe, the loss of head due to friction is 1.5 m. Take Darcy's coefficient as 0.01.
17. Calculate the discharge through a pipe of diameter 200mm when the difference of pressure head between the two ends of pipe 500 m apart is 4 m of water. Take the value of 'f' = 0.009.
18. Water flows through a pipe of 200 mm in diameter 60 m long with a velocity of 2.5 m/sec. Find the head loss due to friction by using Darcy's formula, assuming f = 0.005and by using Chezy's formula, assuming C = 55.
19. Find the difference in the elevations between the water surfaces in the two tanks which are connected by a horizontal pipe of diameter 300mm and length 400 m. The rate of flow of water through the pipe is 300 litres/sec. Consider all losses and take the value of f = 0.008.
20. In a power station, water is available from a reservoir at a head of 75 m. If the efficiency of transmission is 60%, find the power available when 1.25 m^3 of water flows to the station in one section.
21. Find the maximum power that can be transmitted by a power station through a hydraulic pipe of 3 kilometres long and 200 mm diameter. The pressure of water at the power station is 1500 kPa. Take f = 0.01.

22. The pressure at the inlet of a pipeline is 400 kPa and the pressure drop is 200 kPa. The pipeline is 1.5 kilometre long. If 100 KW is to be transmitted over this pipeline, find the diameter of the pipe and efficiency of transmission. Take f = 0.006.
23. A town having a population of 1,20,000 is to be supplied with water from a reservoir at 5 km distance. It is stipulated that one half of the daily supply of 150 litres per head should be delivered within 8 hours. What must be the size of the pipe to furnish the supply, if the head available is 12 metres. Take C = 45 in Chezy's formula.
24. A pipe 3.2 kilometres long and of 0.9 m diameter is fitted with a nozzle of 200 mm diameter at its discharge end. Find the velocity of water through the nozzle, if the head of water is 50 m. Take f = 0.006 for the pipe.
25. A hydro-electric plant is supplied water at the rate of 500 litres/sec., under a head of 250 m through a pipeline 3.2 kilometres long and 500 mm diameter. The pipeline terminates in a nozzle, which has a diameter of 200 mm. find the power that can be transmitted, if the Darcy's coefficient for the pipe is 0.01.

26. A pipe of 75 mm diameter and 250 m long has a nozzle of 25 mm fitted at the discharge end. If the total head of the water is 48 m, find the maximum power transmitted. Take f as 0.01 for the pipe.

27. A pipe having a diameter 300 mm and length 3500 m is used for transmission of power by water. The total head available at pipe inlet is 500 m. Find the maximum power available at the outlet of the pipe, if f = 0.006.

CO-4: EVALUATE THE PERFORMANCE OF HYDRAULIC TURBINES AND OPERATION AND PERFORMANCE OF CENTRIFUGAL AND RECIPROCATING PUMPS

Understanding

1. Classify hydraulic turbine with examples.
2. Explain with the help of a line diagram the working principle of Impulse turbine.
3. Differentiate impulse with reaction turbines.
4. Explain the concept of cavitations in turbine.
5. Explain different Efficiency turbine.
6. Explain Draft tube. Mention its types.
7. Explain a)Penstock b)Anchor block
8. Explain Surge tank and mentions its function.
9. Indicate the factors for selection of Hydraulic turbine.
10. Indicate the functions of draft tube.
11. Classify the pumps.
12. Explain the priming in centrifugal pump.
13. Classify the various Reciprocating pumps.
14. Explain slip and negative slip of the pump.
15. Explain with a line diagram the working of Submersible pump.
16. Differentiate between the centrifugal pump and reciprocating pumps.
17. Explain slip, negative slip and Percentage Slip of Reciprocating pump.
18. Explain: (i) Slip (ii) Negative slip and (iii) Coefficient of discharge in reciprocating pump.

Applications

1. Explain with the help neat sketch, the working principle of Impulse turbine.
2. Show construction and the working principle of pelton wheel.
3. Explain the construction and the working of Francis turbine with a neat sketch.
4. Explain the construction and working of Kaplan turbine with a neat sketch.
5. Explain with neat sketch the following.
   a)Penstock b)Anchor Block.
6. Explain Surge tank with a neat sketch.
7. Explain surge tank with neat sketch.
8. Explain the multistage centrifugal pump with a neat sketch.

9. Explain with a neat sketch, constructional details and principle ofoperation of a centrifugal pump.
10. Explain with neat sketch the working of multistage pump for high head.
11. Explain with neat sketch the working of multistage pump for high discharge.
12. Explain with a neat sketch the construction and working of Single acting Reciprocating pump.
13. Explain with a neat sketch the construction and working of Double acting Reciprocating pump.
14. Explain with a neat sketch air vessel and its functions.
15. Write about Reciprocating pump and Mention its types.
16. Explain with a line diagram the working of Submersible pump.
17. A Pelton wheel develops 2000KW under a head of 100meters, and with an overall efficiency of 85%. Find the diameter of the nozzle, if the coefficient of velocity for the nozzle is 0.98.
18. A Pelton wheel, having semicircular buckets and working under a head of 140meters, is running at 600rpm. The discharge through the nozzleis500 litres/sec and diameter of the wheel is 600mm. Find: a) Power available at the nozzle,   b) Hydraulic efficiency of the wheel, if coefficient of velocity is 0.98.
19. A Pelton wheel, working under a head of 500 metres, produces 13000 kW at 430 r.p.m. If the efficiency of the wheel is 85%, determine a) Discharge of the turbine. b)Diameter of the wheel. c) Diameter of the nozzle. Assume suitable data.
20. In Hydro electric scheme the distance between high level reservoir at the top of the mountains and the turbine is 1.6Km and difference of their levels is 500m. The water is brought in 4 penstocks each of diameters of 0.9 metres connected to a nozzle of 200mm at the end. Find a) Power of each jet, and b) Total power available at the reservoir, taking the value of Darcy's co-efficient of friction as 0.008.
21. The Pykara power house in south India is equipped with impulse turbines of pelton type. Each turbine delivers a maximum power of 14250KW, when working under a head of 900m, and running 600rpm. Find the diameter of the jet, and the mean diameter of the wheel. Take overall efficiency of turbine as 89.2%.
22. A Pelton wheel is required to generate 3750KW under an effective head of400m. Find the total flow in litres/sec and size of the jet. Assume Generator efficiency 95%, Overall efficacy 80%, co-efficient of velocity 0.97, Speed ratio 0.46. If the jet ratio is 10, find the mean diameter of the runner.
23. The overall efficiency of a pelton wheel is 86% when the power developed is 500KW under a head of 80m. If the coefficient of velocity for the nozzle is 0.97, find the diameter of the nozzle.
24. A pelton wheel of 1m diameter is working under a head of 150m. Find the speed of the runner, if the coefficient of velocity and velocity ratio is 0.98 and 0.47 respectively.
25. A pelton wheel producing 1350KW under a head of 80m at 300 rpm. Find the diameter of the wheel, if the speed ratio is 0.45.Take C_V = 0.98.

26. A Kaplan turbine, operating under a net head of 20m, develops 20,000KW with an overall efficiency of 86%. The speed ratio is 2.0 and flow ratio is 0.6. The hub diameter of the wheel is 0.35 times the outside diameter of the wheel. Find the diameter and speed of the turbine.

27. A propeller turbine runner has an outer diameter of 4.5m and an inner diameter of 2.5m and develops 21,000KW when running at 140rpm. under a head of 20m. The hydraulic efficiency is 94% and overall efficiency is 88%. Find discharge through the turbine, and guide blade angle at inlet.

28. A Kaplan turbine working under a head of 5.5m develops 7500 KW. The speed ratio and flow ratio are 2.1 and 0.71 respectively. If the boss diameter is 1/3 of that of the runner and overall efficiency is 85%. Find the diameter of the runner and speed of the turbine.

29. A centrifugal pump delivers water at 30ltrs/sec to a height of 18m through a pipe of 90m long and 100mm diameter. If the overall efficiency of the pump is 75%, find the power required to drive the pump. Take f = 0.012.

30. A centrifugal pump delivers 60ltrs of water per sec to a tank situated at a height 20m. If the overall efficiency of the pump is 70%. Find the power required for the pump.

31. A centrifugal pump having an overall efficiency of 75% is discharging 30ltrs of water per sec through a pipe of 150mm diameter and 125m long. Calculate the power required to drive the pump, if the water is lifted through a height of 25m. Take coefficient friction as 0.01.

32. A double acting reciprocating pump as a stroke of 300mm and a piston of diameter 150mm. The delivery and suction head of 26m and 4m respectively including friction heads. If the pump is working at 60rpm, find power required to drive the pump with 80% efficiency.

33. A single acting reciprocating pump having a bore of 150mm diameter and Stroke of 300mm length discharges 200ltrs of water per minute. Neglecting losses, find
 a) Theoretical discharge in litre/minute.   b)Coefficient of dischargec)Slip of the pump.

34. A single acting reciprocating pump having cylinder diameter of 150mm and stroke 300mm is used to raise water to a total height of 30m.Find the power required to drive the pump, if the crank rotates at 60rpm.

35. A double acting reciprocating pump of plunger diameter 100mm and stroke of 250mm length is discharging water into a tank fitted 20m higher than the axis of the pump. If the pump is rotating at 45rpm, find the power required to drive the pump.

CO-5: APPLY KNOWLEDGE AND SELECT, OPERATE AND MAINTAIN VARIOUS HYDRAULIC ELEMENTS FOR A PARTICULAR LOW COST AUTOMATION APPLICATION IN SUSTAINABLE MANUFACTURING SYSTEM AND ITS IMPACT ON SOCIETY

Remembrance
1. State the advantages of Hydraulics system.
2. State the applications of Hydraulics system.
3. List the hydraulics system components.
4. Name the different types of valves used in hydraulics system.

5. Describe a)Pressure relief valve   b)Direction control valve
6. Describe   a)Flow control valve   b)Actuators
7. State the classification of control valves.
8. Describe Accumulator.

Understand
1. Give the difference between external gear pump and lobe pump.
2. Differentiate between simple pressure relief valve and pilot operated pressure relief valve.
3. Explain is flow control valve.
4. Explain the   non-return valve.
5. Classify of control valves.

Applications
1.Explain the hydraulic system with neat sketch.
2. Sketch and explain the gear pump.
3. Explain the working principle of lobe pump with neat sketch.
4. Sketch and explain the vane pump.
5. Sketch and explain the 5/2 DC valve.
6. Sketch and explain simple relief pressure valve.
7. Explain with neat sketch the pilot operated pressure relief valve.
8. Sketch and explain the pressure reducing valve.
9. Sketch and explain the non-return valve.
10. Sketch and explain the pilot operated valve.
11. Sketch and explain the pilot operated sequence valve.
17. Sketch and explain the Spring loaded Accumulator.

18. Explain with a neat sketch single acting cylinder.

19.Explain with a neat sketch double acting cylinder.

CO-6: APPLY KNOWLEDGE AND SELECT, OPERATE AND MAINTAIN VARIOUS PNEUMATIC ELEMENTS FOR A PARTICULAR LOW COST AUTOMATION APPLICATION IN SUSTAINABLE MANUFACTURING SYSTEM AND ITS IMPACT ON SOCIETY

Remembrance

1. State the applications of pneumatics.
2. State and explain the Pascal's law.

3. List the components of pneumatic system.
4. State the advantages of pneumatic system.
5. Describe are the pneumatic actuators.
6. State the applications of single-acting cylinder and double-acting cylinder.

7. List any five pneumatic symbols.

8. State the functions of FRL unit.

Understanding

1. Explain the Pascal's law.

2. Explain the pneumatic DCV with its symbolic representation.

3. Explain the pneumatic actuators.

4. Explain the general layout of pneumatic system.

5. Explain air motor.

6. Explain briefly FRL unit.

Applications

1. Sketch and explain the arrangement of pneumatic components.

2. Sketch and explain the vane compressor.

3. Explain the application of 2/2 DCV with its neat sketch.

4. Sketch and explain the 3/2 DCV.

5. What is 5/2 DCV. Explain with its neat sketch.

6. Explain with neat sketch, the single-acting cylinder.

7. Explain with neat sketch, the double-acting cylinder.

8. Explain air motor with Sketch.

9. Explain the piston motor with sketch.

10. Sketch and explain the gear motor.

11. Explain the working principle of vane motor with its neat sketch.

12. Write short on air motors.

13. Sketch the following pneumatic symbols.

a)FRL unit   b)Air motor   c)3/2 Pilot valve   d)Single acting actuator

c)Flow control valve.

	Course Title: **BASIC THERMAL ENGINEERING**		
	Scheme (L:T:P) : **4:0:0**	Total Contact Hours: **52**	Course Code: **15ME42T**
	Type of Course: **Lectures, Self Study & Quiz**	Credit :**04**	Core/ Elective: **Core**
CIE- 25 Marks			SEE- 100 Marks

Prerequisites: Knowledge of basic mathematics and Applied Science

Course Objectives:

1. It is a science of energy transfer and its effect on physical properties of substances. It is based upon observations of common experiences of energy (mainly heat) transfer.
2. This course will provide an understanding of the basic principles of thermodynamics which is must for understanding of major fields of mechanical engineering system

Course Outcomes:

On successful completion of the course, the students will be able to attain CO:

Course Outcome		**CL**	**Linked PO**	**Teaching Hrs**
CO1	Apply basic concepts, laws and principles of thermodynamics to use and select equipments/devices/machines working on these basics	*R/U/A*	1,2,3,4,6,10	**10**
CO2	Outline various Thermodynamic process and analyze them with respect to various parameters	*R/U/A/An*	1,2,3,4,6,10	**10**
CO3	Understand the Limitations, applications and Comparison of Thermodynamic cycles based on different parameters.	*R/U/A*	1,2,3,4,10	**11**
CO4	Analyze performance of ICEs by operating them and observing changes in thermodynamic properties during each stroke of ICEs (and by using thermodynamic diagrams.)	*R/U/A/An*	1,2,3,4,6,10	**12**
CO5	Calculate heat transfer for given heat transfer system	*U/A*	1,2,3,4,10	**05**
CO6	Identify the elements of gas turbines and processes of Jet propulsion system	*R/U*	1,2,3,4,10	**04**
			Total sessions	**52**

Legend: R; Remember, U: Understand A: Application

COURSE-PO ATTAINMENT MATRIX

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
BASIC THERMAL ENGINEERING	3	3	3	3	-	3	-	-	-	3
Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed. *Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.* *If ≥40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3* *If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2* *If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1* *If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.*										

COURSE CONTENT AND BLUE PRINT OF MARKS FOR SEE

Unit No	Unit Name	Hour	Questions to be set for SEE/Marks			Marks weightage	weightage (%)
			R	U	A		
1	**BASIC CONCEPTS AND LAWS OF THERMODYNAMICS**	10	5	5	15	25	17
2	**THERMODYNAMIC PROCESSES**	10	5	5	20	30	21
3	**THERMODYNAMIC CYCLES**	11	5	5	20	30	21
4	**IC ENGINES-PERFORMANCE OF I.C ENGINES**	12	5	10	20	35	24
5	**HEAT TRANSFER**	05	-	5	10	15	10
6	**GAS TURBINE AND JET PROPULSION SYSTEMS**	04	5	5	-	10	07
	Total	52	25	35	85	145	100

Legend: R; Remember, U: Understand A: Application

UNITI: BASIC CONCEPTS AND LAWS OF THERMODYNAMICS   10 Hrs

Basic concepts-Definitions :system - boundary, surrounding, working fluid and state of a system.-thermodynamic systems – closed, open and isolated systems with examples-Properties of system- Intensive and Extensive properties with examples.-Definitions for properties like Enthalpy (H), Entropy(s) Internal energy (U)- Specific heat at constant pressure(C_p), specific heat at constant volume(C_v) for a gas-Relation between C_p &C_v , characteristic gas equation, Universal gas constant, Definitions for quasi-static work flow-Law of thermodynamics-Zeroth, first & second laws of thermodynamics- simple problems on conversion of Heat into Work and vice versa., Problems on gas equations-Steady flow energy equation (without proof)

UNTII: THERMODYNAMIC PROCESSES   10 Hrs

Thermodynamic processes,- Explain with P-V and T-S diagram the Constant pressure, Constant volume, Isothermal, Isentropic, Polytrophic, Free expansion and throttling processes & equations representing the processes- Derivation for work done for the above processes- Calculation of change in internal energy, heat supplied or rejected, change in Entropy for the above processes. Simple problems on the above processes .

UNITIII: THERMODYNAMIC CYCLES   11Hrs

Thermodynamic cycle – reversible and irreversible cycles conditions for reversibility of a cycle-Explanation of Carnot cycle with P.V. and T-S diagrams, Air standard Efficiency - Problems on Carnot cycle-Explanation of Otto cycle with P.V. and T-S diagrams, Air standard Efficiency - Simple problems on Otto cycle-Explanation of Diesel cycle with P.V. and T-S diagrams, Air standard Efficiency - Simple problems on Diesel cycle.-Explanation of Dual cycle with P.V. and T-S diagrams, Air standard Efficiency - Simple problems on dual cycle.

UNIT IV: IC ENGINES- PERFORMANCE OF I.C ENGINES   12Hrs

IC engine -definition-classification- Terminology of IC engine - Working principle of Two Stroke petrol & Diesel engine - Working principle of Four Stroke petrol & Diesel engine. Testing of IC engines-Rope brake Dynamometer-Formulae for Brake power, Indicated power Mechanical efficiency, Indicated thermal efficiency, Brake thermal efficiency, Air standard efficiency, Relative efficiency, Volumetric efficiency-Concept of Heat balance sheet for an engine-Simple problems on testing of I.C. engines and heat balance sheet

UNIT V:HEAT TRANSFER   05Hrs

Introduction -Methods of heat transfer-- Conduction, convection and radiation -Fourier's law of heat conduction-Newton law of cooling- Stefan-Boltzmann law -Heat transfer by conduction through slab and composite wall- Heat transfer by Radiation: -Thermal Radiation, Absorptivity, Transmissivity, Reflectivity, Emissivity, black and gray bodies, Radial heat transfer by conduction through thick cylinder-Simple problems on above (conduction only)

UNIT VI: GAS TURBINE AND JET PROPULSION SYSTEMS   04 Hrs

Gas turbines- classification of gas turbines-Closed cycle gas turbine-Schematic diagram-explanation-Open cycle gas turbine-schematic diagram-explanation-Comparison of open cycle and closed cycle gas turbines.-Jet propulsion-Ram–jet engine ,turbojet engines and Rocket engine- principle of working & application.

TEXT BOOKS AND REFERENCES

Sl.No.	Title of Books	Author	Publication
1.	Heat Engines	Pandya and Shah	Charotar Publishing House
2.	Thermodynamics and Heat power Engg.	Mathur and Mehta	Tata Mcgraw- Hill
3	A Text book of Thermal Engineering	R S Khurmi& J K Gupta	S Chand
4.	Thermal Engineering	P.L.Ballaney	Khanna.Publishers
5	Thermal Engineering	A. S. Sarao	SatyaPrakashan
6	Thermal Engineering	R K Rajput	Laxmi.Publications
7	Practical Thermodynamics	G D Rai	Khanna Publisher

LIST OF SOFTWARES/ LEARNING WEBSITES:

a. http://www.nptel.iitm.ac.in/video.php?subjectId=112105123 (IIT-B Video lectures)
b. http://www.thermofluids.net/
c. http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv301-Page1.htm
d. http://www.grc.nasa.gov/WWW/k-12/airplane/thermo.html
e. http://www.youtube.com/watch?v=Xb05CaG7TsQ
f. http://www.youtube.com/watch?v=aAfBSJObd6Y
g. http://www.youtube.com/watch?v=DHUwFuHuCdw
h. http://www.youtube.com/watch?v=kJlmRT4E6R0
i. http://www.youtube.com/watch?v=GKqG6n6nAmg

SUGGESTED LIST OF STUDENT ACTIVITYS

Note: the following activities or similar activities for assessing CIE (IA) for 5 marks (Any one)

- Each student should do any one of the following type activity or similar activity related to the course and before take up, get it approved from concerned Teacher and HOD.
- Each student should conduct different activity and no repeating should occur

1	Identify and list real situations which works on: a: Zeroth law. b: First law of thermodynamics. c: Second law of thermodynamics.
2	Identify different Thermodynamic process in real situations.
3	Prepare charts of diesel, duel and gasoline cycles. Tabulate main points of differences between them.
4	Write the specifications of I.C.Engine of any two wheelers. Also Construct & explain cycle on which that I.C.Engine works.
5	*Arrange visit to any gas turbine power plant/Diesel engine power plant, study the operational features of Gas turbines/Diesel engines*

Course Delivery:

- The course will be delivered through lectures and Power point presentations/ Video

- **MODEL OF RUBRICS /CRITERIA FOR ASSESSING STUDENT ACTIVITY**

RUBRICS MODEL

RUBRICS FOR ACTIVITY(5 Marks)						
Dimension	**Unsatisfactory**	**Developing**	**Satisfactory**	**Good**	**Exemplary**	**Student Score**
	1	**2**	**3**	**4**	**5**	
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	Ex: 4
Fulfill 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	5
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.	3
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	2
Average / Total marks=(4+5+3+2)/4=14/4=3.5=4						

Note: This is only an example. Appropriate rubrics/criteria may be devised by the concerned faculty (Course Coordinator) for assessing the given activity.

Course Assessment and Evaluation Scheme:

	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment	CIE	IA	Students	Three IA tests (Average of three tests will be computed)	20	Blue books	1,2,3,4,5,6
				Student activities	05	Activities sheets	
	SEE	End Exam		End of the course	100	Answer scripts at BTE	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	1 & 2,3 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3,4,5,6 Effectiveness of Delivery of instructions & Assessment Methods

Note: I.A. test shall be conducted for 20 marks. Average marks of three tests shall be rounded off to the next higher digit.

Note to IA verifier: **The following documents to be verified by CIE verifier at the end of semester**
1. Blue books (20 marks)
2. Student suggested activities report for 5 marks
3. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods.

FORMAT OF I A TEST QUESTION PAPER (CIE)

Test/Date and Time	Semester/year		Course/Course Code	Max Marks
Ex: I test/6 th weak of sem 10-11 Am	I/II SEM		**BASIC THERMAL ENGG.**	20
	Year:		Course code:15ME42T	
Name of Course coordinator : CO's:____				Units:__

Question no	Question	MARKS	CL	CO	PO
1					
2					
3					
4					

Note: Internal choice may be given in each CO at the same cognitive level (CL).

MODEL QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks
Ex: I test/6 th weak of sem 10-11 Am	IVSEM	BASIC THERMAL ENGG.	20
	Year: 2016-17	Course code:15ME42T	

Name of Course coordinator :	Units:1,2 Co: 1,2

Note: Answer all questions

Question no	Question	MARKS	CL	CO	PO
1	Differentiate between intensive and extensive properties of a system. Give three examples for each.	04	U	1	1,2, 3,6, 10
2	A volume of 0.5 m^3 of gas at a pressure of 10 bar and 200ºC is expanded in a cylinder to 1.2 m^3 at constant pressure. Determine the amount of work done by the gas and the increase in internal energy. Assume C_p = 1.005 kJ/kg K and C_v = 0.712 kJ/kg K. **OR** A closed system undergoes a change in process in which 5 kJ of heat energy is supplied to the system. Determine the change in internal energy under the following conditions. i) 1 kJ of work is done on the system. ii) 1.25 kJ of work is done by the system.	06	A	1	1,2, 3,4, 6,10
3	Derive an expression for work done during polytrophic process.	04	U	2	1,2, 3,4, 6,10
4	One kg of gas expands reversibly and adiabatically. Its temperature during the process falls from 515K to 390K, while the volume is doubled. The gas does 92 kJ of work in this process Calculate: The value C_p and C_v **OR** A gas has a molecular mass of 26.7. The gas is compressed through a ratio of 12 according to the law PV$^{1.25}$ = C, from initial conditions of 0.9 bar and 333 K. Assuming specific heat at constant volume C_v = 0.79 kJ/kg K. Calculate per kg of mass, work done and heat flow across the cylinder walls. Gas constant and ratio of specific heat.	06	A	2	1,2, 3,4, 6,10

IV- Semester Diploma Examination
Course Title: **BASIC THERMAL ENGINEERING**

Time: **3 Hours**]   [Max   Marks**:   100**

   Note: Answer any **SIX from PartA** and any **SEVEN from Part B**

                              PART-A   6x5=30 marks

1.   Define the terms: (i) system (ii) boundary and (iii) surroundings.

2.   A closed system received a heat transfer of 120 kJ and delivers a work transfer of 150 kJ. Determine the change of internal energy.

3.   Derive expression for work done in constant temperature process with PV diagram.

4.   A volume of 0.5 m^3 of gas at a pressure of 10 bar and 200ºC is expanded in a cylinder to 1.2 m^3 at constant pressure. Determine the amount of work done by the gas and the increase in internal energy. Assume C_p = 1.005 kJ/kg K and C_v = 0.712 kJ/kg K.

5.   List the assumptions made in thermodynamic air standard cycle.

6   Define IC engine and give the classification of IC engines.

7.   Explain following terms:

          a) Volumetric efficiency b) Mechanical efficiency

8.   State and derive Fourier's law of heat conduction.

9.   State the applications and limitations of gas turbine.

                              PART-B

1.   a. Differentiate between intensive and extensive properties of a system. Give three examples for each.   04
      b. A cold storage is to be maintained at -5º while surroundings are at 35ºC. The leakage from the surroundings into the cold storage is estimated to be 29 kW. The actual C.O.P. of the refrigeration plant is one - third of an ideal plant working between the same temperatures. Determine the power required to drive the plant.   06

2.   a) Prove that C_p-C_v=R   04

      b) A piston - cylinder containing air expands at a constant pressure of 150 KPa from a temperature of 285 K to a temperature of 550 K. The mass of air is 0.05 kg. Determine the heat transfer, work transfer and change in internal energy during the process C_p = 1.01 kJ/kg K and C_v = 0.72 kJ/kg K.   06

3.   a) List the thermodynamic processes on gases.   04

      b)A piston cylinder containing air expands at a constant pressure of 150 kpa from a temperature of 285 K to a temperature of 550 K. The mass of air is 0.05 kg. Determine the heat transfer, work transfer and the change in internal energy during the process. Take C_p = 1 kJ/kg K, R = 0.287 kJ/kg K.   06

Directorate Of Technical Education   Karnataka State   **15ME42T MECH**

4. a. Derive an expression for work done during polytrophic process. 04

   b. A gas of mass 0.56 kg is expanded adiabatically from a pressure at 8 bar to 1 bar adiabatically. Initial temperature of the gas is 200°C. Determine the work done and change in internal energy. Take C_p = 1 kJ/kg K and C_v = 0.714 kJ/kg K. 06

5. Explain with the help of P-V and T-S diagrams working of Otto cycle and derive an expression for the air standard efficiency of it. 10

6. A certain quantity of air at a pressure of 1 bar and temperature 70°C is compressed reversibly and adiabatically until the pressure is 7 bar in an Otto cycle engine. 460 kJ of heat per kg of air is now added at constant volume.

   Determine:

   i)Compression ratio of the engine.   ii)Temperature at the end of compression.

   iii)Temperature at the end of heat addition.Take for air, C_P = 1 kJ/kg K and

   C_v = 0.707 kJ/kg . 10

7. a) Compare petrol and diesel engines. 04

   b) A heat engine has a piston diameter of 150 mm, length of stroke 400 mm and mean effective pressure 5.5 bar. The engine makes 120 explosions per minute. Determine the mechanical efficiency of the engine, if the engine BP is 5 kW. 06

8. The following data refers to a four stroke diesel engine, speed 300 rpm cylinder diameter 200 mm, stroke 300 mm, effective brake load 500 kg,   circumference of the brake drum 400 mm, mean effective pressure 6 bar. Diesel oil consumption 0.1 litres/min, specific gravity of diesel 0.78,   calorific value of oil = 43900 kJ/kg.

   Determine : i) Brake power   ii) Indicated power   iii) Frictional power   10

9. a) Define : (i) Conduction (ii) Radiation. 03

   b) Heat is conducted through a wall of room made of composite plate with a conduction of 134 W/mK and 60 W/mK and thickness 36 mm and 42 mm respectively. The temperature at the outer face is 96 0C and 8 0C. Determine the temperature at the interface of the two materials. 07

10. a) Explain closed cycle gas turbine with schematic diagram. 06

    b) State the applications and limitations of gas turbine 04

MODEL QUESTION BANK

Diploma in Mechanical Engineering
IV Semester
Course title: MECHANICS OF MACHINES
BASIC THERMAL ENGINEERING

CO1:APPLY BASIC CONCEPTS, LAWS AND PRINCIPLES OF THERMODYNAMICS TO USE AND SELECT EQUIPMENTS/DEVICES/MACHINES WORKING ON THESE BASICS

REMEMBERING

1. Define the terms: (i) system (ii) boundary and (iii) surroundings.
2. Define the terms: i) Cycle (iv) Enthalpy (v) Entropy.
3. State the comparison between closed system and open system.
4. Define intensive and extensive property.
5. Define specific heat at constant pressure and specific heat at constant volume.
6. State the zeroth law and first law of thermodynamics.
7. State first law and second law of thermodynamics.
8. Define heat and work. Are these quantities a path function or point function? Explain.
9. Define the following :
    i) Quasi-static process
    ii) Internal energy
10. Define steady flow process & write steady flow energy equation with notations.

UNDERSTANDING

1. Explain open system with example.
2. Explain the closed system with example.
3. Differentiate between intensive and extensive properties of a system. Give three examples for each.
4. Derive the characteristic gas equation.
5. Establish that C_p-C_v=R.

APPLICATION

1. A closed system received a heat transfer of 120 kJ and delivers a work transfer of 150 kJ. Determine the change of internal energy.

2. During the compression stroke of an engine, the work done on the working substance in the engine cylinder is 80 kJ/kg and the heat rejected to the surrounding is 40 kJ/kg. Determine the change of internal energy.

3. A closed system undergoes a change in process in which 5 kJ of heat energy is supplied to the system. Determine the change in internal energy under the following conditions.
    a. i) 1 kJ of work is done on the system.   ii)1.25 kJ of work is done by the system.

4. A piston - cylinder containing air expands at a constant pressure of 150 KPa from a temperature of 285 K to a temperature of 550 K. The mass of air is 0.05 kg. Determine the heat transfer, work transfer and change in internal energy during the process C_p = 1.01 kJ/kg K and C_v = 0.72 kJ/kg K.

5. A cold storage is to be maintained at -5° while surroundings are at 35°C. The leakage from the surroundings into the cold storage is estimated to be 29 kW. The actual C.O.P. of the refrigeration plant is one - third of an ideal plant working between the same temperatures. Determine the power required to drive the plant.

6. In a compressor, the air has an internal energy at beginning of the expansion is 200 kJ/kg and after expansion the internal energy becomes 510 kJ/kg. The work done by the air during expansion is 150 kJ/kg. Determine the heat flow.

7. Determine the coefficient of performance and heat transfer rate in a condenser of a refrigerator in kJ/hr whose refrigeration capacity is 11000 kJ/hr if the power input is 1.5 kW.

8. The net work output of a cyclic process is 45 kN-m. If the heat input is 125 kJ, determine the efficiency of the cycle.

9. One litre of hydrogen at 0°C is suddenly compressed to one-half its volume. Determine the change in temperature of the gas if the ratio of two specific heats for hydrogen is 1.4.

CO2: OUTLINE VARIOUS THERMODYNAMIC PROCESS AND ANALYZE THEM WITH RESPECT TO VARIOUS PARAMETERS

REMEMBERING

1. List out the different thermodynamic processes on gases.
2. State characteristics of throttling process

UNDERSTANDING

1. Explain reversible and irreversible process.
2. Explain free expansion process with sketch.
3. Explain throttling process
4. Construct the PV and TS diagram for i) Constant pressure process ii) Constant volume process iii) Constant temperature process.
5. Derive expression for work done in constant temperature process with PV diagram.
6. Derive expression for work done in constant entropy (Isentropic) process with PV diagram.
7. Derive an expression for work done during polytrophic process.

1. A quantity of gas occupies a space of $0.3m^3$ at a pressure of 2 bar and a temperature of 77°C which is heated at a constant volume, until the pressure is 7 bar. Determine (i) Temperature at the end of the process (ii) mass of the gas (iii) change in internal energy and (iv) change in enthalpy during the process.
   Assume: C_p = 1.005 kJ/kg K, Cv = 0.714 kJ/kg K, R = 287 J/kg K.

2. A quantity of gas has a volume of 0.14 m^3, pressure 1.5 bar and temperature 100°C. If the gas is compressed at a constant pressure, until its volume becomes 0.112 m^3, determine :
   a. i)Temperature at the end of the compression ii)Work done in compressing the gas
   b. iii) Decrease in internal energy iv)Heat given out by the gas.

3. If the values of C_p = 0.984 kJ/kg K and C_v = 0.728 kJ/kg K for an ideal gas. Determine the characteristic gas constant and ratio of specific heats for the gas. If one kg of this gas is heated at constant pressure from 25°C to 200°C. Estimate the heat added, ideal work done and change in internal energy. Also Determine the pressure and final volume if the initial volume was 2 m^3.

4. A volume of 0.5 m^3 of gas at a pressure of 10 bar and 200°C is expanded in a cylinder to 1.2 m^3 at constant pressure. Determine the amount of work done by the gas and the increase in internal energy. Assume C_p = 1.005 kJ/kg K and C_v = 0.712 kJ/kg K.

5. A quantity of air has a volume of 0.4 m^3 at a pressure of 5 bar and a temperature of 80°C. It is expanded in a cylinder at a constant temperature to a pressure of 1 bar. Determine the amount of work done by the air.

6. 0.1 m^3 of air at a pressure of 1.5 bar is expanded isothermally to 0.5 m^3 Determine the final pressure of the gas and heat supplied during the process.

7. 0.5 kg of gas is compressed isentropically in such a manner that the ratio of final pressure to initial pressure is 5.25. If the initial temperature is 100°C Determine; (i) work done (ii) change in internal energy. Assume: γ= 1.4 and R = 287 J/kg K.

8. One kg of gas expands reversibly and adiabatically. Its temperature during the process falls from 515K to 390K, while the volume is doubled. The gas does 92 kJ of work in this process Calculate: The value C_p and C_v

9. A gas of 0.15 m^3 at NTP is expanded adiabatically in a cylinder to a volume of 0.3 m^3, Determine the pressure at the end of expansion and the work during expansion. Take C_p=1.4 KJ/Kg K

10. A certain quantity of air has a volume of 0.028 m^3 at a pressure of 1.25 bar and 25°C. It is compressed to a volume of 0.0042 m^3 according to the law $PV^{1.3}$= C. Determine the final temperature and work done during compression. Also determine the reduction in pressure at a constant volume required to bring the air back to its original temperature.

11. A gas has a molecular mass of 26.7. The gas is compressed through a ratio of 12 according to the law $PV^{1.25}$ = C, from initial conditions of 0.9 bar and 333 K.

Assuming specific heat at constant volume $C_V = 0.79$ kJ/kg K. Determine per kg of mass, work done and heat flow across the cylinder walls. Gas constant and ratio of specific heat.

<table>
<tr><td>CO3:</td><td>UNDERSTAND THE LIMITATIONS, APPLICATIONS AND COMPARISON OF THERMODYNAMIC CYCLES BASED ON DIFFERENT PARAMETERS.</td></tr>
</table>

REMEMBERING

1. Define: Air standard cycle, Reversible cycle.
2. List the assumptions made in thermodynamic air standard cycle.

UNDERSTANDING

1. Give the comparison between Otto, diesel and dual combustion cycles.
2. Derive efficiency of Carnot cycle with PV diagram.
3. Derive the efficiency of Otto cycle with PV diagram.
4. With the help of P-V and T-S diagrams, derive an expression for the air standard efficiency of a diesel cycle.
5. Derive an equation for the air standard efficiency of dual cycle.
6. Explain with the help of P-V and T-S diagrams working of Carnot cycle .
7. Explain with the help of P-V and T-S diagrams working of Otto cycle.
8. Explain with the help of P-V and T-S diagrams working of Diesel cycle.
9. Explain with the help of P-V and T-S diagrams working of Dual cycle .

APPLICATION

1. A Carnot engine working between 655 K and 320 K, produces 150 kJ of work. Determine thermal efficiency and heat added during the process.
2. A Carnot engine operates with a thermal efficiency of 70%. The minimum temperature of the cycle is 30ºC. Determine the maximum temperature of the cycle.
3. An engineer claims his engine to develop 3.75 kW. On testing, the engine consumes 0.44 kg of fuel per hour having a calorific value of 42000 kJ/kg. The maximum temperature recorded in the cycle is 1400ºC and minimum is 350ºC. Determine whether the engineer is justified in his claim.
4. A Carnot cycle receives heat at 900ºC and rejects at 50ºC. Determine the efficiency of the cycle. If the cycle receives 4600 kJ of heat per minute, Determine the power developed by the engine.
5. A Carnot cycle works with isentropic compression ratio of 5 and isothermal expansion ratio of 2. The volume of air at the beginning of the isothermal expansion is 0.3 m^3. If the maximum temperature and pressure is limited to 550 K and 21 bar. Determine; Minimum temperature in the cycle, Thermal efficiency of the cycle. Pressure at all salient points. Take ratio of specific heats as 1.4

6. In an Otto cycle, the beginning and end temperatures of a isentropic compression are 316 K and 596 K respectively. Determine the air standard efficiency and the compression ratio. Take $\gamma = 1.4$.

7. A certain quantity of air at a pressure of 1 bar and temperature 70°C is compressed reversibly and adiabatically until the pressure is 7 bar in an Otto cycle engine. 460 kJ of heat per kg of air is now added at constant volume. Determine: Compression ratio of the engine. Temperature at the end of compression. Temperature at the end of heat addition. Take for air, $C_p = 1$ kJ/kg K and $C_v = 0.707$ kJ/kg K.

8. An Otto cycle has a cylinder diameter of 150 mm and a stroke of 225 mm. The clearance volume is 1.25×10^{-3} m^3. Calculate the air standard efficiency of the cycle. Take $\gamma = 1.4$.

9. In an air standard Otto cycle, the compression ratio is 6.5 and the compression begins at 1 bar and 313 K. The heat added is 2520 kJ/kg. Determine: The maximum temperature and pressure of the cycle. Work done per kg of air. Cycle efficiency. Take for air $C_v = 0.713$ kJ/kg K, R = 287 J/kg K = 0.287 kJ/kg K.

10. In an Otto cycle, air at 1 bar and 290 K is compressed isentropically until the pressure is 15 bar. The heat is added at constant volume until the pressure rises to 40 bar. Determine the air standard efficiency and work done during the cycle. Take $C_v = 0.717$ kJ/kg K and $R_u = 8.314$ kJ/kg mol K.

11. A diesel engine with a compression ratio is 13:1 and fuel cut off ratio is at 8% of the stroke. Determine the air standard efficiency of an engine. Take, for air $\gamma = 1.4$.

12. A diesel cycle operating with the temperatures at the beginning and end of compression are 57°C and 603°C respectively. The temperatures at the beginning and end of expansion are 1950°C and 870°C respectively. Determine the ideal efficiency of the cycle. Take $\gamma = 1.4$. If the compression ratio is 14 and the pressure at the beginning of compression is 1 bar. Determine the maximum pressure of the cycle.

13. An ideal diesel engine has a diameter 150 mm and stroke 200 mm. The clearance volume is 10 percent of the swept volume. Determine the compression ratio and the air standard efficiency of the engine if the cut-off takes place at 6 percent of the stroke.

14. A diesel engine has a compression ratio of 15. Heat addition at constant pressure takes place at 10% of the stroke. Determine the air standard efficiency of the engine. Take $\gamma = 1.4$ for air.

15. The compression ratio of an ideal air standard diesel cycle is 15. The heat transfer is 1465 kJ/kg of air. Determine the pressure and temperature at the end of each process and determine the cycle efficiency, if the inlet conditions are 300 K and 1 bar. Take $\gamma = 1.4$ and $C_v = 0.712$ kJ/kg K, $C_p = 1$ kJ/kg K for air.

16. An engine working on dual combustion cycle, has a compression ratio 10 and cut off takes place at of the stroke. If the pressure at the beginning of compression is 1 bar and maximum pressure 40 bar, determine the air standard efficiency of the cycle. Take $\gamma = 1.4$.

17. An engine working on dual combustion cycle with cylinder diameter of 30 cm and a stroke of 42 cm. The clearance volume is 1800 cm^3 and cut off takes place at 6% of the stroke. The explosion pressure ratio is 1.4. Determine the air standard efficiency of the engine. Assume γ= 1.4 for air.

CO4: ANALYZE PERFORMANCE OF ICES BY OPERATING THEM AND OBSERVING CHANGES IN THERMODYNAMIC PROPERTIES DURING EACH STROKE OF ICES (AND BY USING THERMODYNAMIC DIAGRAMS.)

REMEMBERING

1. Define IC engine and give the classification of IC engines.
2. Define the following terms i) cylinder bore ii) swept volume iii) compression ratio.
3. Define brake power, indicated power, mechanical efficiency.
4. Define: Indicated thermal efficiency, Brake mean effective pressure, Brake thermal efficiency.
5. Define : Air standard efficiency, Volumetric efficiency, Relative efficiency

UNDERSTANDING

1. Explain with diagram internal combustion engine indicating the component parts.
2. Explain with neat diagram the working of two stroke petrol engine.
3. Explain with neat diagram the working of four stroke petrol engine.
4. Explain with neat diagram the working of two stroke Diesel engine.
5. Explain with neat diagram the working of four stroke diesel engine.
6. Explain with diagram Rope brake dynamometer
7. Explain the concept of heat balance sheet.

APPLICATION

1. A heat engine has a piston diameter of 150 mm, length of stroke 400 mm and mean effective pressure 5.5 bar. The engine makes 120 explosions per minute. Determine the mechanical efficiency of the engine, if the engine BP is 5 kW.
2. A diesel engine uses 6.5 kg of oil per hour of calorific value 30000 kJ/kg. If the BP of the engine is 22 kW and mechanical efficiency 85%. Determine : 1) Indicated thermal efficiency, 2) Brake thermal efficiency 3) Specific fuel consumption in kg/BP/hr.
3. During the test on single cylinder diesel engine, working on the four stroke cycle and fitted with a rope brake, the following readings are taken:
    Effective diameter of brake wheel = 360 mm; Dead load on brake = 200 N; Spring balance reading = 30 N; Speed = 450 rpm; Area of indicator diagram = 420 m^2; Length of indicator diagram = 60 mm; Spring scale = 1.1 bar per mm; Diameter of cylinder = 100 mm; Stroke = 150 mm; Quality of oil used = 0.815 kg/hr; Calorific value of oil = 42000 kJ/kg.Determine brake power, indicated power, mechanical efficiency, brake thermal efficiency and brake specific fuel consumption.

4. A test is carried out on a single cylinder four stroke petrol engine gave the following results :

Cylinder diameter = 0.3 m; piston movement = 0.52 m; clearance volume = 0.0092 m3; explosions per minute = 110, indicated mean effective pressure = 7 bar; mass of the fuel = 28 kg/hr; calorific value of fuel = 19228 kJ/kg and take γ = 1.4 for air. Determine   :i) Indicated thermal efficiency   ii) Air standard efficiency iii) Relative efficiency.

5. The following observations were made during a test on a single cylinder 4 stroke cycle diesel engine.

Speed	-	150 rpm
Circumference of brake drum	-	920 rpm
Load on brake drum	-	150 mm
Spring balance reading	-	25 N
Area of indicated diagram-		950 mm2
Length of indicated diagram	-	60 mm
Spring constant	-	0.035 N/mm2/mm
Cylinder diameter -		80 mm
Length of stroke	-	110 mm
C.V. of fuel	-	45430 kJ/kg
Fuel consumed	-	0.85 kg/hr

6. Determine :   i) Mechanical efficiency   ii) Indicated thermal efficiency   iii) BMEP

7. A four stroke diesel engine has a cylinder bore of 150 mm and a stroke of 250 mm. The crank shaft speed is 300 rpm and fuel consumption is 1.2 kg/hr, having a calorific value of 39900 kJ/kg. The indicated mean effective pressure is 5.5 bar. If the compression ratio is 15 and cut off ratio is 1.8. Determine the relative efficiency. Assuming = 1.4 for the air.

8. A four stroke four cylinder petrol engine gave the following details:

   i. Stroke = 95 mm; Bore = 65 mm; Speed = 3000 rpm; Clearance volume = 65 cm3; Relative efficiency on brake thermal efficiency is 45%; CV of petrol is 46300 kJ/kg. Torque developed is 70 N-m. Determine i) Specific fuel consumption, ii) Brake power, iii) BMEP. Take = 1.4 and = 80%.

9. A petrol engine consumes 0.28 kg of fuel per BP-hr, calorific value of fuel is 44000 kJ/kg, mechanical efficiency is 80% and compression ratio is 5.8. Determine (a) Brake

thermal efficiency, (b) Indicated thermal efficiency, (c) air standard efficiency, (d) Relative efficiency, take = 1.4 for air.

10. An I.C. engine uses 6 kg of fuel having calorific value 44000 kJ/kg in one hour. The I.P developed is 18 kW. The temperature of 11.5 kg of cooling water was found to rise through 25 ^{0}C per minute. The temperature of 4.2 kg of exhaust gas with specific heat 1 kJ/kgK was found to rise through 220 ^{0}C. Construct heat balance sheet for the engine.

8. A gas engine working on four stroke constant volume cycle, gave the following results when loaded by friction brake during a test of an hour's duration :

   Cylinder diameter 240 mm; Stroke length 480 mm; Clearance volume 445010--6 m3; Effective circumference of the brake wheel 3.86 m; Net load on brake 1260 N at overall speed of 226.7 rpm; Average explosions/min 77; mep of indicator card 7.5 bar; Gas used 13 m3/hr at 15 0C and 771 mm of Hg; Lower calorific value of gas 49350 kJ/m3 at NTP; Cooling jacket water 660 kg raised to 34.2 0C; Heat lost to exhaust gases 8%. Determine: i) IP ii) PB, iii) Indicated thermal efficiency   iv) Efficiency ratio. Also Construct a heat balance sheet for the engine.

9. 31. A test on a single cylinder 4 stroke oil engine having bore 18 cm and stroke 36 cm yielded the following results : Brake torque 0.44 kN-m, MEP 7.2 bar, fuel consumption 3.5 kg/min, cooling water flow 4.5 kg/min, water temperature rise 36^{0}C, A/F ratio 25, exhaust gas temperature 415^{0}C, Room temperature 21^{0}C, Specific heat of exhaust gases 1.05 kJ/kgK,   calorific value 45200 kJ/kg, speed = 286 rpm. Construct up a heat balance sheet on kJ/min basis.

CO5: CALCULATE HEAT TRANSFER FOR GIVEN HEAT TRANSFER SYSTEM

UNDERSTANDING

1. Derive an expression for heat transfer through a slab.
2. Derive an expression heat transfer through a composite wall.
3. Derive an expression for the quantity of heat flow through boiler tubes.
4. Explain with line diagram thermal conductivity and thermal resistance of a material.
5. Explain with line diagram radial heat transfer by conduction through thick cylinder.

APPLICATION

6. A boiler is made of iron plates 12 mm thick, if the temperature of the outside surface be 120 ^{0C} and that of the inner is 100 ^{0C}, Determine (i) heat transfer per hr and (ii) mass of water evaporated per hour. Assume that the area of heating surface is 5 m2. Take K for iron as 84 W/mK and latent heat of water at 100 ^{0C} is hfg = 2260 kJ/kg.
7. Heat is conducted through a wall of room made of composite plate with a conduction of 134 W/mK and 60 W/mK and thickness 36 mm and   42 mm respectively. The temperature at the outer face is 96 ^{0C} and 8 ^{0C}. Determine the temperature at the interface of the two materials.

8. A furnace wall is made up of bricks of 200 mm thick. The inner and outer surfaces of the wall have temperature of 800 ^{0C} and 200 ^{0C}. Determine the heat loss. If the outside temperature becomes 25 ^{0C}, after the furnace wall is covered with insulator of 100 mm thick, Determine the reduction in heat loss.
   a. Take Kbrick = 4.5 W/mK, Kinsulator = 0.5 W/mK.

9. Glass windows of a room have a total area of 10 m2 and the glass is 4 mm thick. Determine the quantity of heat that escapes from the room by conduction per second when the inside surfaces of windows are at 25 ^{0} and the outside surfaces at 10^0 The value of K is 0.84 W/mK.

10. The walls of a room having the parallel layers in contact of cement, brick and wood of thickness 20 mm, 300 mm and 10 mm respectively. Determine the quantity of heat that passes through each m2 of wall per minute. If the temperature of air in contact with the wall is 5 ^{0C} and 30^0 C inside. The values of K for cement, brick and wood are 0.294, 0.252 and 0.168 W/mK respectively.

11. Determine the rate of heat flow per square metre through the furnace wall made of 3 cm thick iron metal and covered with an insulating material of   0.4 cm thick. Take K iron = 51 W/mK and K insulator = 0.15 W/mK. The temperatures of the outside and inside surfaces of the wall are 400 ^{0} and 64 ^{0}C respectively.

CO6: IDENTIFY THE ELEMENTS OF GAS TURBINES AND PROCESSES OF JET PROPULSION SYSTEM

REMEMBERING

1. List the classification of gas turbine.
2. State the applications and limitations of gas turbine.
3. State the application of gas turbine and fuel used in gas turbine.
4. Identify the difference between the closed cycle gas turbine and a open cycle gas turbine.

UNDERSTANDING

1. Explain closed cycle gas turbine with schematic diagram.
2. Explain open cycle gas turbine with schematic diagram.
3. Explain with neat diagram closed cycle gas turbine with intercooling and reheating
4. Explain with neat diagram the turbo-jet engine.
5. Explain with neat diagram the working of Ram-jet engine.
6. Explain the working principle of rocket engine with line diagram.

	Course Title: **MACHINE TOOL TECHNOLOGY**		
	Scheme (L:T:P) : **4:0:0**	Total Contact Hours: **52**	Course Code: **15ME43T**
	Type of Course: **Lectures, Self Study & Quiz**	Credit :**04**	Core/ Elective: **Core**
CIE- 25 Marks			SEE- 100 Marks

Prerequisites: Applied science, Basic work Shop practice

Course Objectives:

1. Expose to the Concept and Basic Mechanics of Metal Cutting

2. Familiarise with Working Of Standard Machine Tools Such As Lathe, Shaping And planer, Milling, Grinding And Super finishing Process and other Non conventional machining practices

Course Outcomes:

On successful completion of the course, the students will be able to attain CO:

	Course Outcome	**CL**	**Linked PO**	**Teaching Hrs**
CO1	Understand The Concept And Basic Mechanics Of Metal Cutting	*R/U/A*	1,2,3,4,5,10	**07**
CO2	Know the Working Of Standard Machine Tools Such As Lathe, Milling, Reciprocating Machine tools and demonstrate the need of such machine tools for sustainable development	*R/U/A*	1,2,3,4,10	**33**
CO3	Selection of super finishing process for an application and understand the impact of such process in environmental context	*R/A*	1,2,3,4,5,6, 10	**05**
CO4	Expose and appreciate the application Un conventional machining process area and understand the impact of such process in environmental context	*U/A*	1,2,3,4,5,6, 10	**07**
		Total sessions		**52**

COURSE-PO ATTAINMENT MATRIX

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
MACHINE TOOL TECHNOLOGY	**3**	**3**	**3**	**3**	**2**	**1**	**-**	**-**	**-**	**3**
Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed. *Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.* *If ≥40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3* *If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2* *If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1* *If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.*										

COURSE CONTENT AND BLUE PRINT OF MARKS FOR SEE

Unit No	Unit Name	Hour	Questions to be set for SEE/Marks			Marks weightage	weightage (%)
			R	U	A		
1	THEORY OF METAL CUTTING	07	05	05	05	15	10
2	LATHE AND OPERATIONS	11	05	10	15	30	21
3	RECIPROCATING MACHINE TOOLS	10	05	05	20	30	21
4	DRILLING AND MILLING MACHINES	12	10	20	10	40	28
5	SUPER FINISHING PROCESSES	05	05	-	10	15	10
6	NON CONVENTIONAL MACHINING PROCESS	07	-	05	10	15	10
	Total	52	30	45	70	145	100

Legend: R; Remember, U: Understand A: Application

UNIT I: THEORY OF METAL CUTTING   07Hrs

Introduction: Metal Removal Processes, Types Of Machine Tools – Theory Of Metal Cutting: Chip Formation, Orthogonal Cutting- Oblique Cutting- Machinability of metal. Cutting Tool-Classification of cutting tools-Single point Cutting Tool Geometry-Cutting Tool Materials, Tool Wear, Tool Life, and Cutting Fluids-Functions and properties.

UNIT II:LATHE AND OPERATIONS   10Hrs

Centre Lathe-Construction- Various Operations, Taper Turning Methods, Thread Cutting operation, Lathe Attachments& Accessories. Capstan and Turret Lathes – Automats – Single Spindle, Swiss Type, Multi Spindle Automatic lathe.

UNIT III: RECIPROCATING MACHINE TOOLS   11Hrs

Shaper -Principal parts, Classification, Specification of shaper, Shaper Mechanisms, Types-Hydraulic shaper. Cutting Speed, Feed, Depth of cut & machining time-Various shaper operations-Introduction to Planer -Principal parts and working of Double housing Planer, Principal parts of Slotter-Working of slotter

UNIT IV:DRILLING AND MILLING MACHINES   12Hrs

Drilling operations- Twist drill geometry –Radial drilling machine-Jigs and Fixtures-Definition-Need of Jigs and Fixtures Drill Jig-Locating devices. .Milling-Classification, Column and knee type milling machine - Milling cutters and classification-Fundamentals of milling processes-Milling operations. Indexing methods-Simple and compounding. Cutting speed, feed, depth of cut and machining time.

UNIT V:SUPER FINISHING PROCESSES   05Hrs

Abrasive Processes- Grinding Wheel – Specifications And Selection, Types Of Grinding Process – Cylindrical Grinding, Surface Grinding, Centre less Grinding–Super finishing process- Honing, Lapping, Super Finishing, Polishing And Buffing

UNIT VI: NON CONVENTIONAL MACHINING PROCESS   07Hrs

Unconventional Machining Process - Classification, Electron Beam Machining, Laser Beam Machining, Electric Discharge Machining, Ultrasonic Machining, Abrasive Jet Machining. Additive manufacturing-Concept – Various applications of Additive manufacturing

TEXT BOOKS

1. Rao, P.N., *Manufacturing Technology, Vol I & II*, Tata Mcgraw Hill Publishing Co., New Delhi, 1998
2. Seropekalpakjian, Steven R Schmid*Manufacturing Engineering and Technology*-Pearson Education-Delhi

REFERENCES

1. Sharma, P.C., *A Textbook Of Production Technology – Vol I And II*, S. Chand & Company Ltd., New Delhi, 1996
2. HMT – *"Production Technology",* Tata Mcgraw-Hill, 1998

SUGGESTED LIST OF STUDENT ACTIVITYS

Note: the following activities or similar activities for assessing CIE (IA) for 5 marks (Any one)

1. Each student should do any one of the following type activity or any other similar activity related to the course and before conduction, get it approved from concerned Teacher and HOD.
2. Each student should conduct different activity and no repeating should occur

1	Make Visit to nearest work shop ,observe the lathe and make list of real time machine components which are machined ,Submit hand written report of 500 words
2	Observe the milling machine of your polytechnic and study its specifications. List the possible milling operation can done on that machine, Submit hand written report of 500 words
3	Dismantle some important parts of drilling machine and carry servicing activities and Submit hand written report of 500 words
4	Compare various unconventional machines by collecting their broachers. Make comparative hand written report of 500 words
5	Visit nearest Machine tool work shop and map the machiningactivity of a particular component, prepare a drawing, list the sequence of operation, tools and machineries used. Submit hand written report of 500 words
6	Motivate student to take case study on particular manufacturing activity to inculcate self and continues learning, Submit hand written report of 500 words on selected case study

Course Delivery:

The course will be delivered through lectures and Power point presentations/ Video
Teachers can prepare or download ppt or Videos of different Machines usage in mechanical engineering application

- **MODEL OF RUBRICS /CRITERIA FOR ASSESSING STUDENT ACTIVITY**

RUBRICS MODEL

RUBRICS FOR ACTIVITY(5 Marks)						
Dimension	**Unsatisfactory**	**Developing**	**Satisfactory**	**Good**	**Exemplary**	**Student Score**
	1	**2**	**3**	**4**	**5**	
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	Ex: 4
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	5

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.	3
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	2
			Average / Total marks=(4+5+3+2)/4=14/4=3.5=4			

Note: This is only an example. Appropriate rubrics/criteria may be devised by the concerned faculty (Course Coordinator) for assessing the given activity.

Course Assessment and Evaluation Scheme:

	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment	CIE	IA	Students	Three IA tests (Average of three tests will be computed)	20	Blue books	1,2,3,4
				Student activities	05	Report	
	SEE	End Exam		End of the course	100	Answer scripts at BTE	1,2,3,4
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	1 & 2 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3,4 Effectiveness of Delivery of instructions & Assessment Methods

Note: I.A. test shall be conducted for 20 marks. Average marks of three tests shall be rounded off to the next higher digit.

Note to IA verifier: ***The following documents to be verified by CIE verifier at the end of semester***
1. Blue books (20 marks)
2. Student suggested activities report for 5 marks and should be assessed on RUBRICS
3. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods.

FORMAT OF I A TEST QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks
Ex: I test/6 th weak of sem 10-11 Am	I/II SEM	**MACHINE TOOL TECHNOLOGY**	20
	Year:	Course code:15ME43T	

Name of Course coordinator :   Units:__
CO's:____

Question no	Question	MARKS	CL	CO	PO
1					
2					
3					
4					

Note: Internal Choice may be given in each CO at the same cognitive level (CL).

MODEL QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks
Ex: I test/6 th weak of sem 10-11 Am	III SEM	**MACHINE TOOL TECHNOLOGY**	20
	Year: 2015-16	Course code:15ME43T	

Name of Course coordinator :   Units:1,2 Co: 1,2

Note: Answer all questions

Question no	Question	MARKS	CL	CO	PO
1	Describe briefly the Metal removal process.	05	R	1	1,2
2	Give four examples for Orthogonal Cutting& **Oblique** Cutting.	05	U	1	1,2
3	Sketch and Explain taper turning attachment in a lathe OR Sketch and Explain the thread cutting operation in a lathe	10	A	2	1,2

3- Semester Diploma Examination
MACHINE TOOL TECHNOLOGY

Time: **3 Hours**]   [Max Marks**: 100**

Note: Answer any <u>SIX</u> from **Part A** and any <u>SEVEN</u> from **Part B**

PART-A 6x5=30 marks

1. Give four examples for Orthogonal Cutting & Oblique Cutting
2. Explain steady rest and follower rest
3. Differentiate between capstan and turret lathe.
4. Write specification of shaper
5. Define w.r.t shaper: Cutting Speed, Feed, and Depth of cut machining time
6. Explain with sketch end milling
7. Explain Counter sinking and counter boring
8. Explain wheel truing and dressing
9. Discuss Additive manufacturing.

PART-B   7x10=70 marks

11. Explain the Process of chip formation with sketch
12. Explain the three taper turning methods with line sketch
13. Explain the important method of holding work in a lathe
14. Explain with neat sketch the working of Hydraulic shaper mechanism
15. Explain with neat sketch the working of planer.
16. Explain with sketch twist drill geometry
17. Explain with sketch Column and knee type of milling machine.
18. Explain with neat sketch cylindrical grinder
19. Sketch and explain Electric Discharge Machining
20. Describe briefly the principle of Additive manufacturing.

III Semester Diploma in Mechanical Engineering
COURSE TITLE: MACHINE TOOL TECHNOLOGY

COI: UNDERSTAND THE CONCEPT AND BASIC MECHANICS OF METAL CUTTING
LEVEL: REMEMBER
1. Describe briefly the Metal removal process.
2. State the condition that would allow continuous chips formation.
3. State the difference between orthogonal cutting & Oblique Cutting.
4. List the cutting tool materials.
5. List how tool wear can be minimised.
6. State the important characteristics of cutting tool materials.
7. List the factors to be considered for the selection of tool materials.
8. List the properties of cutting fluid.
9. List the factors affecting tool life.
10. Name five cutting Tools Material.
11. State the tool variables &machine variables affecting the machinability.
12. Give the classification of Cutting Fluids. List few examples in case.
13. Define tool wear and State the reasons for tool wear.
14. Define Tool Life.
15. Define cutting fluid. State the Function of Cutting Fluids.
16. Describe briefly the Mechanics of Metal cutting.

LEVEL: UNDERSTANDING
17. Explain orthogonal cutting.
18. Explain Oblique Cutting.
19. Give four examples for Orthogonal Cutting& **Oblique** Cutting.
20. Explain the Different type of chips.

LEVEL: APPLICATION
21. Write the classification of machine tools.
22. Outline the classification of cutting tools.
23. Write and explain Taylor's Tool Life Equation.
24. Illustrate the importance of various Single point cutting tool angles.
25. Sketch the geometry of single point cutting tool.
26. Sketch the Process of chip formation.

CO 02: KNOW THE WORKING OF STANDARD MACHINE TOOLS SUCH AS LATHE MACHINE TOOLSAND DEMONSTRATE THE NEED OF SUCH MACHINE TOOLS FOR SUSTAINABLE DEVELOPMENT
LEVEL: REMEMBER
1. List various operations that can be performed in lathe.
2. State the advantages of turret lathe over capstan lathe.

3. List the difference between capstan lathe and automats.
4. List the important method of holding work in a lathe.

LEVEL: UNDERSTANDING
5. Distinguish capstan lathe with centre   lathe.
6. Differentiate between capstan and turret lathe.
7. Differentiate between steady rest and follower rest.
8. Explain with sketch 3 jaw chuck.
9. Explain with sketch 4 jaw chuck.
10. Explain the process of cutting internal threads in a lathe.
11. Explain any Two taper turning methods with sketch.
12. Explain the thread cutting operation with sketch.
13. Explain with neat sketch lathe mandrel.
14. Explain with sketch face plate.

LEVEL: APPLICATION
15. Write the Specification Of a centre Lathe.
16. Sketch taper turning attachments.
17. Compare the applications and disadvantages of 3 jaw chuck & 4 jaw chucks
18. Sketch and explain the working of single spindle automats.
19. Sketch and explain the working of multiple spindle automats.

CO 02: KNOW THE WORKING OF STANDARD MACHINE TOOLS SUCH RECIPROCATING MACHINE TOOLSAND DEMONSTRATE THE NEED OF SUCH MACHINE TOOLS FOR SUSTAINABLE DEVELOPMENT
LEVEL: REMEMBER
1. Define w.r.t shaper: Cutting Speed, Feed, and Depth of cut machining time.
2. List the operation performed on a shaper.
3. List the various operations performed in planer.
4. List the various operations performed in slotter.

LEVEL: UNDERSTANDING
5. Differentiate between shaper and planer.
6. Classify the shapers
LEVEL: APPLICATION
7. Write specification of shaper.
8. Sketch and Explain the working of slotter.
9. Sketch and Explain the working of Shaper
10. Sketch and Explain the working of Hydraulic shaper mechanism.
11. Sketch and Explain the working of Planer.

CO 02:KNOW THE WORKING OF STANDARD MACHINE TOOLS SUCH DRILLING AND MILLING MACHINE TOOLSAND DEMONSTRATE THE NEED OF SUCH MACHINE TOOLS FOR SUSTAINABLE DEVELOPMENT

LEVEL: REMEMBER

1. Define Jig and fixture.
2. State the importance of jig.
3. List the importance of fixture.
4. Describe briefly any two locating devices with sketch
5. State the advantages of up milling.
6. State the advantages of down milling.
7. Define w.r.t milling: Cutting Speed, Feed, and Depth of cut machining time.

LEVEL: UNDERSTANDING

8. Explain with sketch twist drill geometry.
9. Explain reaming and tapping process.
10. Explain Counter sinking and counter boring
11. Explain with neat sketch face milling.
12. Explain with neat sketch slab milling.
13. Differentiate between jigs and fixture.
14. Explain with neat sketch up milling and down milling process.
15. Write the classification of milling cutters.
16. Distinguish between a plain milling cutter and a side-milling cutter.

LEVEL: APPLICATION

17. Sketch and Explain the working of radial drilling machine.
18. Sketch and Explain end milling.
19. Sketch and explain drill jig.
20. Sketch Column and knee type of milling machine and label the parts

CO 03:SELECTION OF SUPER FINISHING PROCESS FOR AN APPLICATION AND UNDERSTAND THE IMPACT OF SUCH PROCESS IN ENVIRONMENTAL CONTEXT

LEVEL: REMEMBER

1. State the specification of grinding wheel.
2. How the grinding wheels are selected.
3. List various super finishing process.
4. State the advantages of centre less grinding over cylindrical grinding.
5. Describe wheel truing and dressing.

LEVEL: APPLICATION

6. Sketch and Explain the working of surface grinding.
7. Sketch and Explain the working of centre less grinding.
8. Sketch and Explain the working of cylindrical grinder.
9. Write the classification of grinding process.

CO 04: EXPOSE AND APPRECIATE THE APPLICATION NON CONVENTIONAL MACHINING PROCESS AREA AND UNDERSTAND THE IMPACT OF SUCH PROCESS IN ENVIRONMENTAL CONTEXT.

LEVEL: UNDERSTANDING

1. Describe briefly the principle of Additive manufacturing.
2. Give the classification of non conventional machining process.
3. Differentiate between AJM and ultra sonic machining.
4. Give the classification of nonconventional machining process.
5. Discuss Additive manufacturing.

 LEVEL: APPLICATION
6. Sketch and explain Ultrasonic Machining.
7. Sketch and explain Abrasive jet machining process.
8. Sketch and explain Electric Discharge Machining.
9. Sketch and explain Electron Beam Machining.
10. Sketch and explain Laser Beam Machining.

PROFESSIONAL ETHICS	Course Title: **PROFESSIONAL ETHICS & INDIAN CONSTITUTION**		
	Scheme (L:T:P) : **4:0:0**	Total Contact Hours: **52**	Course Code: **15ME44T**
	Type of Course: **Lectures, Self Study& Quiz**	Credit :**04**	Core/ Elective: **Core**
CIE- 25 Marks			SEE- 100 Marks

Prerequisites: Enthusiasm to learn the subject

Course Objectives:

1. To create an awareness on Engineering Ethics and Human Values.
2. To instill Moral and Social Values and Loyalty.
3. Create awareness among engineers about their social responsibilities
4. Appreciate the Ethical issues
5. To Know the Human rights and concept of women empowerment
6. To know features of our constitution.

Course Outcomes:

7.
8: *On successful completion of the course, the students will be able to attain CO:*

	Course Outcome	**CL**	**Linked PO**	**Teaching Hrs**
CO1	Practice the moral values that ought to guide the Engineering profession.	*R/U*	5,6,7,8,10	**10**
CO2	Discover of the set of justified moral principles of obligation, ideals that ought to be endorsed by the engineers and apply them to concrete situations	*U/A*	5,7,8,10	**09**
CO3	Know the definitions of risk and safety also discover different factors that affect the perception of risk	*R/U*	5,6,7,10	**05**
CO4	Appreciate the Ethical issues and Know the code of ethics adopted in various professional body's and industries	*R/U*	5,6,7,10	**06**
CO5	Justify the need for protection of human rights and to know about concept of women empowerment	*R/U*	5,6,7,8,10	**8**
CO6	Know the successful functioning of democracy in India	*R/U*	5,6,7,9,10	**14**
			Total sessions	**52**

Legend: R; Remember, U: Understand A: Application

COURSE-PO ATTAINMENT MATRIX

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
PROFESSIONAL ETHICS & INDIAN CONSTITUTION	-	-	-	-	3	3	3	3	2	3

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.

Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.
If >40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3
If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2
If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1
If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

COURSE CONTENT AND BLUE PRINT OF MARKS FOR SEE

Unit No	Unit Name	Hour	Questions to be set for SEE			Marks weightage	weightage (%)
			R	U	A		
1	HUMAN VALUES	10	15	15	-	30	21
2	ENGINEERING ETHICS	09	10	15	-	25	17
3	SAFETY, RESPONSIBILITIES OF ENGINEERS	05	05	-	10	15	11
4	ETHICAL ISSUES IN ENGINEERING PRACTICE	06	05	05	5	15	11
5	HUMAN RIGHTS	8		15	5	20	13
6	INDIAN CONSTITUTION	14		25	15	40	27
	Total	52	35	75	35	145	100

Legend: R; Remember, U: Understand A: Application

UNITI: HUMAN VALUES   10Hrs

Professional Ethics-Objectives of study of professional ethics-Human values- Definition of Morals and Ethics-Difference between Morality and Ethics-Values-Definition-Types of values- Definition of Integrity- Concept of Work Ethic- Service Learning- Definition Virtues-Definition-Civic Virtue-Duties and Rights - Respect for Others – Attitude and values, opinions-changing attitude-beliefs-Reliability-Living Peacefully-Means to be adopted for leaving peacefully-Caring-Sharing-Honesty-ValuingTime-Co-operation-Commitment-Empathy-Self-Confidence-Spirituality.

UNTII: ENGINEERING ETHICS   09Hrs

Engineering ethics-Definition-Approach-Senses of Engineering Ethics-variety of moral issues– Inquiry-Types-Moral dilemmas-Steps to solve dilemma-Moral autonomy –Definition-consensus & controversy –Profession-Definition–Ethical theories-Theories about right action Personality–Self control- Self-interest –Self respect.

UNITIII: SAFETY, RESPONSIBILITIES OF ENGINEERS   05Hrs

Safety and risk-definition- - assessment of safety and risk - risk benefit analysis and reducing risk –Personal risk-Public risk-Reducing risk-Voluntary Risk-Collegiality and loyalty–Authority-Types- collective bargaining -occupational crime –Responsibility of engineers–Types-Social responsibility-Professional responsibility-confidentiality-conflicts of interest-liability

UNIT IV:ETHICAL ISSUES IN ENGINEERING PRACTICE   06Hrs

Ethical issues–Industrial standards-Environmental ethics –Plastic waste disposal-E-Waste Disposal-Semi conductor waste Disposal-Industrial waste disposal-Human centred environmental ethics- computer ethics –Types of issues-Computer as the Instrument and Object of Unethical Acts -Engineers as managers-Codes of ethics-Sample code of Ethics like -Institution of Engineers(India)-Institute of Electrical & Electronics engineers- Institute of Electronics & Telecommunication Engineers - Indian Institute of Materials Management.

UNIT V: HUMAN RIGHTS   8 Hrs

Human Rights-Definition-constitutional provisions-right to life and liberty-Human Rights of Women-Discrimination against women- steps that are to be taken to eliminate discrimination against women in Education, employment, health care, Economic and social life, Women in rural areas- Status of Women in India - Constitutional Safeguards - Dowry Prohibition act 1961- Domestic violence act 2005- Sexual harassment at work place bill 2006-Human Rights of Children- Who is a child- list the Rights of the Child- Right to education--Protection of Children from Sexual Offences Act(POCSO)-2012- National Human Rights Commission-Constitution- Powers and function of the Commission-Employee rights- Provisions made-Contractual-Non contractual employee rights-Whistle blowing-definition-Aspects-Intellectual Property Rights (IPR)–Meaning-Need for protection- Briefly description of concept of patents, Copy right, Trade mark.

Introduction to constitution of India-Formation and Composition of the Constituent Assembly-Salient features of the Constitution-Preamble to the Indian Constitution Fundamental Rights- Fundamental Duties-Directive principles of state policy.

Parliamentary system of governance- Structure of Parliament- Lokhasabha and Rajyasabha - Functions of parliament- Legislative ,Executive, Financial Function, Powers of Loksabha and Rajya Sabha- Procedure followed in parliament in making law-Structure of union executive- Power and position of President, Vice President, Prime minister and council of ministers. Structure of the judiciary: Jurisdiction and functions of Supreme Court, high court, and subordinate courts

Federalism in the Indian constitution, Division of Powers- Union list, State list and concurrent list, Structure of state legislation, Legislative assembly and Legislative council, Functions of state legislature, Structure of state executive-Powers and positions of Governor, ,Speaker, Deputy Speaker, Chief Minister and council of minister.

Local self government- meaning-Threetiersystem-Villagepanchayath-Talukpanchayath-Zillapanchayath-Local bodies-Municipalities and Corporations, Bruhath mahanagara Palike. Functions of Election commission, UPSC, KPSC.

TEXT BOOKS

1. Naagarazan, R.S. , "Professional Ethics and Human Values " New age International http://www.imd.inder.cu/adjuntos/article/524/Professional%20Ethics%20and%20Human%20Values.pdf
2. Charles D. Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall,

3. NCERT_Indian_Constitution_at_Work_Political_Science_Class_11_www.upscportal.com (1)

REFERENCES

1. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice HallofIndia,NewDelhi,2004.
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics - Concepts and Cases", Wadsworth Thompson Learning, United States, 2000
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi,2003.
4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001
5. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York, 1996.
6. Introduction to the Constitution of India- Dr.Durga Das Basu
7. Empowerment of rural women in India-Hemalatha H.M and RameshwariVarma,HemaPrakashana.

LIST OF LEARNING WEBSITES:
1. http://www.imd.inder.cu/adjuntos/article/524/Professional%20Ethics%20and%20Human%20Values.pdf
2. http://www.course.sdu.edu.cn/G2S/eWebEditor/uploadfile/20131017113401956.pdf

SUGGESTED LIST OF STUDENT CASE STUDY

Note: The following or similar Case study related for assessing CIE (IA) for 10 marks

1	Teacher form the group of 5- 6 students, Ask to think by each student, about an important value acquired from their child hood and the value still retained with them and value they rejected. Ask to share the values retained and explore what has made to reject some values. Make report
2	The construction company wants to make a feasibility study of a proposed ring road near your city. It hires Civil engineer for this purpose. The engineer learns that the project would have a very negative impact in term of pollution, economy, and lives of low income rural population. The Engineer had no intention of divulge the information during public hearings. What should the Engineer as Adviser to do? Make report
3	The computer engineer develops a computer program used as a tool in developing other programs assigned to him. He uses the facilities of the company to develop the program. He changes jobs and takes the only copy of the first program with him for use in his new job. Will it be a violation of the employer's right? Does he require previous employer's permission before using it on the new job? Make report
4	A manufacturing enterprise pays their Technicians Trainees overtime salary and a handsome bonus to work during a strike period. The strike was organized by the union against the unsafe working conditions of the plant. You, considered as a Technician trainee, believe that the conditions may be unsafe even though no government regulations apply. What will you do? Make report Options: 1. Refuse to work, because thinking that the allegations of the union have merit 2. Refuse to work because believing that breaking the strike is unethical. 3. Continue to work, because he feels this is an obligation to the employees 4. Continue to work because it will help clear some of his pending commitments 5. Work, because otherwise Management is likely to be fired and cannot get alternate job.
5	A woman who was driving a car was involved in an accident. The vehicle dashed against the divider. She had fallen unconscious. You are passing by your vehicle. She is known to you, alive and stable. You are going to appear for an interview for Air Force recruitment. Is it (or) is it not your duty to save her from suffering? You are likely to fulfill a duty of protecting the country. What you will do .Apply Ethical theory on this situation. Make report
6	Teacher form the group of 5- 6 students, Ask to Visit local general hospital/leading Nursing homes. Ask them to observe how their hospital wastes being disposed. Will they follow the safe disposable measures? Assess how it will violate their environmental ethics. Make report

MORE SUGGESTED CASE STUDY FOR UNDERSTANDING THE COURSE

Case Studies: Study the cases given in text book *Vide page number 120 to page number 138*: *Naagarazan, R.S "Professional Ethics and Human Values "*New age International (E-link :http://www.imd.inder.cu/adjuntos/article/524/Professional%20Ethics%20and%20Human%20Values.pdf) and analyzes the ethical issues and comment on what one should do. State ethical principles, codes of ethics of professional societies, to support your comments.

Course Delivery:

- The course will be delivered through lectures and Power point presentations/ Video
- Teachers can encourage the students to take case study and make the report of the same.

Course Assessment and Evaluation Scheme:

	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment	CIE	IA	Students	Three tests (Average of three tests to be computed)	20	Blue books	1,2,3,4,5,6
				One Case study	05	Report	1,2,3,4,5,6
				Total	25		
	SEE	End Exam		End of the course	100	Answer scripts at BTE	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	1 & 2,3 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3,4,5,6 Effectiveness of Delivery of instructions & Assessment Methods

Note: I.A. test shall be conducted for 20 marks. After taking average of three tests marks, any decimals shall be rounded off to the next higher digit.

Example only: RUBRICS/CRITERIA FOR ASSESSING STUDENT's CASE STUDY (5 Students in a group).

Dimension	Scale					Students Score				
	Unsatisfactory 1	Developing 2	Satisfactory 3	Good 4	Exemplary 5	1	2	3	4	5
1. Research and gather data information	Does not collect information relate to topic	Collects very limited information, some relate to topic	Collects basic information, most refer to the topic	Collects more information, most refer to the topic	Collects a great deals of information, all refer to the topic	3				
2.Full fills teams roles and data interpretation	Does notable to interpret data perform any duties assigned to the team role	slightly able to interpret data and Performs very little duties	Not precisely able to interpret data and Performs nearly all duties	Precisely Able to interpret Data and Performs almost all duties	Excellent in interpreting data and Performs all duties of assigned team roles	4				
3.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	Always does the assigned work, rarely needs reminding.	Always does the assigned work, without needing reminding	5				
4. Listen to other team mates and able to conclude	Is always talking, never allows anyone to else to speak not able to infer	Usually does most of the talking, rarely allows and the others to speak and slightly able to infer	Listens, but sometimes talk too much and able to infer	Listens and talks a little more than needed and able to precisely conclude	Listens and talks a fare amount and excellently conclude this opinion	2				
Grand Average/Total						14/4=3.5 ~ 4				

Questions for CIE and SEE will be designed to evaluate the various educational components (Bloom's taxonomy) such as:

Sl. No	Bloom's Category	% in Weightage
1	**Remembering**	**35**
2	**Understanding**	**50**
3	**Application**	**10**
4	**Analysis (activities)**	**05**

FORMAT OF I A TEST QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code		Max Marks		
Ex: I test/6 th weak of sem 10-11 Am	I/II SEM	**PROFESSIONAL ETHICS & INDIAN CONSTITUTION**		20		
	Year:	**15ME44T**				

Name of Course coordinator :   Units:__
CO's:____

Question no	Question	MARKS	CL	CO	PO
1					
2					
3					
4					

Note: Internal choice may be given in each CO at the same cognitive level (CL).

MODEL QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks
Ex: I test/6 th weak of sem 10-11 Am	IV SEM	**PROFESSIONAL ETHICS& INDIAN CONSTITUTION**	20
	Year: 2015-16	Course code: **15ME44T**	

Name of Course coordinator :   Units:1,2 and CO: 1,2

Note: Answer all questions and carry equal marks

Question no	Question	CL	CO	PO
1	List the factors for one to work peacefully.	R	1	5,6,7
2	Illustrate the ethical aspect principle of caring or sharing, with an example? OR Explain various actions of an engineer leading to dishonesty?	A	1	5,6,7
3	State the specific virtues relating to honesty? OR List the situations when moral dilemmas arise?	R	2	5,7,8
4	Explain the relation between autonomy and authority?	A	2	5,7,8

4- Semester Diploma Examination

PROFESSIONAL ETHICS & INDIAN CONSTITUTION

Time: **3 Hours**]   [Max Marks**: 100**

Note: *Answer any <u>SIX</u> from Part A and any <u>SEVEN</u> from Part B*

PART-A   6x5=30 marks

1. Distinguish between 'morality' and 'ethics'

2. Explain the terms, 'Profession', 'Professional', and 'Professionalism'?

3. Name a few techniques (steps) to reduce risks?

4. List the ill effects of E waste disposal on environment?

5. Explain the role of computers as object of Unethical Acts?

6. State various provisions under 'human rights?

7. Differentiate between 'Patent' and 'Trade secret'?

8. State the function of Governor?

9. Write Note on gram panchayaths?

PART-B   7x10=70 marks

10. Illustrate the ethical aspect principle of caring or sharing, with an example?

11. Explain various actions of an engineer leading to dishonesty?

12. List the situations when moral dilemmas arise?

13. Distinguish between 'corporate responsibility' and 'corporate accountability?

14. Explain Occupational crime?

15. Explain code of Ethics followed in Institution of Engineers?

16. Explain Sexual harassment at work place bill 2006?

17. Explain the basic structure of Parliament?

18. Explain the formation and functions of state high Court?

19. State the role of following members in Rajyasabha?:

    a) Chairman

    b) Leader of the house

    c) Opposition leader

MODEL QUESTION BANK

4th Semester

Course title: PROFESSIONAL ETHICS & INDIAN CONSTITUTION

CO1: PRACTICE THE MORAL VALUES THAT OUGHT TO GUIDE THE ENGINEERING PROFESSION.

Level-1: Remember

1. Define Engineering Ethics?
2. State the two approaches to Engineering ethics?
3. List different meanings of 'ethics'.
4. List the key trends in engineering ethics?
5. Distinguish between 'morality' and 'ethics'?
6. List different types of values and give a few examples in each?
7. List the civic virtues one should develop?
8. List the types of virtues, with an example for each
9. List the factors for one to work peacefully?
10. List different ways the honesty reflects?
11. List the benefits of empathy?
12. Define 'character' and 'spirituality'?

Level-2: Understand

13. How do the human values evolve?
14. Explain the term 'respect for others' with suitable example?
15. Explain what should one do or not to do live peacefully?
16. Distinguish between 'caring' and 'sharing'?
17. What are the impediments to proper co-operation?
18. Explain the factors that shape self-confidence in a person?
19. Explain two methods of developing self-confidence?
20. Illustrate the ethical aspect principle of caring or sharing, with an example?
21. Explain various actions of an engineer leading to dishonesty?
22. Explain Service Learning and discuss on its components?
23. Explain any two Human values in detail?

CO2: DISCOVER OF THE SET OF JUSTIFIED MORAL PRINCIPLES OF OBLIGATION, IDEALS THAT OUGHT TO BE ENDORSED BY THE ENGINEERS AND APPLY THEM TO CONCRETE SITUATIONS

Level-1: Remember

1. List the objectives of this course 'professional ethics'?
2. Define the term, 'moral dilemma'?
3. List the situations when moral dilemmas arise?
4. List the steps in confronting moral dilemma?
5. State the five characteristics of professionals?
6. State the specific virtues relating to honesty?
7. Define 'corporate responsibility'
8. Define 'corporate accountability?
9. List the skills required to handle moral problems/issues in engineering ethics?

Level-2: Understand

10. Why do people behave unethically?
11. Why and how do moral problems arise in a profession?
12. Explain the moral dilemma
13. Explain the difficulties in solving moral problems?

14. Explain the relation between autonomy and authority?
15. Highlight the principle of 'pre-conventional level' of moral development?
16. Explain the terms, 'Profession', 'Professional', and 'Professionalism'?
17. Describe the virtues fulfilled under professional responsibility?
18. Distinguish between 'corporate responsibility' and 'corporate accountability'?
19. What is moral integrity? Write on its significance?
20. Differentiate between self-respect and self-esteem.?
21. Distinguish between causal responsibility, moral responsibility and Legal responsibility?
22. What is meant by Professional Responsibility?
23. Where and how do moral problems arise in engineering practice? Justify the safety and other obligations of professional engineers?

CO3: KNOW THE DEFINITIONS OF RISK AND SAFETY ALSO DISCOVER DIFFERENT FACTORS THAT AFFECT THE PERCEPTION OF RISK

Level-1: Remember

1. Name the factors that influence the perception of risk?
2. List the factors that affect the risk acceptability?
3. Name a few techniques (steps) to reduce risks?
4. List various aspects of collegiality?
5. List factors/principles to justify 'confidentiality'?
6. State the difference between 'bribe' and 'gift'?

Level-2: Understand

7. What is meant by 'safe exit', in the study of safety?
8. Describe 'institutional authority' with an example?

Level-3: Application

9. Explain 'collective bargaining with example?
10. Explain briefly ''institutional authority?
11. Explain Occupational crime?

CO4: APPRECIATE THE ETHICAL ISSUES AND KNOW THE CODE OF ETHICS ADOPTED IN VARIOUS PROFESSIONAL BODY'S AND INDUSTRIES

Level-1: Remember

1. List the ill effects of E waste disposal on environment?
2. Define 'computer ethics'? List the issues in 'computer ethics'?
3. Name different types of problems in 'computer ethics'?
4. List the ethical problems by computers in workplace?
5. List the ethical features involved in computer crime?

Level-2: Understand

6. Describe briefly on code of ethics?
7. Write note on Industrial standards?
8. What are the duties of an engineer as an experimenter, in environmental ethics?
9. How the plastic waste disposals create havocs?
10. Discuss on Industrial waste disposal creating disasters on environment?

Level-3: Application

11. Explain 'environmental ethics'?

12. Explain human centred environmental ethics?

13. Explain the role of computers as instruments?

14. Explain the role of computers as object of Unethical Acts?

15. Explain the role of engineers as managers?

16. Explain code of Ethics followed in Institution of Engineers?

17. Explain code of Ethics followed in engineering council of India?

18. Explain code of Ethics followed in TATA group?

19. Explain code of Indian Institute of Materials Management?

CO 5: JUSTIFY THE NEED FOR PROTECTION OF HUMAN RIGHTS AND TO KNOW ABOUT CONCEPT OF WOMEN EMPOWERMENT

Level-1: Remember
1. State various provisions under 'human rights?
2. List the features of 'international human rights?
3. State the provisions under professional rights?
4. State the features of the employee rights?
5. List the principles of *conflict resolution?*
6. List the ethical responsibilities of consulting engineers?
7. List the various Special Programs for Women's Development from government?

Level-2: Understand
8. Describe briefly 'trademark'?
9. Differentiate between 'Patent' and 'Trade secret'?
10. Describe briefly 'right of conscientious refusal'?
11. Describe 'right to due processes?
12. Describe 'intellectual property rights?

Level-3: Application
13. Explain briefly the 'copyright'?
14. Explain briefly about patents?
15. Explain on the participation in professional societies? `
16. Explain the concept of women empowerment?
17. Explain woman and Development?
18. Explain Dowry Prohibition act 1961?
19. Explain POCSO act 2012?
20. Explain domestic violence act 2005?
21. Explain Sexual harassment at work place bill 2006?

CO6: KNOW THE SUCCESSFUL FUNCTIONING OF DEMOCRACY IN INDIA

Level-1: Remember
1. List the function and powers of parliament?
2. State the positions and powers of the Governor?
3. State the powers and Functions of the Chief Minister?
4. State the functions of Taluk panchayaths?
5. State the functions of Zilla panchayaths?
6. List the functions of urban local bodies?
7. State the powers of the president?
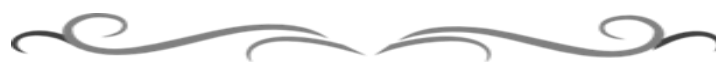8. State the functions of the president?

9. State the powers and Functions of the prime minister?
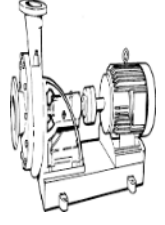
Level-2: Understand

10. Describe briefly about Indian constitution?
11. Write about structure of Parliament?
12. What are the Procedure followed in parliament in making law?
13. Describe the role of gram panchayaths in community upliftment?
14. Describe the role of: a) Chairman b) Leader of the house c) Opposition leader in Rajyasabha?
15. Describe importance of Judiciary?
16. Describe the Structure of state legislation
17. Describe the Jurisdiction of Supreme court,
18. Describe the Jurisdiction high court?

Level-3: Application

19. Explain theFormation & Composition of constituent assembly?
20. Explain preamble and its main objectives of Indian constitution?
21. Explain the fundamental Rights of Every citizen?
22. Explain the fundamental Duties of Every citizen?
23. Explain salient features of Indian constitution?
24. Explain the basic structure of Parliament?
25. Explain the composition of Lokasabha?
26. Explain the composition of Rajyasabha?
27. Explain the Directive principles of state policy?
28. Explain the Structure Of The Judiciary?
29. Explain the Powers of Rajya Sabha and Loksabha ?
30. Describe briefly about, Division of Powers- Union list, State list and concurrent list,
31. Explain the federalism in the Indian constitution ?
32. Explain the role of vice president?
33. Explain the role of State council of ministers?
34. Explain the functions of Zilla panchayaths?
35. Explain the formation and functions of Supreme Court?
36. Explain the formation and functions of state high Court?
37. Explain the formation and functions of subordinate courts?
38. Explain the formation of three tier system for local self government?

	Course Title: **HYDRAULICS AND PNEUMATIC LAB**		
	Scheme (L:T:P) : **0:2:4**	Total Contact Hours: **78**	Course Code: **15ME45P**
	Type of Course: **Tutorial and practice**	Credit :**03**	Core/ Elective: **Core(practice)**
CIE- 25 Marks			SEE- 50 Marks

Prerequisites: Learning concepts of Hydraulics and Pneumatics

Course Objectives:

1. Exposure to the Hydraulics and field application of Fluid Power

Course Outcomes:

On successful completion of the course, the students will be able to attain CO:

Course Outcome		**CL**	**Linked Exercise**	**Linked PO**	**Teaching Hrs**
CO1	Apply Bernoulli's equations in flow experiments to determine the coefficient of discharge	U/A	1	1,2,3,8,9,10	**06**
CO2	Determine hydraulic coefficients of notches	U/A	2	1,2,3,8,9,10	**06**
CO3	Analyze, Variation in flow rates, pressure changes, and minor and major head losses for viscous flows through various diameter pipes.	U/A	3	1,2,3,8,9,10	**06**
CO4	Evaluate the performance of turbines	U/A	4,5,6	1,2,3,8,9,10	**18**
CO5	Evaluate the operation and performance of different types of pumps	U/A	7,8	1,2,3,8,9,10	**12**
CO6	Create the various fluid power circuits for an Engineering application for sustainable development in societal and environmental contexts	U/A	9,10,11,12,13,14	1,2,3,6,8,9,10	**30**
				TOTAL HOURS	**78**

Legend: R; Remember, U: Understand A: Application

1. COURSE-PO ATTAINMENT MATRIX

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
HYDRAULICS AND PNEUMATIC LAB	3	3	3	3	3	1	-	3	3	3

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.
Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.
If ≥40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3
If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2
If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1
If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

LIST OF GRADED PRACTICAL EXERCISES

The practical/Graded exercises should be properly designed and implemented with an attempt to develop different types of learning out comes in affective domain and psychomotor domain, so that students are able to acquire the necessary skills. Following is the list of experiments to be carried out.

Exercise No.	Practical/Exercise	Apprx. Hrs. Required
A. HYDRAULICS		
1	Determination of Coefficient of discharge of Venturimeter	06
2	Determination of hydraulic coefficients of Rectangular and V-Notch and compare	06
3	Evaluate the major losses in pipes of varying diameter due to friction and interpret their results	06
4	Interpret the performance characteristics for Pelton wheel	06
5	Evaluate the performance characteristics for Kaplan turbine	06
6	Analyzethe performance characteristics for Francis turbine.	06
7	Draw the performance characteristics for Centrifugal pump and compare the same with reciprocating pump	06
8	Draw the performance characteristics for Reciprocating pump	06
B . PNEUMATICS		
9	Control of actuators by simple hydraulic circuits.	06
10	Control of actuators by simple Pneumatic circuits.	09
11	Crate and Demonstration of meter in and meter out circuit.	06
12	Demonstration of sequencing circuit.	03
13	Demonstration of pneumatic circuit for speed control of double acting cylinders.	03
14	Demonstration of pneumatic circuit for speed control of pneumatic motor..	03
	TOTAL	78

1.R.S.Khurmi, *"Fluid Mechanics and Machinery"*,S.Chand and Company, 2nd Edition, 2007.
2.*Hydraulics& Pneumatics* – Andrew Parr, Jaico Publishing House New Delhi.

SUGGESTED LIST OF STUDENT ACTIVITYS

Note: the following activities or similar activities for assessing CIE (IA) for 05 marks (Any one)

1. Each student should do any one of the following type activity or any other similar activity related to the course and before conduction, get it approved from concerned Teacher and HOD.

1	Ask the students to Study of a jet pump and submersible pump used in the fields
2	Take the students to Polytechnic machine shop; ask to observe the hydraulic circuit in shaper machine. Make the sketch and analyze its operation
3	Take the students to nearby earthmoving equipment (JCB) servicing work shop; ask to observe the hydraulic circuit installed in earthmoving equipment. Make the sketch and analyze its operation
4	Study of trouble shooting procedures of various hydraulic and pneumatic circuits
5	Study and think an oil power circuit for an application beyond the syllabus and Draw the circuit diagram , submit hand written report of 500 words
6	Study and think an pneumatic circuit for an application beyond the syllabus and Draw the circuit diagram , submit hand written report of 500 words

2. Each student should conduct different activity and no repeation should occur

Course Delivery:

1. *Prepare/Download a dynamic animation to illustrate the following:*
    - Working principle of hydraulic pumps.
    - Working principle of hydraulic valves and actuators.
    - Working of different types of hydraulic devices (applications).
    - Download the catalogue of Hydraulic devices.
    - Download the catalogue of pneumatic devices.
2. The course will be delivered through Demonstration and Shop practices

MODEL OF RUBRICS /CRITERIA FOR ASSESSING STUDENT ACTIVITY

Dimension	Unsatisfactory 1	Developing 2	Satisfactory 3	Good 4	Exemplary 5	Student Score
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	Ex: 4
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	5
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.	3
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	2
Average / Total marks=(4+5+3+2)/4=14/4=3.5=4						

Note: This is only an example. Appropriate rubrics/criteria may be devised by the concerned faculty (Course Coordinator) for assessing the given activity.

Course Assessment and Evaluation Scheme:

Method	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
DIRECT ASSESSMENT	**CIE** (Continuous Internal Evaluation)	**IA** Tests	Students	Two Tests (Average of two tests to be computed)	10	Blue books	1,2,3,4,5,6
				Record Writing (Average marks of each exercise to be computed)	10	Record Book	1,2,3,4,5,6
				Activity	05	Report	1,2,3,4,5,6
				TOTAL	25		
	SEE (Semester End Examination)	End Exam		End of the course	50	Answer scripts at BTE	1,2,3,4,5,6
INDIRECT ASSESSMENT	Student Feedback on course		Students	Middle of the course		Feedback forms	1, 2,3 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3, 4,5,6 Effectiveness of Delivery of instructions & Assessment Methods

*CIE – Continuous Internal Evaluation ***SEE** – Semester End Examination

Note:
1. I.A. test shall be conducted as per SEE scheme of valuation. However obtained marks shall be reduced to 10 marks. Average marks of two tests shall be rounded off to the next higher digit.
2. Rubrics to be devised appropriately by the concerned faculty to assess Student activities.
3. Student suggested activities report for 5 marks
4. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods

Serial no	Description	Marks
1	**Writing procedure** a)One experiment on Fluid mechanics/Machines b)One experiment on Pneumatics	05+05=10
2	**Conducting of Experiment** a)One experiment on Fluid mechanics/Machines**(Group of Five**)b) One experiment on Pneumatics (**Individual)**	10+10=20
3	**Calculation, results, Inference(Both experiments)**	15+5=20
	TOTAL	50

MODEL QUESTION PAPER

IV Semester Diploma in Mechanical Engineering
HYDRAULIC & PNEUMATICS LAB

Time: 3 **Hours**   [Max Marks**: 50]**

1. Determine the Coefficient of discharge of a Venturi meter.
2. Draw the pneumatic circuit to control   double acting cylinders by using 5/2 H.L. Valve and Demonstrate.

EQUIPMENT LIST: **Quantity: 01 Each**
1. Bench mounted Test Rig for Venturi meter
2. Bench mounted Test Rig for Notches
3. Bench mounted Test Rig for Friction through pipes
4. Bench mounted Test Rig for Centrifugal Pumps
5. Bench mounted Test Rig for Reciprocating Pumps
6. Bench mounted Test Rig for Kaplan Turbines
7. Bench mounted Test Rig for Francis Turbines
8. Bench mounted Test Rig for Pelton Wheel
9. Pneumatics Trainer Kit with all standard accessories.
10. Oil power hydraulics Trainer Kit with all standard accessories.

	Course Title: **MACHINE SHOP**		
	Scheme (L:T:P) : **0:2:4**	Total Contact Hours: **78**	Course Code: **15ME46P**
	Type of Course: **Tutorial and practice**	Credit :**03**	Core/ Elective: **Core(practice)**
CIE- 25 Marks			SEE- 50 Marks

Prerequisites: Theoretical concepts Machine tool Technology

Course Objectives:

1. To understand Constructional features of basic machine tools
2. To know the various Metal cutting operations and Machine tool parameters

Course Outcomes:

On successful completion of the course, the students will be able to attain CO:

	Course Outcome	**CL**	**Linked Shops**	**Linked PO**	**Teaching Hrs**
CO1	Acquire skill on working of general purpose machine tools and on various manufacturing processes.	*U/A*	-	1,2,3,4,5,6,7,8,10	**24**
CO2	Create model by demonstrating various turning operation	*U/A*	Turning models exercises	1,2,3,4,5,6,7,8,10	**12**
CO3	Develop a model by demonstrating various drilling and grinding operation	*U/A*	Drilling, grinding model exercises	1,2,3,4,5,6,7,8,10	**12**
CO4	Create model by demonstrating various shaping operation	*U/A*	Shaper models exercises	1,2,3,4,5,6,7,8,10	**24**
CO5	Create model by demonstrating various Milling operation	*U/A*	Milling models exercises	1,2,3,4,5,6,7,8,10	**06**
				Total sessions	**78**

Legend: R; Remember, U: Understand A: Application

COURSE-PO ATTAINMENT MATRIX

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
MACHINE SHOP	3	3	3	3	3	3	3	3	-	3
Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed. *Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.* *If ≥40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3* *If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2* *If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1* *If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.*										

COURSE CONTENT

Unit No	Unit Name	Hour
1	TURNING PRACTICE	24
2	DRILLING PRACTICE	12
3	SHAPING PRACTICE	12
4	MILLING PRACTICE	24
5	GRINDING PRACTICE	06
	Total	78

UNITI: TURNING PRACTICE   **24Hrs**

Demonstration and detailed explanation of Machine tools (Ordinary lathe/capstan/Turret Lathe) and work holding devices used-Description and specification of Cutting tools required for creating model–Various Turning operations performed in Machine shop-Safety practices to be observed-Clean the machine after operation

Hands on Experience
1. Turning practice on mild steel specimen to an accuracy of ± 0.25 mm.
2. Preparing at least **ONE model** involving the following operations. Plain Turning, Step Turning, Taper Turning, Knurling, Thread cutting

UNTII: DRILLING PRACTICE   **12Hrs**

Demonstration and detailed explanation of Machine tools (Radial drilling Machine) and work holding devices used-Description and specification of Cutting tools required for creating

model–Various Drilling operations performed in Machine shop-Safety practices to be observed-Clean the machine after operation

Hands on Experience
1. Preparation of ONE model with two or three different sizes holes for different materials at different locations

UNITIII: SHAPING PRACTICE   12Hrs

Demonstration and detailed explanation of Machine tools (Shaper) and work holding devices used-Description and specification of Cutting tools required for creating model–Various Shaping operations performed in Machine shop-Safety practices to be observed-Clean the machine after operation

Hands on Experience
1. Preparation of ONE model with Shaping step block cut dovetail to angles 60

UNITIV: MILLING PRACTICE   24 Hrs

Demonstration and detailed explanation of Machine tools (MILLING MACHINE) and work holding devices used-Selection and specification of Cutting tools required for creating model–Various Milling operations performed in Machine shop-Safety practices to be observed-Clean the machine after operation

Hands on Experience
1. Preparation of ONE model Milling-square-hexagon, Spur gear teeth, Key way from round bars with indexing and without indexing

UNITV: GRINDING PRACTICE   06Hrs

Demonstration and detailed explanation of Machine tools (Grinding) and work holding devices used-Selection and specification of Grinding wheels required for creating model–The grinding operations performed in Machine shop-Safety practices to be observed-Clean the machine after operation

Observe on Experience
1. The Grinding Single point cutting tool for required angle

Elements of Workshop Technology (Vols. 1 and II) by Hajra Chaudhary

SUGGESTED LIST OF STUDENT ACTIVITYS

Note: the following activities or similar activities for assessing CIE (IA) for 10 marks (Any one)
1. Each student should do any one of the following type activity or any other similar activity related to the course and before conduction, get it approved from concerned Instructor and Foreman with an intimation to HOD
2. Each student should conduct different activity and no repeating should occur

1	Take the students for local Machine shop observe the Machining practices followed in the industry and submit an hand written report of 500 words
2	Ask the students to observe the Various machining operations carried out in a sample

	component and submit an hand written report of 500 words					
3	Take the students for industrial visit for a nearby MSME; observe the safety practices followed and Study Various operational activities. and submit an hand written report of 500 words					

Course Delivery:

The course will be delivered through Demonstration and Shop practices

Course Assessment and Evaluation Scheme:

	What		**To whom**	**When/Where (Frequency in the course)**	**Max Marks**	**Evidence collected**	**Course outcomes**
Direct Assessment meth	CIE	IA	Students	Activities	10	Blue Book	2,3,4.5
				Record – Average marks of graded exercises to be computed	15	Graded exercises	2,3,4,5
	SEE	End Exam		End of the course	50	Answer scripts at BTE	1,2,3,4,5
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	1,2,3 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3,4,5 Effectiveness of Delivery of instructions & Assessment Methods

Note: 1. The activity related exercises shall be evaluated as per the Rubrics developed by the concerned department related to the course.
  2. The course related graded exercises to be evaluated as per performance mentioned in SEE scheme of evaluation.

Note to IA verifier: ***The following documents to be verified by CIE verifier at the end of semester***
  1. Blue books (Activity for 10 marks)
  2. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods.

Scheme of Valuation for End Examination

Note: Any one model in any one practice

Serial no	Description	Marks
1	Listing of tools & operations required for performing job	05
2	Marking of job	05
3	Operation performed	15
4	Dimensional accuracy of job	15
5	Finishing of job	10
	TOTAL	**50**

1. Turret and Capstan Lathes 01
2. Horizontal Milling Machine 01
3. Vertical Milling Machine 01
4. Surface Grinding Machine 01
5. Cylindrical Grinding Machine 01
6. Shaper 02
7. Planner 01
8. Radial Drilling Machine 01
9. Power tools-Drilling
10. Power tools-grinding
11. Power tools-polishing
12. Cordless screw driver

## GENERAL INSTRUCTION IN WORK SHOP

1. Every student should obtain a set of instruction sheets entitled manufacturing processes Laboratory.
2. For reasons of safety, every student must come to the laboratory in shoes. it is unsafe for the students to come to the laboratory wearing garments with parts that that hang about loosely. Students should preferably Use half-sleeve shirts. The Students should also ensure that floor around the machine is clear and dry (not oily) to avoid slipping.
3. An apron will be issued to each student. Students not wearing an apron will not be permitted to the work in the laboratory.
4. Instruments and tools will be issued from the tool room. Every student must produce his identity card for the purpose. Tools, etc. must be returned to the tool room on the same day.
5. The student should take the permission of the Lab Staff / Tutor before handling any machine.
6. The student should not lean on the machine when it is working.
7. Power to the machines will be put off 10 minutes before the end of laboratory session to allow the students to return the tools.
8. Students are required to clear off the chips from the machine and lubricate the guides etc. at the end of the session.
9. Laboratory reports should be submitted on blue Book.
10. Blue Book will not be returned to the students.

UNIT I: TURNING PRACTIC -24 Hrs
(NOTE: INDIVIDUAL MODEL)

1. To make the part shown in the sketch from a mild steel rod on a Lathe
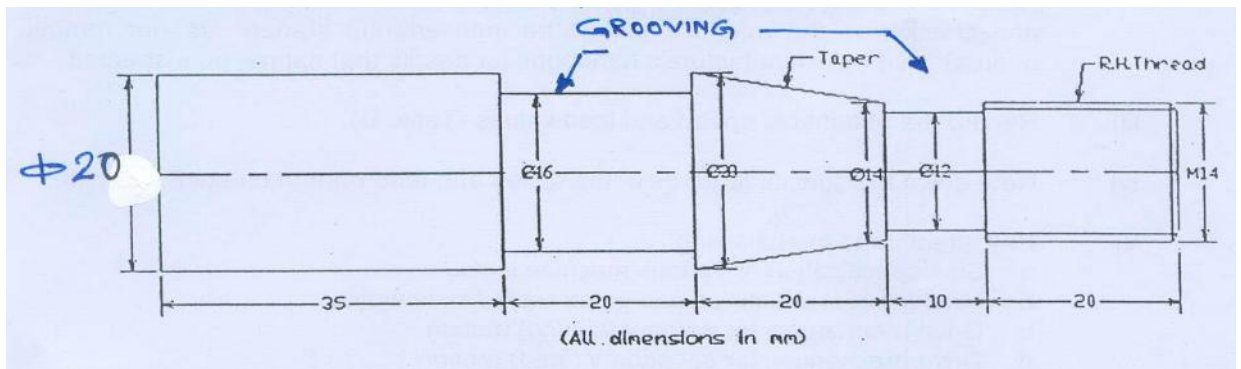
EQUIPMENT: List all tools and instruments used.

OUTLINE OF PROCEDURE

Hold the bar in a three jaw chuck and face the end with a right hand facing tool. Make central hole with a center drill. Repeat these' operations for the other end of the bar. Replace the chuck by a dog plate (Center plate) and hold the job in a carrier between centers. Turn the bar to the required diameter with rough cuts. Face the steps and finishes the diameters to the required sizes. Machine the roots and the groove with form tools. Machine the taper with the help of the cross-slide swiveling arrangement. Knurl the required surface. Cut the threads.

OBSERVATIONS

(a) Measure all dimensions (up to second decimal place) on the specimen turned by your group. Make a neat sketch and indicate all measured dimensions.

(b) Discuss briefly how tapered portion was turned.

(c) Show the calculation of the required gear ratio for thread cutting.

(d) Sketch the main drive unit of 'the- lathe and show how the speed steps are obtained.

UNTII: DRILLING PRACTICE   -12Hrs
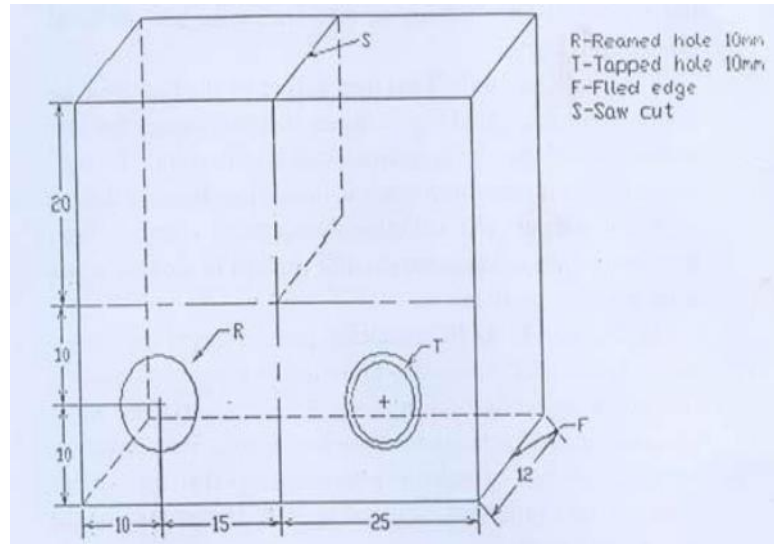## (NOTE: INDIVIDUAL MODEL)

UNTII: DRILLING PRACTICE   12Hrs

**2. To drill, file, as shown in the sketch, out of the work piece provided and tap holes on the mild steel plate.)**

R-Reamed hole 10mm
T-Tapped hole 10mm
F-Filed edge
S-Saw cut

OBJECTIVE: To study the characteristic features of Drilling machine.

OUTLINE OF PROCEDURE

i) Run the machine at low speed and observe the motions, which control the shapes of the surfaces produced. Note particularly the features, which control the geometrical form of the surface.

ji) Learn the names of the major units and the components of each machine. Record these details (Table A). (Please ensure that the main isolator switch is off and check that the machine cannot be inadvertently started. Do not remove guards). Use the manufacture's handbook for details that cannot be inspected.

jii) Record the obtainable speed and feed values

iv) Note down the special features *of* the speed and feed control on each machine,

v) Pay attention to the following:
    a, Size specification *of* various machine tools,
    b, Machine tool structures and guide ways I slide ways.
    c. Drive mechanism for primary (cutting) motion,
    d. Drive mechanism for secondary (feed) motion.

UNIT III: SHAPING PRACTICE -12Hrs
(NOTE:ONE MODEL FOR GROUP OF 05 STUDENTS)

3. To machine a V-block as shown in the sketch out of the work piece provided.

All dimensions in (mm)
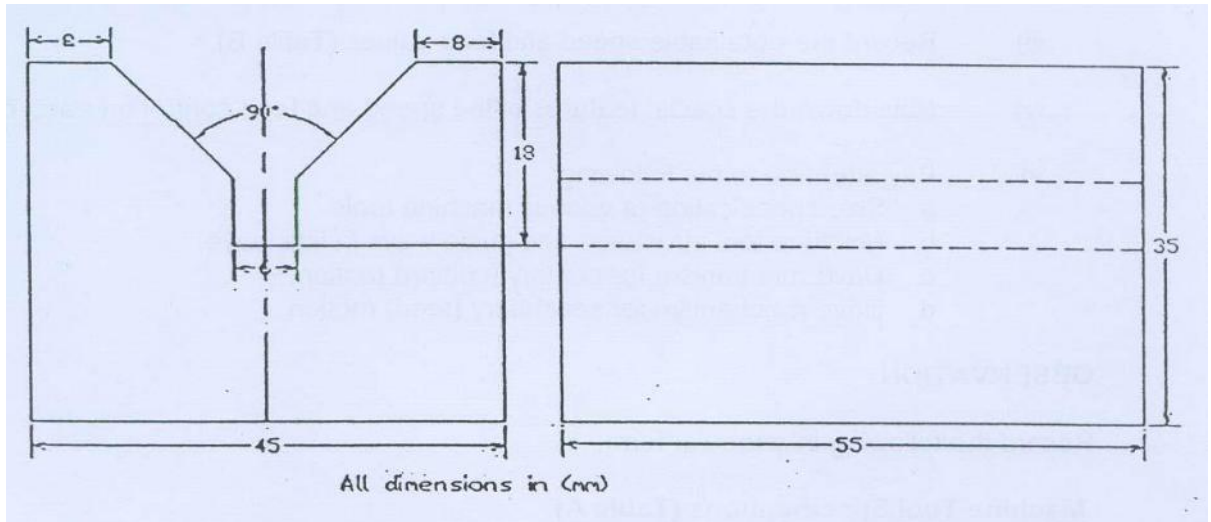
OBJECTIVE: To study the characteristic features of Shaper.

OUTLINE OF PROCEDURE

i) Run the machine at low speed and observe the motions, which control the shapes of the surfaces produced. Note particularly the features, which control the geometrical form of the surface.

ii) Learn the names of the major units and the components of each machine. (Please ensure that the main isolator switch is off and check that the machine cannot be inadvertently started. Do not remove guards). Use the manufacture's handbook for details that cannot be inspected.

iii} Record the obtainable speed and feed values

iv) Note down the special features of the speed and feed control on each machine.

v) Pay attention to the following:

    a. Size specification of various machine tools.

    b. Machine tool structures and guide ways I slide ways.

    c. Drive mechanism for primary (cutting) motion.

    d. Drive mechanism for secondary *(feed)* motion.

OBJECTIVE: To Machine V-Block

EQUIPMENT

List all tools and instruments used.

OUTLINE OF PROCEDURE

Hold the work piece in a vice and machine the bottom surface shown in the sketch. Invert the casting in the vice and machine the top surface till the desired height is obtained. Machine the inclined faces using right and left hand tools. Finally machine the groove.

OBSERVATIONS

(a) Measure all dimensions (up to second decimal place) on he specimen machined by your group. Make a neat sketch and indicate all measured dimensions.

(b) Calculate the machining time *for* the bottom surface of the specimen.

(c) Explain -the quick return mechanism.

(d) Explain the use of clapper box on the machine.

UNIT IV:MILLING PRACTICE -24 Hrs

(NOTE:ONE MODEL FOR GROUP OF 05 STUDENTS)

4. To machine the hexagonal head and the slot shown in the sketch on the specimen,

EQUIPMENT: List all tools / cutters and instruments used.

OUTLINE OF PROCEDURE
Fit the helical cutter on the arbor and the specimen between the centers of the dividing head and the tail center. Carefully adjust the work piece so that the cutter just touches the top surface of the specimen. Calculate the necessary depth of cut and then mill the six *faces* of the hexagonal head in succession. Change the cutter and mill the rectangular slot. Cut at least 2 Spur gear teeth on round rod by using milling gear teeth cutter.
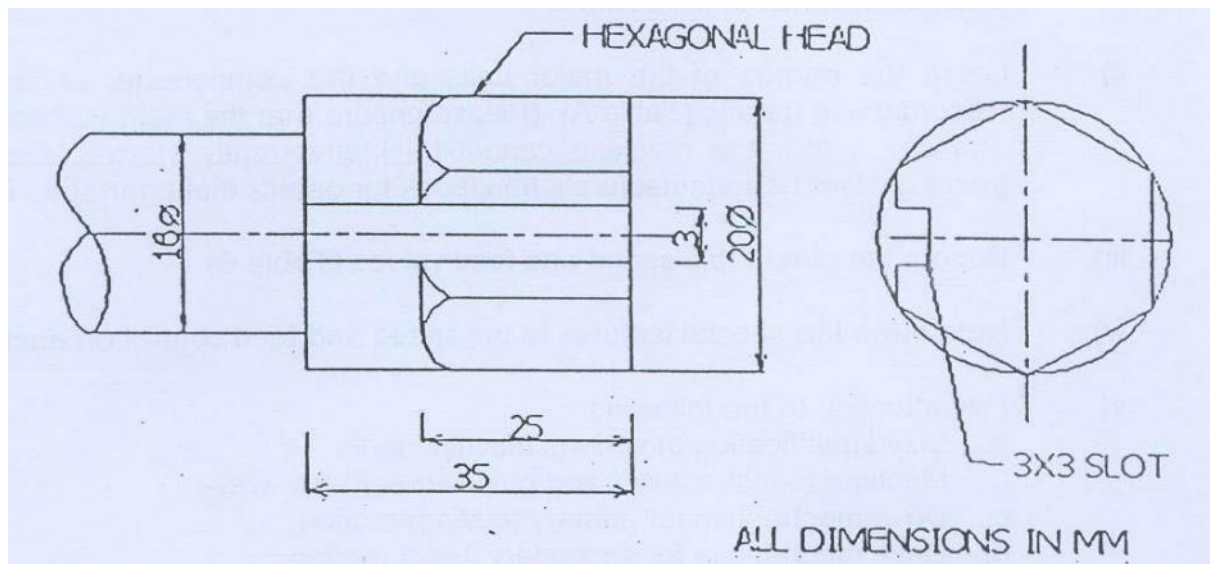

OBSERVATIONS
   (a) Measure all dimensions (up to second decimal place) on the specimen milled by your
       group. Make a neat sketch and indicate all measured dimensions.
   (b) Explain in brief how the required indexing was obtained with the dividing head.
   (c) Explain up-milling and down-milling operations. Which one did you use *for* slot
       milling and why?
   (d) Explain the advantages of using a helical milling cutter.

COURSE TITTLE: **MACHINE SHOP**
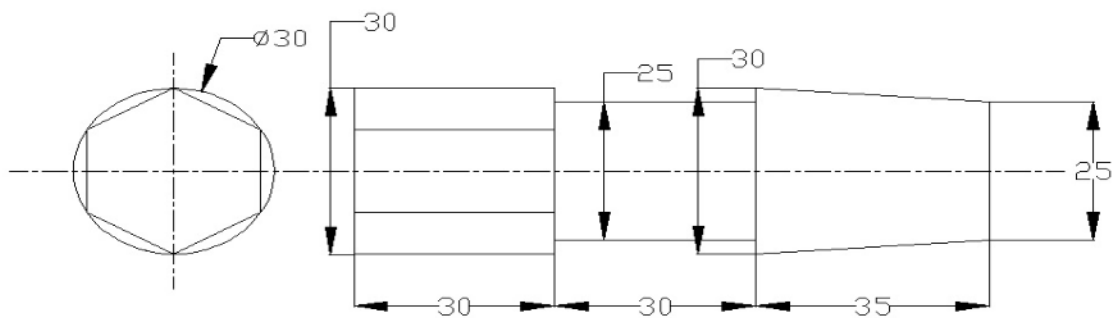
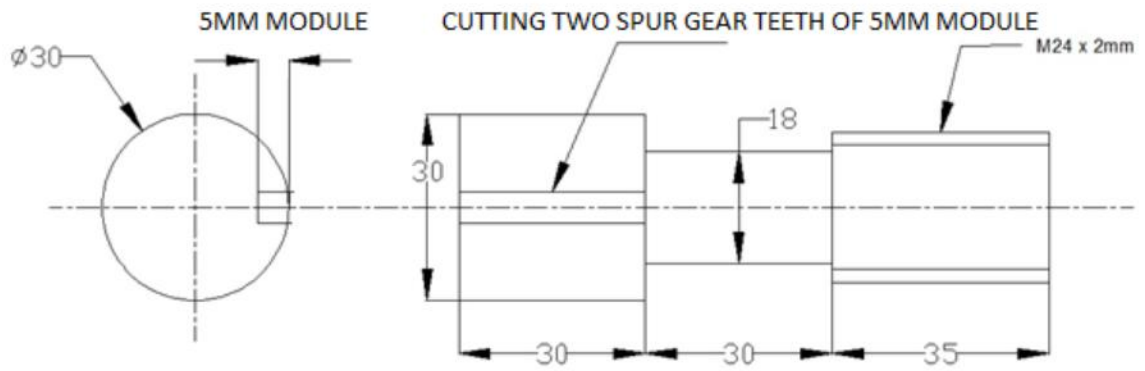TIME: 3 HOURS   MARKS:50

1.Prepare the model as per the given sketch
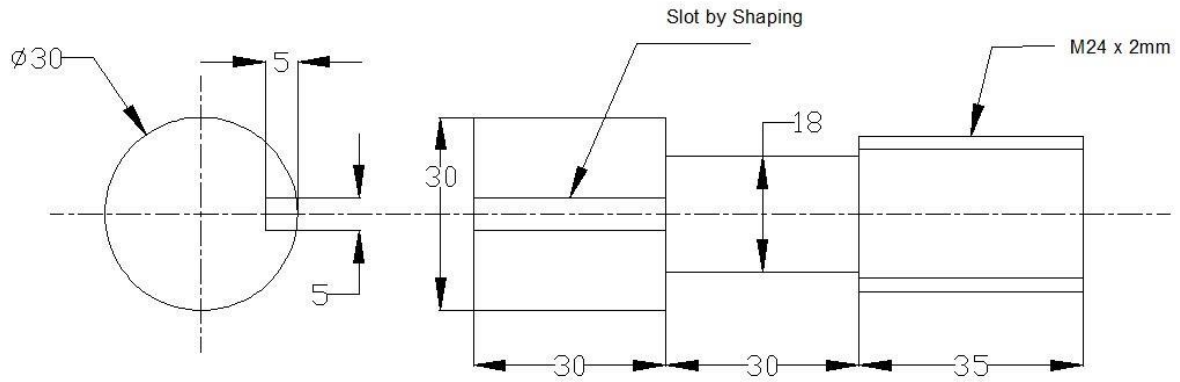
2.Prepare the model as per the given sketch

3.Prepare the model as per the given sketch

5MM MODULE

CUTTING TWO SPUR GEAR TEETH OF 5MM MODULE

M24 x 2mm

Ø30

30

18

30

30

35

	Course Title: **C PROGRAMMING LAB**		
	Scheme (L:T:P) : **0:2:4**	Total Contact Hours: **78**	Course Code:**15ME47P**
	Type of Course: **Tutorial and practice**	Credit :**03**	Core/ Elective: **Core(practice)**
CIE- 25 Marks			SEE- 50 Marks

Prerequisites: Knowledge of computer operation.

Course Objectives:

1. Apply the specification of syntax rules for numerical constants and variables, data types,
2. Usage of Arithmetic operator, Conditional operator, logical operator and relational operators and other C constructs.
3. Write C programs using decision making, branching, looping constructs
4. Apply and Write C programs to implement one dimensional and two dimensional arrays
5. Writing programs using functions

Course Outcome:

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

	Course Outcome	**CL**	**Linked Exercise**	**Linked PO**	**Teaching Hrs**
CO1	Acquire logical thinking, Implement the algorithms and analyze their complexity, Identify the correct and efficient ways of solving problems	U/A	1 to 10	1,2,3,5,10	**69**
CO2	Implement real time applications using the power of C language features.	U/A	11,12,13	1,2,3,4,5,10	**09**
			Total sessions		**78**

Legend: R; Remember, U: Understand A: Application

1. **COURSE-PO ATTAINMENT MATRIX**

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
MACHINE SHOP	3	3	3	1	3	-	-	-	-	3

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.
Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.
If ≥40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3
If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2
If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1
If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

Introduction to C programming- Need for a computer language, types of computer languages, features of C, Character set- Structure of C program., keywords, statements, standard library functions, pre-processor, main function, comments, variables, data types, operators, assignments, strings, format specifies, escape sequences, control structures-sequential, conditional, repetitive/looping, arrays-one & two dimensions, user defined functions

LIST OF GRADED PRACTICAL EXERCISES

The practical/Graded exercises should be properly designed and implemented with an attempt to develop different types of learning out comes in affective domain and psychomotor domain, so that students are able to acquire the necessary skills. Following is the list of experiments to be carried out

Exer cise No.	Practical/Exercise	Apprx. Hrs. Required
C PROGRAMMING		
1	Introduction to C programming (Lecture and demo).And Write C programme to convert the temperature in degree Celsius to degree Fahrenheit.	04+05
2	To find the sum and average of 3 real numbers.	01+02
3	To find the sum of even and odd numbers from 1 to N.	01+02
4	To find the sum of digits of a number.	01+02
5	To reverse the given integer and check whether it is a palindrome or not	02+04
6	To find the roots of a quadratic equation using switch statement.	03+06
7	To arrange N numbers in ascending order using Bubble sort technique	03+06
8	To perform addition of two matrices.	03+06
9	To perform a multiplication of two matrices after checking the compatibility for multiplication.	03+06
10	To find the largest of 3 numbers using functions (functions with arguments and return value)	03+06
11	To find the distance travelled by a vehicle, given it's initial velocity 'u', acceleration 'a' and time 't' [$S = ut + 1/2at^2$]	01+02
12	To find out Clearance volume of an Engine, given its bore diameter, Length of stroke and Compression ratio	01+02
13	To find the power transmitted by shaft by inputting the value speed and torque transmitted	01+02
	TOTAL	**78Hrs**

Note: For the above exercises, first the flowchart should be developed and then the programs should be written and executed.

Concepts in C- Balaguruswamy

SUGGESTED LIST OF STUDENT ACTIVITYS

Note: the following activities or similar activities for assessing CIE (IA) for 10 marks (Any one)

1. Each student should do any one of the following type activity or any other similar activity related to the course and before conduction, get it approved from concerned Teacher and HOD.
2. *Each student should conduct different activity and no repeating should occur*

1	Ask the students to take the simple problems in Hydraulics , develop a C Programme
2	Ask the students to take the simple problems in Strength of Materials , develop a C Programme
3	Ask the students to take the simple problems in Thermal engineering, develop a C Programme

Course Delivery:

The course will be delivered through lectures and presentations

Course Assessment and Evaluation Scheme:

	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct meth **Assessment**	CIE	IA	Students	Student Activities	10	Activities sheet	1,2
				Record – Average marks of graded exercises to be computed	15	Graded exercises	1,2
				End of the course	50	Answer scripts at BTE	1,2
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	1 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2 Effectiveness of Delivery of instructions & Assessment Methods

*CIE – Continuous Internal Evaluation   ***SEE** – Semester End Examination

Note:

1. Rubrics to be devised appropriately by the concerned faculty to assess Student activities.

- ## MODEL OF RUBRICS /CRITERIA FOR ASSESSING STUDENT ACTIVITY

Dimension	Unsatisfactory	Developing	Satisfactory	Good	Exemplary	Student Score
RUBRICS FOR ACTIVITY(5 Marks)						
	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	Ex: 4
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=(4+6+8+8)/4=26/4=6.5=7						

Note: This is only an example. Appropriate rubrics/criteria may be devised by the concerned faculty (Course Coordinator) for assessing the given activity.

Note to IA verifier: ***The following documents to be verified by CIE verifier at the end of semester***
1. Student suggested activities report for 10 marks
2. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods.

Scheme of Valuation for End Examination

Serial no	Description	Marks
1	**Writing Programme**	20
2	**Execution**	20
4	**Viva**	10

	TOTAL		50

1. Latest Configuration Computers -20 no
2. C software
3. LCD Projector

MODEL QUESTION PAPER

IV Semester Diploma in Mechanical Engineering
C-PROGRAMMING LAB

Time: 3 **Hours**   [Max Marks**: 50]**

1. Write C programme for Finding the power transmitted by shaft by inputting the value speed and torque.

Writing Programme	20
Execution	20
Viva	10
TOTAL	50

MODEL QUESTION BANK
IV Semester Diploma in Mechanical Engineering
C-PROGRAMMING LAB

1	Write C programme to convert the temperature in degree Celsius to degree Fahrenheit.
2	To find the sum and average of 3 real numbers.
3	To find the sum of even and odd numbers from 1 to N.
4	To find the sum of digits of a number.
5	To reverse the given integer and check whether it is a palindrome or not
6	To find the roots of a quadratic equation using switch statement.
7	To arrange N numbers in ascending order using Bubble sort technique
8	To perform addition of two matrices.
9	To perform a multiplication of two matrices after checking the compatibility for multiplication.
10	To find the largest of 3 numbers using functions (functions with arguments and return value)
11	To find the distance travelled by a vehicle, given it's initial velocity 'u', acceleration 'a' and time 't' [$S = ut + 1/2at^2$]
12	To find out Clearance volume of an Engine, given its bore diameter, Length of stroke and Compression ratio
13	To find the power transmitted by shaft by inputting the value speed and torque transmitted

4ನೇ ಸೆಮಿಸ್ಟರ್-ಕನ್ನಡ ಕಲಿ-2 (ಕನ್ನಡೇತರರಿಗೆ ಕನ್ನಡ ಪರಿಚಯ)

<table>
<tr>
<td rowspan="3">4th Semester</td>
<td colspan="2">Course:
Kannada Kali-2</td>
<td>Course Code:15KA4NT
(2016-17)</td>
</tr>
<tr>
<td colspan="2">No. of Credits:02</td>
<td>No. of teaching
hours/week:02
No. of teaching
hours/Semester:26</td>
</tr>
<tr>
<td colspan="2">Mode of Assessment and Evaluation:
Semester   End   Examination
(SEE)only. No CIE.</td>
<td>Maximum Marks: 50
(SEE only)
Minimum Passing marks:20</td>
</tr>
</table>

ಉದ್ದೇಶ:

1. ಕೇಳುವುದು, ಗ್ರಹಿಸುವುದು, ನಿರರ್ಗಳವಾಗಿ ಮತ್ತು ಸ್ಪಷ್ಟವಾಗಿ ಓದುವ ಮತ್ತು ಮಾತನಾಡುವ (ಅಭಿವ್ಯಕ್ತಿಸುವ) ಸಾಮರ್ಥ್ಯವನ್ನು ಬೆಳೆಸುವುದು.

2. ಜ್ಞಾನಾರ್ಜನೆ, ಸಾಹಿತ್ಯಾಭಿರುಚಿ, ಚಿಂತನೆ ಮತ್ತು ಆನಂದಕ್ಕಾಗಿ ಸ್ವತಂತ್ರವಾಗಿ ಓದಲು, ಬರೆಯಲು ಮತ್ತು ಮಾತನಾಡಲು ಸಮರ್ಥರಾಗುವಂತೆ ಮಾಡುವುದು.

3. ಪದ ಸಂಪತ್ತನ್ನು ಹೆಚ್ಚಿಸಿಕೊಂಡು ಸ್ಪಷ್ಟ ಉಚ್ಚಾರಣೆಯೊಡನೆ ಲಿಖಿತ ಮತ್ತು ಮೌಖಿಕ ಚಟುವಟಿಕೆಗಳನ್ನು ಮಾಡಿಸಿ, ಸ್ವತಂತ್ರವಾಗಿ ಭಾಷೆಯ ಬಳಕೆ ಮಾಡುವುದು.

4. ನಾಡು-ನುಡಿ, ಸಂಸ್ಕೃತಿ ಮತ್ತು ಸಾಹಿತ್ಯಗಳ ಪರಿಚಯ ಮತ್ತು ಆತ್ಮೀಯ ಭಾವಾಭಿಮಾನವನ್ನು ಬೆಳೆಸುವುದು.

5. ಕ್ರಿಯಾತ್ಮಕ ಚಟುವಟಿಕೆಗಳಿಂದ ಭಾಷಾ ಕೌಶಲ್ಯದ ಸರಳ ಪ್ರಯೋಗ ಮಾಡಿಸುವುದು./ಕಲಿಸುವುದು.
(ಕ್ರಿಯಾತ್ಮಕ ಚಟುವಟಿಕೆ ಎಂದರೆ, ವರ್ಣಮಾಲೆ ಪರಿಚಯ, ವ್ಯಾಕರಣದ ಸರಳ ಪರಿಚಯ, ಗುಣಿತಾಕ್ಷರ, ಸಂಯುಕ್ತಾಕ್ಷರಗಳು, ನಾಮಪದ, ಲಿಂಗ, ವಚನ, ಪ್ರತ್ಯಯಗಳು, ವಾಕ್ಯರಚನೆ (ಕರ್ತೃ, ಕರ್ಮ, ಕ್ರಿಯಾಪದ) ಇತ್ಯಾದಿ).

Course outcome:
1. Developing listening and speaking skills.
2. Easy Interaction with peers.
3. Students can use the language at ease in daily life situations

ಪಠ್ಯಕ್ರಮ ಮತ್ತು ಸರಳ ಭಾಷಾ ಕೌಶಲ್ಯ
(ಕನ್ನಡ ಕಲಿ-ಪಠ್ಯಪುಸ್ತಕ -ಶ್ರೀ ಲಿಂಗದೇವರು ಹಳೇಮನೆ – ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ ಪ್ರಕಾಶನ)

ಭಾಗ-2

ಪಾಠಗಳ ಕ್ರಮಾಂಕ Lesson No	ಪಠ್ಯವಸ್ತುವಿನ ವಿವರ – Curriculum Content	ಸೆಮಿಸ್ಟರ್ ಬೋಧನ ಆವಧಿ Total no.of Classes /Sem
Part-I		
11	Plan to go for a movie. Comparative, non-past tense, instrumental and ablative case	02
12	Conversation between Doctor & Patient. Potential forms, accusative case.	02
13	Enquiring about friend's family	02

14	Past tense –d, and –t- and –id-, negation. Conversation between friends – Past tense –k – T – D and –id-v negation verbal noun	02
15	Routine activities of a Student.	01
16	About children's education. Continuous, Perfect tenses and negations.	02
17	Halebidu - Belur Relative participle, negation and Participle nouns.	02
18	Discussing about Examination and future plan-conditional and negative conditions.	03
19	Karnataka (Lesson for reading)(reading skill)	03
20	bEku bEDagaLu (Lesson for reading (Reading skill)	03
Part-II	Kannada Scripts	03
	ECA-word/sentence formation/letter/small essay writing	01
ಒಟ್ಟು ಗಂಟೆಗಳು		**26**

ಸೂಚನೆಗಳು:

- ಮೇಲಿನ ಪಾಠಗಳ ಪುನರಾವರ್ತಿತ ಭಾಗಗಳಿಗೆ ಬದಲಾಗಿ "ಕ್ರಿಯಾತ್ಮಕ ಚಟುವಟಿಕೆ"ಯಿಂದ ಗಳಿಸುವ ಅಕ್ಷರ ಜ್ಞಾನ ದಿಂದ ಪದ ಸಂಪತ್ತು ಹೆಚ್ಚಿಸಿ, ಪದಗಳಿಂದ ಸ್ವಂತ ವಾಕ್ಯಗಳ ರಚನೆ ಮಾಡಿಸುವುದು. (ಅಮ್ಮ, ಮೊಬೈಲ್, ಕನ್ನಡ ಭಾಷೆ, ಕವಿಗಳು, ನಾಟಕ, ಜನಪದ ಕಲೆ, ನಾಡಿನ ಪ್ರಸಿದ್ಧ ವ್ಯಕ್ತಿಗಳು, ಸಹೋದರ, ಸ್ನೇಹಿತ, ತರಕಾರಿ, ದೋಸೆ, ತಿಂಡಿ, ನಿದ್ದೆ, ಬಿಸಿ, ಚಳಿ, ಆಕಾಶ, ಓದು, ಇತ್ಯಾದಿ ನಿತ್ಯ ಬಳಕೆಯ ಸರಳ ಪದಗಳಿಂದ ವಾಕ್ಯರಚನೆ ಮತ್ತು 25-50 ಪದಗಳ ಕಿರು ಪ್ರಬಂಧ ರೂಪದ ಲೇಖನ ರಚನೆ).

- ಸಂಸ್ಥೆಯ ಪ್ರಾಚಾರ್ಯರಿಗೆ ವಿದ್ಯಾರ್ಥಿಯ ಮನವಿ ಪತ್ರ, ಕುಂದುಕೊರತೆಗಳ ಬಗ್ಗೆ ಸಂಬಂಧಿಸಿದವರಿಗೆ ಪತ್ರ, ಸ್ನೇಹಿತರಿಗೆ ಪತ್ರಗಳು, ಸರಳವಾಗಿ ಯಾವುದೇ ಸಾಮಾನ್ಯ ವಿಷಯಗಳ ಬಗ್ಗೆ ಪತ್ರಲೇಖನ. (6-10 ವಾಕ್ಯಗಳು).

ಆಕರ ಗ್ರಂಥಗಳು:

1. ಕನ್ನಡ ಕಲಿ-ಶ್ರೀ ಲಿಂಗದೇವರು ಹಳೇಮನೆ – ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.
2. ಪ್ರಾಥಮಿಕ ಶಾಲೆಯ ಕನ್ನಡ ಪಠ್ಯಪುಸ್ತಕಗಳು
3. ಸರಳ ಕನ್ನಡ ವ್ಯಾಕರಣ ಪುಸ್ತಕಗಳು– ಎಂ.ವಿ ನಾಗರಾಜರಾವ್/ಇತರೆ ಲೇಖಕರು.
4. ಪ್ರಯೋಗ ಪ್ರಣತಿ–ಪ್ರಥಮ ಪಿಯುಸಿ ಪೂರಕ ಪಠ್ಯ.
5. ಸರಳ ಪತ್ರವ್ಯವಹಾರದ ಪುಸ್ತಕಗಳು

ಡಿಪ್ಲೊಮಾ 4ನೇ ಸೆಮಿಸ್ಟರ್-_ಕನ್ನಡ ಕಲಿ-2 (ಕನ್ನಡೇತರರಿಗೆ ಕನ್ನಡ ಪರಿಚಯ)_

ಸೆಮಿಸ್ಟರ್ ಅಂತಿಮ ಲಿಖಿತ ಪರೀಕ್ಷೆ

ಸಮಯ: 2 ಗಂಟೆಗಳು   ಗರಿಷ್ಠ ಅಂಕಗಳು:50

\---

1. Fill in the blanks using the appropriate words.

2. Rewrite as directed.

3. Combine the following sentences.

4. Translate into Kannada.

5. Answer the following questions.

6. Fill in the blanks using the correct past tense forms of the verbs giving in the bracket.

7. Transform into negative.

8. Substitute and complete the sentence

9. Vocabulary (meanings of words) using formation of sentences (any five).

10. Questions from lessons 17 to 19. (Out of 6 questions, answer any 3 questions).

11. Scripts- consonants form- +vowel (10 types)

12. Conversation & other questions. (KK-Exercises)

ಮಾದರಿ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ:

ಡಿಪ್ಲೋಮಾ 4ನೇ ಸೆಮಿಸ್ಟರ್–*ಕನ್ನಡ ಕಲಿ–2 (ಕನ್ನಡೇತರರಿಗೆ ಕನ್ನಡ ಪರಿಚಯ)*

ಸೆಮಿಸ್ಟರ್ ಅಂತಿಮ ಲಿಖಿತ ಪರೀಕ್ಷೆ

ಸಮಯ: 2 ಗಂಟೆಗಳು   ಗರಿಷ್ಠ ಅಂಕಗಳು:50

I.   (a) Fill in the blank using the correct past tense forms of the verbs given in the
        bracket.   3+2 =05
        1.ಅವರು ನಿನ್ನೆ ಊರಿನಿಂದ ....   (ಬಾ)
        2. ಅವಳು ಒಂದು ಹೆಣ್ಣ ಮಗು ....   (ಹೆರು)
        3.ನಾನು ನಿನಗಾಗಿ ತುಂಬಾ ಹೊತ್ತು...............   (ಕಾಯು)

        (b) Fill in the blank using the correct verbal participle forms of the verbs given in
        the bracket.
        1.ಆ ಹುಡುಗಿ ಮನೆ .... ಹೋದಳು. (ಬಿಡು)
        2. ಅವನು ಇವತ್ತ ಊರಿನಿಂದ.............ನಾಳೆ ಬರುತ್ತಾನೆ. (ಹೊರಡು)

II. Give the negative forms of the following sentence.   (Any Five)   1X5=05

    ಅ) ನೀವು ಪುಸ್ತಕ ಕೊಡಿ.

    ಆ) ನೀವು ಸಿಗರೇಟ್ ಸೇದಬಹುದು.

    ಇ) ಅವರು ನನಗೆ ಚೆನ್ನಾಗಿ ಗೊತ್ತು.

    ಈ) ಅವರು ಕನ್ನಡ ಚೆನ್ನಾಗಿ ಕಲಿತರು.

    ಉ) ಅವಳು ತಲೆ ಬಾಚಿಕೊಂಡು ಬಂದಳು.

    ಊ) ಅವನಿಗೆ ಫೋನ್ ಬಂದಿದೆ.

    ಎ) ರವಿ ಮನೆಯಲ್ಲಿ ಮಲಗಿತಾನೆ.

III. Translate into KANNADA. (Any Five)   2X5=10

    1) Who will come with you?
    2) Today Ms. Kamala will go to her native place.
    3) You must drink butter milk daily.
    4) Please, don't talk to me.

5) How much advance money did you pay for the hostel?
6) How many of you are learning Kannada seriously?
7) If I get good marks in diploma, I will get admission for BE program.
8) At what time today you will be available in the hostel?.

IV. Vocabulary.

(a) Write English equivalents of the Kannada words. (Any five)   1X5=05

1. ಆಗಸ 2. ಶೈಲಿ 3. ಅನುಮಾನ 4.ಪರೀಕ್ಷೆ   5.ಜಾತಿ   6.ನೈಸರ್ಗಿಕ 7.ಮತ 8. ವಾಣಿಜ್ಯ

(b) Write Kannada equivalents of the English words.   (Any five)   1X5=05

1. Wealth 2. Religion 3. Memory 4.fear 5.Environment 6. Primary 7. Mistakes 8. Tall

VI. Conversation:

ಈ ಕೆಳಗಿನ ಅಪೂರ್ಣ ಸಂಭಾಷಣೆಯನ್ನು ಆವರಣದಲ್ಲಿ (bracket) ನೀಡಿರುವ ಪದಗಳನ್ನು ಅರ್ಥಮಾಡಿಕೊಂಡು ಪೂರ್ತಿ ಮಾಡಿ.   –05

ರಾಜು: ನಿನಗೆ ನಿನ್ನೆ ಮೋಹನ್ ಸಿಕ್ಕನಾ?
ರಾಮು: .... negative)   ನಿನಗೆ ಸಿಕ್ಕನಾ?
ರಾಜು ....   (Positive) ಹೌದು, ನಿಮ್ಮನ್ನು ನೋಡುವುದಕ್ಕೆ ಹೋಗುತ್ತೀನಿ ಅಂತ ಹೇಳಿದ.
ರಾಮು: ....   (Enquiring about meeting him)
ರಾಜು:   ಅವನು ಕೆಲಸ ಬಿಟ್ಟನಂತೆ.
ರಾಮು: .... (Questioning)
ರಾಜು: ....(Answer).

VII.Transform the following sentences as per direction. (Any Five)   1X5=05

1. ಮಕ್ಕಳು ರಸ್ತೆಯಲ್ಲಿ ಆಟ ಅಡ್ತಾ   (into present continuous)   ಇದ್ದವು.
2. ಹುಡುಗರು ತರಗತಿಯಲ್ಲಿ ಸುಮ್ಮನೆ (into present continuous) ನಗ್ತಾ ಇದ್ದರು.
3. ಆ ಹೆಂಗಸರು ಜಗಳ ಆಡ್ತಾ ಇದ್ದಾರೆ. (into past continuous)
4. ತರಕಾರಿ ಕಡಿಮೆ ಬೆಲೆಗೆ ಸಿಗ್ತಾ ಇದೆ. (into past continuous)
5. ಅವನು ದಿನಾ ಇಲ್ಲಿಗೆ ಬರ್ತಾನೆ.   (into habitual)
6. ಇಲ್ಲಿ ಬಸ್ಸುಗಳು ತುಂಬಾ ಓಡಾಡ್ತ (into habitual) ಇವೆ.
7. ಆಂಧ್ರಪ್ರದೇಶದಿಂದ ಬಂದಿದ್ದ ವಿದ್ಯಾರ್ಥಿಗಳು ಎಲ್ಲಿದ್ದಾರೆ?(into present perfect)

VIII.Write the Kannada alphabet in the traditional order.   05

OR

ಹಳೇಬೀಡು ಬೇಲೂರಿನಿಂದ ಎಷ್ಟು ದೂರದಲ್ಲಿದೆ ಮತ್ತು ಯಾವ ಜಿಲ್ಲೆಯಲ್ಲಿದೆ? ಇಲ್ಲಿನ ದೇವಸ್ಥಾನಗಳ ಹೆಸರುಗಳು ಏನು ಮತ್ತು ಅವುಗಳನ್ನು ಕಟ್ಟಿಸಿದವರು ಯಾರು?

IX. Combine the following: (Any One)   1X1=01

(A) 1) ಮನೆ + ಇಂದ =
  2) ಮ್ + ಔ   =

(B) Combine the following sentence using verbal participle form. (Any One)   1X1=01

ಅ) ಹುಡುಗರು ದುಡ್ಡು ಕೊಟ್ಟರು.
  ಹುಡುಗರು ಸರ್ಕಸ್ ನೋಡಿದರು.
ಆ) ನಾನು ಕೆಲಸ ಮಾಡ್ತಾ ಇದ್ದೆ.
  ನಾನು ಎಂ.ಎ. ಓದಿದೆ.

(B) Frame meaningful small sentences with using words given given below:(Any Three) -1X3=03.
ಅ) ಮರ   ಆ) ಫಲ   ಇ) ಊರು   ಈ) ಪೇಪರ್   ಉ) ಇವರು   ಊ) ಮನೆ ಎ) ಶಾಲೆ

ಕನ್ನಡ ಪಠ್ಯಕ್ರಮ ರಚನಾ ಸಮಿತಿ

- **ಸಂಪಾದಕೀಯ ಸಮಿತಿ:**

1. ಶ್ರೀ ಟಿ ಎಲ್ ರವೀಂದ್ರ, ಉಪನ್ಯಾಸಕರು, ಸರ್ಕಾರಿ ಜಿ.ಆರ್.ಐ.ಸಿ.ಪಿ ಬೆಂಗಳೂರು.
2. ಶ್ರೀ ಟಿ. ತಿಮ್ಮಪ್ಪ, ಉಪನ್ಯಾಸಕರು(ಆಯ್ಕೆ ಶ್ರೇಣಿ), ಯಾಂತ್ರಿಕ ವಿಭಾಗ, ಸರ್ಕಾರಿ ಪಾಲಿಟೆಕ್ನಿಕ್, ತುಮಕೂರು.

- **ಸಲಹಾ ಸಮಿತಿಯ ಬಾಹ್ಯ ಸಂಪನ್ಮೂಲ ವ್ಯಕ್ತಿಗಳು.**

1. ಪ್ರೊ. (ಡಾ.) ಡಿ. ಪಾಂಡುರಂಗ ಬಾಬು, ಕುಲಸಚಿವರು, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.
2. ಪ್ರೊ. (ಡಾ.) ಅಶೋಕ್ ಕುಮಾರ್ ರಂಜರೆ, ಪ್ರಾಧ್ಯಾಪಕರು, ಪ್ರಸಾರಾಂಗ ವಿಭಾಗ, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.
3. ಪ್ರೊ. (ಡಾ.) ಕೆ ವೈ ನಾರಾಯಣ ಸ್ವಾಮಿ, ಸಹ ಪ್ರಾಧ್ಯಾಪಕರು, ಸ್ನಾತಕೋತ್ತರ ವಿಭಾಗ, ಸರ್ಕಾರಿ ಕಲಾ ಕಾಲೇಜು, ಬೆಂಗಳೂರು.
4. ಪ್ರೊ. (ಡಾ.) ಜೆ ಬಾಲಕೃಷ್ಣ, ಪ್ರಾಧ್ಯಾಪಕರು ಹಾಗು ಮುಖ್ಯಸ್ಥರು, ಕನ್ನಡ ಭಾಷಾ ಅಧ್ಯಯನ ವಿಭಾಗ, ಕೃಷಿ ವಿಶ್ವವಿದ್ಯಾಲಯ, (ಜಿಕೆವಿಕೆ) ಹೆಬ್ಬಾಳ, ಬೆಂಗಳೂರು.

		KARNATAKA STATE BOARD OF TECHNICAL EXAMINATION, BENGALURU.											
		TEACHING AND EXAMINATION SCHEME FOR KANNADA COURSE IN DIPLOMA PROGRAME											
SEMESTER: III			COMMON TO ALL DIPLOMA PROGRAMMES									C-15 Curriculum	
SL.N0	COURSE NAME	Teaching Department	COURSE /QP CODE	Teaching scheme					Examination scheme					
				Contact hours									
				TH	TU	PR	TOTAL	Credit	Exam paper duration in Hrs	End exam		Maximum CIE Marks (IA+SA)	Minimum Marks for passing. (IA + SA)
										Max marks	Min marks		
	THEORY												
1	KANNADA KALI-1	KA	15KA3NT	2	-	-	2	2	-	-	-	-	50	20
2	TANTRIKA KANNADA -1	KA	15KA3KT	2	-	-	2	2	-	-	-	-	50	20

CIE- Continuous Internal Examination: SEE-Semester End Examination: IA-Internal Assessment Tests: SA- Student Activity.

Note: 1. Candidates studied Kannada as one subject in 10th standard shall take Tantrika Kannada 1 &2. Others may take "Kannada Kali-1&2".

   2. In 3rd Semester- Assessment is only by CIE and no SEE. Average marks of three I A tests shall be rounded off to the next higher digit. Rubrics to be devised appropriately to assess student activity.

		KARNATAKA STATE BOARD OF TECHNICAL EXAMINATION, BENGALURU.											
		TEACHING AND EXAMINATION SCHEME FOR KANNADA COURSE IN DIPLOMA PROGRAME											
SEMESTER: IV			COMMON TO ALL DIPLOMA PROGRAMMES									C-15 Curriculum	
SL.N0	COURSE NAME	Teaching Department	COURSE /QP CODE	Teaching scheme					Examination scheme					
				Contact hours									
				TH	TU	PR	TOTAL	Credit	Exam paper duration in Hrs	Sem End Exam		Maximum CIE Marks (IA+SA)	Minimum Marks for passing. (IA + SA)
										Max Exam Marks	Min Passing Marks		
	THEORY												
1	KANNADA KALI-2	KA	15KA4NT	2	-	-	2	2	2	50	20	-	-
2	TANTRIKA KANNADA -2	KA	15KA4KT	2	-	-	2	2	2	50	20	-	-

CIE- Continuous Internal Examination: SEE-Semester End Examination: IA-Internal Assessment Tests: SA- Student Activity.

Note: In 4th Semester- Assessment is only by SEE and no CIE. To award diploma certificate, passing in Kannada course is mandatory. However Kannada course is not included in the eligibility criteria for promotion to the higher semester.

ಡಿಪ್ಲೋಮಾ–ತಾಂತ್ರಿಕ ಕನ್ನಡ–2 (ಕನ್ನಡ ಬಲ್ಲವರಿಗಾಗಿ)

4ನೇ ಸೆಮಿಸ್ಟರ್ – ತಾಂತ್ರಿಕ ಕನ್ನಡ –2 (ಸಾಹಿತ್ಯ ಮತ್ತು ಭಾಷಾ ಕೌಶಲ್ಯ ಪ್ರಯೋಗ) ಪಠ್ಯಕ್ರಮ

4th Semester	Course: ತಾಂತ್ರಿಕ ಕನ್ನಡ –2	Course Code:15KA4KT (2016-17)
	No. of Credits:02	No. of teaching hours/week:02 No. of teaching hours/Semester:26
	Mode of Assessment and Evaluation: Semester End Examination (SEE)only. No CIE.	Maximum Marks: 50 (SEE only) Minimum Passing marks:20

ಪಠ್ಯ ಪ್ರಕಾರ	ಪಾಠ	ಪಠ್ಯದ ಹೆಸರು/ಲೇಖಕರು/ಪ್ರಕಟಣೆ	ಸೆಮಿಸ್ಟರ್ ಬೋಧನಾವಧಿ ಗಂಟೆಗಳು
ಕಾವ್ಯ ಮಂಜರಿ–(ಬದುಕು ಮತ್ತು ಮಾನವತೆ)	1	(ಕಾವ್ಯ ಗುಚ್ಛಗಳು) (1) ನನ್ನ ಹಣತೆ–ಡಾ:ಜಿ.ಎಸ್.ಎಸ್. (2) ಮಂಕು ತಿಮ್ಮನ ಕಗ್ಗ–ಡಿ.ವಿ.ಜಿ	02
ಸಂಸ್ಕೃತಿ	2	ಅಲೆಕ್ಸಾಂಡರ್ನ ಗುರುದಕ್ಷಿಣೆ–ಮಾಸ್ತಿ ವೆಂಕಟೇಶ ಅಯ್ಯಂಗಾರ್	02
ಪರಿಸರ/ಸಾಹಸ	3	ವ್ಯೆನಾಡಿನ ನರಭಕ್ಷಕರು – ಪೂರ್ಣಚಂದ್ರ ತೇಜಸ್ವಿ	02
ಕ್ರೀಡೆ/ಕಲೆ	4	ಜಿ.ಆರ್.ವಿಶ್ವನಾಥ್–ಡಾ: ಕ.ಪುಟ್ಟಸ್ವಾಮಿ	02
ತಂತ್ರಜ್ಞಾನ	5	ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ–ಒಂದು ಸ್ಥೂಲ ನೋಟ–ಜಿ.ಎನ್.ನರಸಿಂಹಮೂರ್ತಿ	02
ಯಶೋಗಾಥೆ/ವ್ಯಕ್ತಿಚಿತ್ರಣ	6	ಡಾ:ವಿಶ್ವೇಶ್ವರಯ್ಯ–ವ್ಯಕ್ತಿ ಮತ್ತು ಇತಿಹ್ಯ – ಎ.ಎನ್.ಮೂರ್ತಿರಾವ್	02
ಭಾಷಾ ಕೌಶಲ್ಯ– ಚಟುವಟಿಕೆಗಳು	7	<u>ಲಿಖಿತ ಅಭಿವ್ಯಕ್ತಿ:</u> ಪತ್ರಗಳ ರಚನೆ–ವ್ಯಾಪ್ತಿ: ಪತ್ರದ ಭಾಷೆ, ಶೈಲಿ, ನಮೂನೆಗಳು (1) ವ್ಯೆಯಕ್ತಿಕ ಪತ್ರ (ಪ್ರವಾಸ/ಕೋರಿಕೆ.(ಮನವಿ/ಆತ್ಮಿಯರಿಗೆ ಬರೆಯುವ ಪತ್ರಗಳು)..) (2) <u>ಪತ್ರ ವ್ಯವಹಾರ</u> (ವಾಣಿಜ್ಯ ಸಂಸ್ಥೆಗಳಿಗೆ ಬರೆಯುವ/ಪ್ರತ್ಯುತ್ತರ ಪಡೆಯುವ, ಬ್ಯಾಂಕ್ಗಳಿಗೆ/ಸರ್ಕಾರಿ ಕಚೇರಿಗಳಿಗೆ ಬರೆಯುವ ಪತ್ರಗಳು....)–ಮಾದರಿಗಳು (3) ಅಭ್ಯರ್ಥನ ಪತ್ರ (ಹುದ್ದೆಗೆ ಅರ್ಜಿ) –1-2 ನಮೂನೆಗಳು–4-5 ಪ್ರಶ್ನೆಗಳು (4) ಓದುಗರ ವಿಭಾಗಕ್ಕೆ ಪತ್ರಿಕಾ ಸಂಪಾದಕರಿಗೆ ಬರೆಯುವ ಪತ್ರಗಳು 1 ನಮೂನೆ–3-4 ವಿಷಯಗಳ ಮೇಲೆ ಪತ್ರ ಬರೆಸುವುದು.	06
	8	<u>ಸಂಕ್ಷಿಪ್ತ ಲೇಖನ</u> (ಸಾರಾಂಶ ಲೇಖನ)	02
	9	<u>ಮೌಖಿಕ ಅಭಿವ್ಯಕ್ತಿ></u> ಚರ್ಚಾ ಸ್ಪರ್ಧೆ/ಕೂಟ–ಭಾಷಣ–ಆಶುಭಾಷಣ –ಕಾರ್ಯಕ್ರಮ ನಿರೂಪಣೆ ಮಾಡುವುದು.	06
		ಒಟ್ಟು ಅವಧಿ	26 ಗಂಟೆಗಳು

<p style="text-align:center">ಡಿಪ್ಲೋಮಾ 4ನೇ ಸೆಮಿಸ್ಟರ್ (ಕನ್ನಡಬಲ್ಲ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ)</p>

<p style="text-align:center">ತಾಂತ್ರಿಕ ಕನ್ನಡ–2</p>

<p style="text-align:center">ಪರಿವಿಡಿ</p>

ಭಾಗ–1

ಕಾವ್ಯ ಗುಚ್ಛ

1. ನನ್ನ ಹಣತೆ–ಡಾ:ಜಿ.ಎಸ್.ಶಿವರುದ್ರಪ್ಪ
2. ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗ–ಡಿವಿಜಿ

ಗದ್ಯ ಸಾಹಿತ್ಯ

3. ಅಲೆಕ್ಸಾಂಡರನ ಗುರುದಕ್ಷಿಣೆ (ಸಂಸ್ಕೃತಿ–ಕತೆ)–ಶ್ರೀನಿವಾಸ (ಮಾಸ್ತಿ)
4. ವೈನಾಡಿನ ನರಭಕ್ಷಕರು (ಪರಿಸರ–ಸಾಹಸ)–ಕೆ.ಪಿ.ಪೂ.ತೇಜಸ್ವಿ
5. ಲಿಟ್ಲಲ್ ಮಾಸ್ಟರ್ (ಕ್ರೀಡೆ/ಕಲೆ)–ಡಾ.ಕೆ.ಪುಟ್ಟಸ್ವಾಮಿ
6. ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ–ಜಿ.ಎನ್.ನರಸಿಂಹಮೂರ್ತಿ
7. ಡಾ:ವಿಶ್ವೇಶ್ವರಯ್ಯ–ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ–ಎ.ಎನ್.ಮೂರ್ತಿರಾವ್

ಭಾಗ–2 –ಭಾಷಾ ಕೌಶಲ್ಯ ಚಟುವಟಿಕೆಗಳು

(1)ಬರಹ ರೂಪದ ಸಂವಹನ ಕನ್ನಡ–ಅಭಿವ್ಯಕ್ತಿಯ ಸ್ವರೂಪ

ಔಪಚಾರಿಕ ಮತ್ತು ಅನೌಪಚಾರಿಕ ಪತ್ರಗಳು

(ಅ) ಪತ್ರವ್ಯವಹಾರ–ವ್ಯಾಖ್ಯೆ–ವಿವರಣೆ

(ಆ) ಪತ್ರಗಳ ಮಾದರಿಗಳು

1. ವಾಣಿಜ್ಯ ಪತ್ರಗಳು–ವ್ಯಾಖ್ಯೆ, ಕೆಲವು ವಿಧಗಗಳು

2. ಖಾಸಗಿ/ವೈಯಕ್ತಿಕ ಪತ್ರಗಳು

3. ಪತ್ರಿಕೆಗಳಿಗೆ ಬರೆಯುವ (ಓದುಗರ)ಪತ್ರಗಳು

4. ಅಭ್ಯರ್ಥನ ಪತ್ರಗಳು

(2) ಸಾರಾಂಶ ಲೇಖನ: ವ್ಯಾಖ್ಯೆ, ಉದ್ದೇಶ, ವಿಧಾನಗಳು.

3 . ಮೌಖಿಕ ಅಭಿವ್ಯಕ್ತಿ ಚಟುವಟಿಕೆಗಳು(ತರಗತಿ ಚಟುವಟಿಕೆಗಳು)

1. ವಿಷಯಾತ್ಮಕ ಭಾಷಣಗಳು

2. ಆಶುಭಾಷಣ (ರಚನಾತ್ಮಕ ವಿಷಯಗಳು)

3. ಚರ್ಚೆ (ವಿಚಾರ ವಿನಿಮಯ/ಪರ–ವಿರುದ್ಧ ವಾದ ಮಂಡನೆ)

4. ನಿರೂಪಣೆ

Course outcome:
 1. Developing listening and speaking skills.
 2. Easy Interaction with peers.
 3. Students can use the language at ease in daily life situations

ಡಿಪ್ಲೋಮಾ ನಾಲ್ಕನೇ ಸೆಮಿಸ್ಟರ್ (ಕನ್ನಡ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ)

ತಾಂತ್ರಿಕ ಕನ್ನಡ–2

ಸಮಯ: **2.00** ಗಂಟೆ   ಅಂಕಗಳು: 50

I. ಕೆಳಗಿನ ಯಾವುದೇ **ಐದು** ಪ್ರಶ್ನೆಗಳಿಗೆ 1–2 **ಪೂರ್ಣ** ವಾಕ್ಯಗಳಲ್ಲಿ ಉತ್ತರಿಸಿ.   1X5=05

  (1) ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನದ ಮಾಹಿತಿಯನ್ನು ನಷ್ಟಗೊಳಿಸುವ ಅನಿಷ್ಟ ಯಾವುದು?
  (2) ದಿವಾನ್ ಪದವಿ ಬಂದಾಗ ಸರ್.ಎಂ.ವಿಶ್ವೇಶ್ವರಯ್ಯನವರು ತಮ್ಮ ತಾಯಿಗೆ ಹೇಳಿದ ಮಾತೇನು?
  (3) ಅರಿಸ್ಟಾಟಲ್ ಯಾರು ಮತ್ತು ಅವರು ಅಲೆಕ್ಸಾಂಡರನಿಗೆ ಏನಾಗಬೇಕು?
  (4) ಸುತ್ತೋಲೆ ಅಥವ ಪರಿಪತ್ರ ಎಂದರೇನು?
  (5) ಫಿನಿಕ್ಸ್ ಎಂದರೇನು?
  (6) 'ಖಡ್ಗ' ಎಂದರೇನು?
  (7) ನಿರೂಪಕರೆಂದರೆ ಯಾರು?

II. ಕೆಳಗಿನ ಯಾವುದೇ **ಮೂರು** ಪ್ರಶ್ನೆಗಳಿಗೆ ಸಂಕ್ಷಿಪ್ತವಾಗಿ ಉತ್ತರಿಸಿ.   5X3=15

  (1) ಕವಿ "ಹಣತೆ ಹಚ್ಚುತ್ತೇನೆ ನಾನು' ಎಂದು ಏಕೆ ಹೇಳುತ್ತಾರೆ?
  (2) ಕ್ಲಿಯಾಂತಸನ ಸಾವು
  (3) ಕಾಕನಕೋಟೆ ಕಾಡು ಹೇಗಿದೆ?
  (4) ಅಂತರಜಾಲದ ಉಪಯೋಗಗಳು.
  (5) ಅನೌಪಚಾರಿಕ ಅಭಿವ್ಯಕ್ತಿ ಎಂದರೇನು ತಿಳಿಸಿ.
  (6) ಚರ್ಚಿ – ವ್ಯಾಖ್ಯೆ ಮತ್ತು ಉಪಯೋಗದ ಬಗ್ಗೆ ಬರೆಯಿರಿ.

III .ಈ ಕೆಳಗಿನ ಯಾವುದೇ **ಮೂರು** ಪ್ರಶ್ನೆಗಳಿಗೆ ವಿವರಣಾತ್ಮಕ ಉತ್ತರ ಬರೆಯಿರಿ.   10X3=30
(ಅ) ಹುಲ್ಲಾಗು ಬೆಟ್ಟದಡಿ…… ಕಗ್ಗದಲ್ಲಿ ಮನುಷ್ಯ ಏನಾಗಬೇಕೆಂದು ಮತ್ತು ಸಂಗೀತ ಕಲೆಯೊಂದು ಸಾಹಿತ್ಯ ಕಲೆಯೊಂದು…." ಕಗ್ಗದಲ್ಲಿ ಕವಿ ಇವೆಲ್ಲ ಮನುಷ್ಯನಿಗೆ ಏಕೆ ಬೇಕೆಂದು ಹೇಳುತ್ತಾರೆ?
(ಆ) ಅಣ್ಣನನ್ನು ಕಾಪಾಡಲು ಯೋಗ ಮಾಡಿದ ಸಾಹಸವನ್ನು ವಿವರಿಸಿ.
         (ಅಥವ)
        ಅತಿಯಾದ ನಗರೀಕರಣಕ್ಕಾಗಿ ಕಾಡುಗಳ ನಾಶದಿಂದ ಪರಿಸರದ ಮೇಲಾಗುವ ಪರಿಣಾಮಗಳ ಬಗ್ಗೆ ಬರೆಯಿರಿ.
 (ಇ) ನೀವು ಕಾಲೇಜಿನಿಂದ ಹೋಗಿಬಂದ ಪ್ರವಾಸದ ಅನುಭವ ಕುರಿತು ನಿಮ್ಮ ಗೆಳೆಯರಿಗೆ ಪತ್ರ ಬರೆಯಿರಿ.
(ಈ) ಕೆಳಗಿನ ವಿಷಯವನ್ನು ಒಂದು ಸೂಕ್ತ ಶೀರ್ಷಿಕೆ ಸಹಿತ 30 ಪದಗಳ ಮಿತಿಯಲ್ಲಿ **ಸಂಕ್ಷೇಪಗೊಳಿ**ಸಿ.

        ನೀಲಾಂಬರ ದ್ವೀಪ. ಇದೊಂದು ಸುಂದರ ದ್ವೀಪ. ಪ್ರವಾಸಿಗಳಿಗೆ ಸ್ವರ್ಗಸಮಾನ ದ್ವೀಪ. ಈ ದ್ವೀಪ ಹಿಂದೂ ಮಹಾಸಾಗರದ ದಕ್ಷಿಣಕ್ಕಿರುವ ಆರು ದ್ವೀಪ ಸಮೂಹದಲ್ಲಿ ಮಧ್ಯದಲ್ಲಿ ಹುಣ್ಣಿಮೆ ಚಂದ್ರನಂತೆ ಕಂಗೊಳಿಸುತ್ತಿರುವ ದೊಡ್ಡ ದ್ವೀಪ. ಈ ದ್ವೀಪ ಒಂದು ಭಾಗದಲ್ಲಿ ಹಸಿರು ಚಾದರ ಹಾಸಿದಂತೆ ಸಮತಟ್ಟಾದ ಹುಲ್ಲುಗಾವಲು. ಇನ್ನೊಂದು' ಪಕ್ಕ ಬಗೆಬಗೆಯ ಹಣ್ಣುಗಳ ಮತ್ತು ಹೂವುಗಳ ಗಿಡಗಳು ಮತ್ತು ಅಡಿಕೆ, ಮಾವು, ಮೆಣಸು, ಏಲಕ್ಕಿ, ಲವಂಗದಂತಹ ಗಿಡ–ಮರಗಳಿಂದ ಕೂಡಿದೆ.ಈ ದ್ವೀಪದ ಮಧ್ಯೆ ಕಿರೀಟದಂತೆ ನಮ್ಮ ಉದಕಮಂಡಲದಂತಿರುವ ಹಸಿರಿನ ಬೆಟ್ಟ, ನಿಸರ್ಗದತ್ತ ಹೂವುಗಳ ಗಿಡಗಳಿಂದ ಪುಷ್ಪೋದ್ಯಾನದಂತಿದೆ. ಪ್ರಕೃತಿಯೇ ನಿರ್ಮಿಸಿರುವ ತಿಳಿನೀರಿನ ಸುಂದರ ಕೊಳ ಈ ಬೆಟ್ಟದ

ಆಕರ್ಷಣೆಯಾಗಿದೆ. ಹೀಗಾಗಿ ಈ ದ್ವೀಪ ಪ್ರವಾಸಿಗರಿಗೆ ಅಪಾರ ಆಕರ್ಷಕ ತಾಣವಾಗಿದೆ. ಇಲ್ಲಿನ ಜನ ಸಹ ಸೌಜನ್ಯಶೀಲರು. ಸೃಷ್ಟಿಯ ಶೃಂಗಾರವನ್ನೆಲ್ಲ ಒಳಗೊಂಡ ಈ ದ್ವೀಪದ ಮುಖ್ಯ ಕಸುಬು ಕೃಷಿ, ತೋಟಗಾರಿಕೆ ಮತ್ತು ಪ್ರವಾಸೋದ್ಯವಾಗಿರುವುದರಿಂದ, ಇದೊಂದು ಶ್ರೀಮಂತ ದ್ವೀಪವಾಗಿದೆ.

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ಕನ್ನಡ ಪಠ್ಯಕ್ರಮ ರಚನಾ ಹಾಗು ಪಠ್ಯಪುಸ್ತಕ ಸಮಿತಿ

- **ಸಂಪಾದಕೀಯ ಸಮಿತಿ:**

1. ಶ್ರೀ ಟಿ ಎಲ್ ರವೀಂದ್ರ, ಉಪನ್ಯಾಸಕರು, ಸರ್ಕಾರಿ ಜಿ.ಆರ್.ಐ.ಸಿ.ಪಿ ಬೆಂಗಳೂರು.
2. ಶ್ರೀ ಟಿ. ತಿಮ್ಮಪ್ಪ, ಉಪನ್ಯಾಸಕರು(ಆಯ್ಕೆ ಶ್ರೇಣಿ), ಯಾಂತ್ರಿಕ ವಿಭಾಗ, ಸರ್ಕಾರಿ ಪಾಲಿಟೆಕ್ನಿಕ್, ತುಮಕೂರು.

- **ಸಲಹಾ ಸಮಿತಿಯ ಬಾಹ್ಯ ಸಂಪನ್ಮೂಲ ವ್ಯಕ್ತಿಗಳು.**

1. ಪ್ರೊ. (ಡಾ.) ಡಿ. ಪಾಂಡುರಂಗ ಬಾಬು, ಕುಲಸಚಿವರು, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.
2. ಪ್ರೊ. (ಡಾ.) ಅಶೋಕ್ ಕುಮಾರ್ ರಂಜರೆ, ಪ್ರಾಧ್ಯಾಪಕರು, ಪ್ರಸಾರಾಂಗ ವಿಭಾಗ, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ.
3. ಪ್ರೊ. (ಡಾ.) ಕೆ ವೈ ನಾರಾಯಣ ಸ್ವಾಮಿ, ಸಹ ಪ್ರಾಧ್ಯಾಪಕರು, ಸ್ನಾತಕೋತ್ತರ ವಿಭಾಗ, ಸರ್ಕಾರಿ ಕಲಾ ಕಾಲೇಜು, ಬೆಂಗಳೂರು.
4. ಪ್ರೊ. (ಡಾ.) ಜಿ ಬಾಲಕೃಷ್ಣ, ಪ್ರಾಧ್ಯಾಪಕರು ಹಾಗು ಮುಖ್ಯಸ್ಥರು, ಕನ್ನಡ ಭಾಷಾ ಅಧ್ಯಯನ ವಿಭಾಗ, ಕೃಷಿ ವಿಶ್ವವಿದ್ಯಾಲಯ, (ಜಿಕೆವಿಕೆ) ಹೆಬ್ಬಾಳ, ಬೆಂಗಳೂರು.