KS INSTITUTE OF TECHNOLOGY BANGALORE

DEPARTMENT OF MECHANICAL ENGINEERING

Date: 05-09-2020

COURSE PLAN

Academic Year	**2020-2021**
Batch	**2018-2022**
Year/Semester/section	**II/III**
Course Component	**Core**
Subject Code-Title	**18ME33-BASIC THERMODYNAMICS**
No. of Students	**47**
Schedule	**L** 4 **T** - **P** -
Name of the Instructor	**Mr. PARASHURAM A K** Dept Mech

Prerequisite Courses	• Basic knowledge in thermodynamics	
Course Objectives	The course objective is to make students of mechanical engineering to learn the basics of automobile engineering and its application.	
Course Outcomes (Min 4 Max 6. Out of which one for content beyond syllabus)	CO1,CO3	Explain fundamentals of thermodynamics and evaluate energy interactions across the boundary of thermodynamic systems
	CO1	Evaluate the feasibility of cyclic and non-cyclic processes using 2nd law of thermodynamics.
	CO3	Apply the knowledge of entropy, reversibility and irreversibility to solve numerical problems and apply 1 st law of thermodynamics to closed and open systems and determine quantity of energy transfers and change in properties
	CO4	Interpret the behavior of pure substances and its application in practical problems
	CO5	Recognize differences between ideal and real gases and evaluate thermodynamic properties of ideal and real gas mixtures using various relations.
Assessment pattern	• Internal Assessment1, Internal Assessment2 & Internal Assessment3 for 60 marks • Model examination for 100 marks • Assignment for 20 marks Portions Covered: • Internal Test1- Module 1 & First Half of Module2. • Internal Test2- Second Half of Module2 & 3rd Module. • Internal Test3- 4th Module and First Half of 5th	

	Module. Model examination- All 5 Modules.

Sl.No	Topic to be covered	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date	Execution date
1	**Module-1** Fundamental Concepts& Definitions: Thermodynamic definition and scope,	L	LCD	1	1	1 /9/ 2020	8/9/2020
2	Microscopic and Macroscopic approaches. Some practical applications of engineering thermodynamic Systems,	L	LCD	1	2	3/9/2020	10/9/2020
3	Characteristics of system boundary and control surface, examples. ,	L	LCD	1	3	4/9/2020	24/9/2020
4	Thermodynamic properties; definition and units, intensive, extensive properties,	L	LCD	1	4	5/9/2020	25/9/2020
5	specific properties, pressure, specific volume, Thermodynamic state, state point, state diagram, path and process,	L	LCD	1	5	8/9/2020	25/9/2020
6	quasi-static process, cyclic and non-cyclic; processes;	L	LCD	1	6	10/9/2020	27/9/2020
7	Thermodynamic equilibrium; definition, mechanical equilibrium; diathermic wall, thermal equilibrium, chemical equilibrium,	L	LCD	1	7	11/9/2020	27/9/2020
8	Zeroth law of thermodynamics, Temperature; concepts, scales, international fixed points and measurement of temperature.	L	LCD	1	8	12/9/2020	5/10/2020
9	Constant volume gas thermometer, constant pressure gas thermometer,mercury in glass thermometer.	L	LCD	1	9	15/9/2020	6/10/2020
10	Problems on temperature scale	L	LCD	1	10	18/9/2020	7/10/2020
11	**Module-2** Work and Heat: Mechanics, definition of work and its limitations	L	LCD	1	11	19/9/2020	7/10/2020
12	Thermodynamic definition of work; examples,	L	LCD	1	12	22/9/2020	10/10/2020
13	, sign convention. Displacement work; as a part of a system boundary, as a whole of a system	L	LCD	1	13	24/9/2020	11/10/2020

No.	Topic						
14	expressions for displacement work in various processes through p-v diagrams	L	LCD	1	14	25/9/2020	12/10/2020
15	expressions for displacement work in various processes through p-v diagrams	L	LCD	1	15	26/9/2020	20/10/2020
16	Shaft work; Electrical work. Other types of work..	L	LCD	1	16	1/10/2020	20/10/2020
17	Heat; definition, units and sign convention. Problems.	L	LCD	1	17	3/10/2020	24/10/2020
18	Problems on work transfer,	L	LCD	1	18	6/10/2020	24/10/2020
19	Problems on work transfe;	L	LCD	1	19	7/10/2020;	25/10/2020
	TEST -1					7/10/2020	
20	First Law of Thermodynamics: Joules experiments,	L	LCD	1	20	8/10/2020	26/10/2020
21	Equivalence of heat and work. Statement of the First law of thermodynamics,.	L	LCD	1	21	9/10/2020	27/10/2020
22	extension of the First law to non - cyclic processes, energy, energy as a property	L	LCD	1	22	10/10/2020	27/10/2020
23	extension of the First law to non - cyclic processes, energy, energy as a property	L	LCD	1	23	13/10/2020	2/11/2020
24	steady flow energy equation(SFEE),	L	LCD	1	24	15/10/2020	2/11/2020
25	problems on closed system	L	LCD	1	25	16/10/2020	5/11/2020
26	problems on open system	L	LCD	1	26	20/10/2020	5/11/2020
27	**Module-3** Second Law of Thermodynamics: Limitations of first law of thermodynamics ,Thermal reservoir, heat engine and heat pump	L	LCD	1	27	22/10/2020	10/11/2020
28	Schematic representation, efficiency and COP. Reversed heat engine, schematic representation, importance and superiority of a reversible heat engine and irreversible processes	L	LCD	1	28	23/10/2020	10/11/2020
29	internal and external reversibility. Kelvin - Planck statement of the Second law of Thermodynamics;	L	LCD	1	29	24/10/2020	17/11/2020
30	PMM I and PMM II, Clausius statement of Second law of Thermodynamics,	L	LCD	1	30	27/10/2020	17/11/2020

31	Equivalence of the two statements; Carnot cycle, Carnot principles.	L	LCD	1	31	29/10/2020	18/11/2020
32	problems on second law of thermodynamics	L	BB	1	32	3/11/2020	19/11/2020
33	problems on second law of thermodynamics	L	BB	1	33	5/11/2020	21/11/2020
34	Entropy: Clausius inequality, Statement- proof,	L	BB	1	34	6/11/2020	23/11/2020
35	Entropy- definition, a property, change of entropy,	L	BB	1	35	7/11/2020	23/11/2020
36	entropy as a quantitative test for irreversibility,	L	BB	1	36	10/11/2020	24/11/2020
37	principle of increase in entropy, entropy as a coordinate.	L	BB	1	37	12/11/2020	28/11/2020
38	problems on entropy	L	BB	1	38	13/11/2020	29/12/2020
39	**Module-5** Ideal gases: Ideal gas mixtures, Daltons law of partial pressures	L	BB	1	39	14/11/2020	30/12/2020
40	Amagat's law of additive volumes,	L	BB	1	40	17/11/2020	30/12/2020
	TEST -2					18/11/2020	
41	evaluation of properties of perfect and ideal gases	L	BB	1	41	19/11/2020	31/12/2020
42	Air- Water mixtures and related properties	L	BB	1	42	20/11/2020	1/1/2021
43	problems on Ideal gases	L	BB	1	43	21/11/2020	4/1/2021
44	Real gases – Introduction, Van-der Waal's Equation of state, Van-der Waal's constants in terms of critical properties	L	BB	1	44	24/11/2020	5/1/2021
45	problems on Real gases	L	BB	1	45	26/11/2020	8/1/2021
46	**Module-4** Pure Substances: P-T and P-V diagrams, triple point and critical points. Sub-cooled liquid, saturated liquid	L	BB	1	46	27/11/2020	11/1/2021
47	Mixture of saturated liquid and vapor, saturated vapor and superheated vapor states of pure substance with water as example	L	BB	1	47	1/12/2020	18/1/2021
48	Enthalpy of change of phase (Latent heat). Dryness fraction (quality), T-S and H-S	L	BB	1	48	4/12/2020	19/1/2021

	diagrams,						
49	Throttling calorimeter, separating and throttling calorimeter,	L	BB	1	49	5/12/2020	22/1/2021
50	Problems on Pure substance	L	BB	1	50	15/12/2020	23/1/2021
	TEST -3						
51	Availability and irreversibility	L	BB	1	51	25/1/2021	25/1/2021
52	Thermodynamic relations	L	BB	1	52	27/1/2021	27/1/2021
53	Gibbs helmotz equations	L	BB	1	53	28/1/2021	28/1/2021
54	Revision of module-1	L	BB	1	54	29/1/2021	29/1/2021
55	Revision of module-1	L	BB	1	55	1/2/2021	1/2/2021
56	Revision of module-1	L	BB	1	56	2/2/2021	2/2/2021
57	Revision of module-1	L	BB	1	57	3/2/2021	3/2/2021
58	Revision of module-2	L	BB	1	58	4/2/2021	4/2/2021
59	Revision of module-2	L	BB	1	59	5/2/2021	5/2/2021
60	Revision of module-2	L	BB	1	60	6/2/2021	6/2/2021
61	Revision of module-2	L	BB	1	61	6/2/2021	6/2/2021
62	Revision of module-3	L	BB	1	62	8/2/2021	8/2/2021
63	Revision of module-3	L	BB	1	63	8/2/2021	8/2/2021
64	Revision of module-3	L	BB	1	64	8/2/2021	8/2/2021
65	Revision of module-5	L	BB	1	65	9/2/2021	9/2/2021
66	Revision of module-5	L	BB	1	66	9/2/2021	9/2/2021
67	Revision of module-5	L	BB	1	67	9/2/2021	9/2/2021
68	Revision of module-4	L	BB	1	68	9/2/2021	9/2/2021
69	Revision of module-4	L	BB	1	69	11/1/2021	11/1/2021
70	Revision of module-4	L	BB	1	70	11/1/2021	11/1/2021

TEXT BOOK:

1 Basic and Applied Thermodynamics P.K.Nag, Tata McGraw Hill 2nd Ed., 2002

2 Basic Engineering Thermodynamics A.Venkatesh Universities Press, 2008

3 Basic Thermodynamics, B.K Venkanna, Swati B. Wadavadagi PHI, New Delhi 2010

REFERENCES:

1. 1.Thermodynamics- An Engineering Approach YunusA.Cenegal and Michael A.Boles Tata McGraw Hill publications 2002
2. An Introduction to Thermodynamcis Y.V.C.Rao Wiley Eastern 1993,
3. Engineering Thermodynamics .B.Jones and G.A.Hawkins John Wiley and Sons.

Course In charge   **HOD/ME**

K.S. INSTITUTE OF TECHNOLOGY BANGALORE

#14, Raghuvanahalli, Kanakapura Main Road, Bengaluru-5600109

DEPARTMENT OF MECHANICAL ENGINEERING

METAL CUTTING AND FORMING- Course Plan

NAME OF THE STAFF   : HARISH U
SUBJECT CODE/NAME   : 18ME35A/ METAL CUTTING AND FORMING
SEMESTER/YEAR   : III/II
ACADEMIC YEAR   : 2020-2021

Sl. No.	Topic to be covered	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date
	Module 1:					
1	**Introduction to Metal cutting**: Orthogonal and oblique cutting.	L+D	BB+LCD	1	**1**	01-09-2020
2	Classification of cutting tools: single, and multipoint.	L+ D	BB+LCD	1	2	03-09-2020
3	Tool signature for single point cutting tool.	L+ D	BB+LCD	1	3	04-09-2020
4	Mechanics of orthogonal cutting; chip formation.	L+D	BB+LCD	1	4	05-09-2020
5	Shear angle and its significance, Merchant circle diagram.	L+D	BB+LCD	1	5	08-09-2020
6	Numerical problems. Cutting tool materials and applications.	L+D	BB+LCD	1	6	10-09-2020
7	Numerical problems. Cutting tool materials and applications.	L+D	BB+LCD	1	7	11-09-2020
8	**Introduction to basic metal cutting machine tools: Lathe**- Parts of lathe machine.	L+D	BB+LCD	1	8	12-09-2020
9	Accessories of lathe machine, and various	L+D	BB+LCD	1	9	15-09-2020

	operations carried out on lathe.					
10	Kinematics of lathe. Turret and Capstan lathe.	L+D	BB+LCD	1	10	18-09-2020
Module 2:						
11	**Milling:** Various Milling operation.	L+D	BB+LCD	1	11	19-09-2020
12	Classification of milling machines, Vertical & Horizontal milling.	L+D	BB+LCD	1	12	22-09-2020
13	Up milling & down milling.	L+ D	BB+LCD	1	13	24-09-2020
14	Indexing: need of indexing, simple, compound & differential indexing.	L+D	BB+LCD	1	14	25-09-2020
15	**Drilling:** Difference between drilling, boring & reaming.	L+D	BB+LCD	1	15	26-09-2020
16	Types of drilling machines.	L + D	BB+LCD	1	16	29-09-2020
17	Boring machines.	L+D	BB+LCD	1	17	30-09-2020
18	Boring machines.	L+D	BB+LCD	1	18	03-10-2020
19	INTERNAL ASSESMENT-I			1	19	06-10-2020
20	**Shaping** -machining operations and operating parameters.	L+D	BB+LCD	1	20	08-10-2020
21	**Planning and Slotting machines**-machining operations and operating parameters.	L+D	BB+LCD	1	21	09-10-2020
22	**Grinding:** Grinding operation	L+D	BB+LCD	1	22	10-10-2020
23	Classification of grinding processes.	L+D	BB+LCD	1	23	15-10-2020
24	Cylindrical, surface & centre less grinding.	L+D	BB+LCD	1	24	16-10-2020
MODULE 3:						
25	Introduction to tool wear.	L+D	BB+LCD	1	25	17-10-2020
26	Tool wear mechanisms, tool life equations	L + D	BB+LCD	1	26	20-10-2020
27	Effect of process parameters on tool life, machinability	L+D	BB+LCD	1	27	22-10-2020
28	Cutting fluid-types and applications	L+D	BB+LCD	1	28	23-10-2020
29	Surface finish, effect of machining parameters on surface finish.	L+D	BB+LCD	1	29	24-10-2020

30	Economics of machining process.	L+D	BB+LCD	1	30	27-10-2020
31	Choice of cutting speed and feed, tool life for minimum cost and production time.	L+D	BB+LCD	1	31	29-10-2020
32	Choice of cutting speed and feed, tool life for minimum cost and production time.	L+D	BB+LCD	1	32	31-10-2020
33	Numerical problems.	L+D	BB+LCD	1	33	03-11-2020
34	Numerical problems.	L+D	BB+LCD	1	34	12-11-2020
MODULE 4:						
35	**MECHANICAL WORKING OF METALS:** Introduction to metal forming processes.	L+D	BB+LCD	1	35	13-11-2020
36	Classification of metal forming processes.	L+D	BB+LCD	1	36	14-11-2020
37	Hot working & cold working of metals.	L+D	BB+LCD	1	37	17-11-2020
38	Forging: Smith forging, drop forging & press forging.	L+D	BB+LCD	1	38	17-11-2020
39	INTERNAL ASSESMENT-II			1	39	18-11-2020
40	Forging Equipment, Defects in forging.	L+D	BB+LCD	1	40	20-11-2020
41	Rolling: Rolling process, Angle of bite.	L+D	BB+LCD	1	41	21-11-2020
42	Types of rolling mills.	L+D	BB+LCD	1	42	24-11-2020
43	Variables of rolling process, Rolling defects.	L+D	BB+LCD	1	43	26-11-2020
44	Drawing & Extrusion: Drawing of wires, rods & pipes.	L+D	BB+LCD	1	44	27-11-2020
45	Variables of drawing process. Difference between drawing & extrusion.	L+D	BB+LCD	1	45	28-11-2020
46	Various types of extrusion processes.	L+D	BB+LCD		46	28-11-2020
Module 5:						
47	**Sheet Metal Operations:** Blanking, piercing.	L+D	BB+LCD	1	47	01-12-2020
48	Punching, drawing, draw ratio, drawing force.	L+D	BB+LCD	1	48	04-12-2020
49	Variables in drawing, Trimming, and Shearing.	L+D	BB+LCD	1	49	05-12-2020
50	Variables in drawing, Trimming, and Shearing.	L+D	BB+LCD	1	50	08-12-2020
51	Bending force calculation.	L+D	BB+LCD	1	51	12-12-2020
52	Embossing and coining.	L+D	BB+LCD	1	52	15-12-2020
53	Types of dies: Progressive.	L+D	BB+LCD	1	53	17-12-2020

54	Compound and combination die.	L+D	BB+LCD	1	54	17-12-2020
55	Revision	L+D	BB+LCD	1	55	21-12-2020
56	Revision	L+D	BB+LCD	1	56	30-12-2020
57	Revision	L+D	BB+LCD	1	57	01-01-2021
58	Revision	L+D	BB+LCD	1	58	01-01-2021
59	INTERNAL ASSESMENT-III				59	08-01-2021
60	Revision	L+D	BB+LCD	1	60	11-01-2021
61	Revision	L+D	BB+LCD	1	61	12-01-2021
62	Revision	L+D	BB+LCD	1	62	18-01-2021
63	Revision	L+D	BB+LCD	1	63	19-01-2021
64	Revision	L+D	BB+LCD	1	64	22-01-2021
65	Revision	L+D	BB+LCD	1	65	25-01-2021
66	Revision	L+D	BB+LCD	1	66	28-01-2021
67	Revision	L+D	BB+LCD	1	67	29-01-2021
68	Revision	L+D	BB+LCD	1	68	01-02-2021
69	Revision	L+D	BB+LCD	1	69	05-02-2021

Text Books:
1. Anthony Esposito, "Fluid Power with applications", Pearson edition, 2000.
2. Majumdar S.R., "Oil Hydraulics", Tala McGRawHllL, 2002.
3. Majumdar S.R., "Pneumatic systems - Principles and Maintenance", Tata McGraw-Hill, New Delhi, 2005

Reference Books:
1. 1. John Pippenger, Tyler Hicks, "Industrial Hydraulics", McGraw Hill International Edition, 1980.
2. Andrew Par, Hydraulics and pneumatics, Jaico Publishing House, 2005.
3. FESTO, Fundamentals of Pneumatics, Vol I, II and III.
4. Herbert E. Merritt, "Hydraulic Control Systems", John Wiley and Sons, Inc.
5. Thomson, Introduction to Fluid power, PrentcieHaIl, 2004
6. John Watton, "Fundamentals of fluid power control", Cambridge University press, 2012.

Web Materials:

- fluidpowerjournal.com
- https://www.tandfonline.com/toc/tjfp20/current
- https://www.sciencedirect.com/science/book/9780750600156

<u>Details for the teaching Aids</u>

Use of projector to show students videos in order to enhance their perception.

Signature of courseincharge   **Signature of HOD**

K.S. INSTITUTE OF TECHNOLOGY BANGALORE

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DEPARTMENT OF MECHANICAL ENGINEERING
Computer Aided Machine Drawing - Course Plan

COURSE INCHARGE   : **Mr. SALEEM KHAN**
COURSE CODE/NAME   : **18ME36A / COMPUTER AIDED MACHINE DRAWING**
SEMESTER/SEC/YEAR   : **III 'A'/ II**
ACADEMIC YEAR   : **2020-2021**

Sl. No.	Topic to be covered	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date
	PART-A					
1.	PART-A : INTRODUCTION TO COMPUTER AIDED SKETCHING Review of graphic interface of the software. Review of basic sketching commands and navigational commands	L+AV	LCD	2	2	02/09/2020
2.	Sections of Solids: Sections of Pyramids, Prisms, Cubes, Cones, Cylinders.	L+D	LCD	2	4	05/09/2020
3.	Orthographic views :Conversion of pictorial views into orthographic projections of simple machine parts with or without section. Hidden line conventions, Precedence of lines.	L+ D	BB	2	6	09/09/2020
4.	Problems on Orthographic projections of standard Components.	L+ D	BB	2	10	12/09/2020
5.	Thread forms: Thread terminology sectional views of threads. ISO Metric (Internal & External), BSW (Internal and External)	L+D	BB	2	12	16/09/2020
6.	sectional views of threads. square, Acme and Sellers thread, American Standard thread.	L+D	BB	2	14	19/09/2020

7.	Fasteners: Hexagonal headed bolt and nut with washer (assembly), square headed bolt and nut with washer (assembly) simple assembly using stud bolts with nut and lock nut, Flanged nut, slotted nut, taper and split pin for locking, counter sunk head screw, grub screw, Allen screw.	L+DE	BB	2	16	23/09/2020
PART-B						
8.	Keys and Joints: Parallel, Taper, Feather Key, Gib head key and Woodruff key	L+D	LCD	2	18	26/09/2020
9.	Joints:Cotter joint (socket and spigot), Knuckle joint (pin joint) for two rods.	L+D	BB	2	20	07/10/2020
10.	Couplings: Split muff coupling, Protected type flange coupling, Pin (bush) type flexible coupling, Oldham's coupling, Universal coupling (Hook's Joint).	L+D	LCD	2	22	10/10/2020
PART-C						
11.	Limits, Fits and Tolerances: Introduction, Fundamental tolerances, Deviations, Methods of placing limit dimensions, Types of fits with symbols and applications, Geometrical tolerances on drawings, Standards followed in industry.	L+D	LCD	2	24	14/10/2020
12.	Assembly Drawings: Screw jack (Bottle type)	L+D	LCD	2	26	21/10/2020
13.	Plummer block (Pedestal Bearing)	L+D	BB	2	28	24/10/2020
14.	Machine vice	L+D	LCD	2	30	28/10/2020
15.	Lever Safety Valve	L+D	BB	2	32	04/11/2020
16.	Tool Head of a Shaper	L+D	BB	2	34	07/11/2020
17.	I.C. Engine connecting rod	L+D	LCD	2	36	18/11/2020

18.	Tail Stock of a Lathe	L+D	LCD	2	38	21/11/2020
19.	Revision	L+D	LCD	2	40	25/11/2020
20.	Revision	L+D	LCD	2	42	02/12/2020
21.	TEST-1			3	45	05/12/2020

Text Books:

1. "A Text Book of Computer Aided Machine Drawing", S. Trymbakaa Murthy, CBS Publishers, New Delhi, 2007.

2. 'Machine Drawing', K.R. Gopala Krishna, Subhash publication.

3. 'A Primer on Computer Aided Machine Drawing-2007', Published by VTU, Belgaum.

Reference Books:

1. 'Machine Drawing', N.D.Bhat & V.M.Panchal, Published by Charotar Publishing House, 1999.

2. 'Machine Drawing', N.Siddeshwar, P.Kannaih, V.V.S. Sastri, published by Tata Mc.Grawhill, 2006.

Web Materials:

W1: https://nptel.ac.in/syllabus/syllabus_pdf/112106075.pdf

W2: https://www.youtube.com/playlist?list=PL-VXiGW5ReVb4_Bx3aQqBNKb9Cr1mE5tT

W3: https://www.autodesk.com/solutions/cad-cam

Details for the teaching Aids

LCD projectors will be used for creating parts, creating assembly and for drawing views of basic machine components.

Signature of Course In charge   **Signature of Module Coordinator**   **Signature of   HOD**

KS INSTITUTE OF TECHNOLOGY BANGALORE

DEPARTMENT OF MECHANICAL ENGINEERING

Date: 19-04-2021

COURSE PLAN

Academic Year	2019-2020						
Batch	2018-2022						
Year/Semester/section	II/IV/B						
Course Component	Core						
Subject Code-Title	18ME42-APPLIED THERMODYNAMICS						
No. of Students	42						
Schedule	L	4	T	-	P	-	
Name of the Instructor	Mr. Parashuram .A.K					Dept	Mech.

Prerequisite Courses	• Basic knowledge in Engineering Thermodynamics	
Course Objectives	The course objective is to make students of mechanical engineering to learn the basics of automobile engineering and its application.	
Course Outcomes (Min 4 Max 6. Out of which one for content beyond syllabus)	CO1	**Identify** the basic thermodynamic cycles like otto,Diesel, Dual and gas turbine cycles applied in IC engine and testing of IC engines.
	CO2	**Apply**thermo dynamic concepts to analyze gas power cycles and gas turbine Applications
	CO3	**Apply**Basic thermo dynamic cycles used in. the steam power plants for power productions based on Rankine cycle.
	CO4	**Construct** refrigeration systems based on various refrigeration cycles along with air conditioning systems..
	CO5	**Make use of** the basic formulations for reciprocating compressors and steam nozzles for efficiency and effect of friction. .
Assessment pattern	• Internal Assessment1, Internal Assessment2 & Internal Assessment3 for 30 marks • Model examination for 100 marks • Assignment for 100 marks Portions Covered: • Internal Test1- Module 1 & First Half of Module2. • Internal Test2- Second Half of Module2 & 3rd Module. • Internal Test3- 4th Module and First Half of 5th Module. Model examination- All 5 Modules.	

Sl.No	Topic to be covered	Text/Ref Book Page No.	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date
Module 1:Unit-1 Air standard cycle
1	Air standard cycles; Carnot,	T2(1)	L	BB	1	1	19/4/2021
2	Efficiency & MEP of Otto cycle	T2(36)	L	BB	1	2	20/4/2021
3	Efficiency & MEP of Diesel cycle	T2(50-79)	L	BB	1	3	21/4/2021
4	Efficiency & MEP of Dual cycle	T2(91-94)	L	BB	1	4	21/4/2021
5	Stirling cycle	T2(220-243)	L	BB	1	5	23/4/2021
6	Comparison of Otto & Diesel cycle	T2(155-157)	L	BB	1	6	26/4/2021
Module 1: Unit-2 I C Engine
7	Classification of IC engines Combustion of SI engine and CI engine	T2(162-165)	L	BB	1	7	27/4/2021
8	Detonation and factors affecting detonation	T2(177-180)	L	BB	1	8	28/4/2021
9	Performance analysis of I.C Engines,	T2(69)	L	BB	1	9	28/4/2021
10	IC Engine fuels, Ratings and Alternate Fuels.	T2(69)	L	BB	1	10	30/4/2021
Module 2: Unit-3 Gas turbine
11	Gas turbine (Brayton) cycle	T2(73-74)	L	BB	1	11	3/5/2021
12	Types of gas turbine cycle	T2(381)	L	BB	1	12	4/5/2021
13	Description and analysis. Regenerative gas turbine cycle	T2(365-367)	L	BB	1	13	5/5/2021
14	Problems on regenerative cycle	T2(365-367)	L	BB	1	14	5/5/2021
Module 2: Unit-4 Intercooling & reheating methods of Gas turbine
15	Intercooling methods	T2(367)	L	BB	1	15	7/5/2021

16	Problems on intercooling method	T2(126-149)	L	BB	1		16	10/5/2021
	TEST 1							
17	Reheating in gas turbine cycle	T2(150-152)	L	BB	1		17	11/5/2021
18	Problems on Reheating	T2(194-198)	L	BB	1		18	12/5/2021
19	Jet propulsion: Turbojet, Ram jet	T2(194-198)	L	BB	1	19		17/5/2021
20	Pulse jet & Rocket propulsion	T2(214-217)	L	BB	1		20	18/5/2021
	Module3: Unit-5 vapour power cylce							
21	**Carnot** vapour power cycle	T2(244)	L	BB	1	21		19/5/2021
22	drawbacks as a reference cycle	T2(226)	L	BB	1		22	19/5/2021
23	Simple Rankine cycle; description, T-s diagram, analysis for performance, Problems on simple rankine cycle	T2(250)	L	BB	1		23	21/5/2021
24	Comparison of Carnot and Rankine cycles	T2(262-278)	L	BB	1		24	22/5/2021
25	Effects of pressure and temperature on Rankine Cycle performance. Actual vapour power cycles.	T2(262-278)	L	BB	1		25	24/5/2021
	Module3: Unit-6 Regenerative & Reheat methods of vapour power cylce							
26	Ideal and practical regenerative Rankine cycles	T2(303-316)	L	BB	1		26	28/5/2021
27	open and closed feed water heaters.	T2(344-351)	L	BB	1		27	31/5/2021
28	Reheat Rankine cycle.	T2(351-352)	L	BB	1		28	1/6/2021

29	Characteristics of an Ideal working fluid in Vapour power cycles,	T2(205)	L	BB	1	29	2/6/2021
30	Binary Vapour cycles.	T3(205-209)	L	BB	1	30	2/6/2021
	Module4: Unit-7 Refrigeration cycle						
31	Vapour compression refrigeration system; description, analysis, refrigerating effect.	T2(299-306)	L	BB	1	31	4/6/2021
32	COP, refrigerants and their desirable ~~properties.~~	T3(92-96)	L	BB	1	32	5/6/2021
	TEST-2						
33	alternate Refrigerants. Any one case study on cold storage or industrial refrigerator.	T2(96)	L	BB	1	33	5/6/2021
34	Air cycle refrigeration; reversed Carnot cycle, reversed Brayton cycle	T2(96)	L	BB	1	34	7/6/2021
35	Vapour absorption refrigeration system. Steam jet refrigeration.	T2(95)	L	BB	1	35	8/6/2021
	Module4: Unit-7 Psychrometrics & Air conditioning						
36	Properties of Atmospheric air, and Psychometric properties of Air,	T2(99-117)	L	LCD	1	36	9/6/2021
37	Psychometric Chart, Analyzing Air-conditioning Processes;	T2(99-117)	L	LCD	1	37	9/6/2021
38	Heating, Cooling, Dehumidification and Humidification	T2(117-118)	L	LCD	2	38	11/6/2021
39	Evaporative Cooling Adiabatic mixing of two moist air streams.	T2(118-119)	L	LCD	2	39	14/6/2021
40	Cooling towers.	T2(209-212)	L	BB	1	40	15/6/2021
	Module 5: Unit-9 Reciprocating compressors						
41	**Operation** of a single stage reciprocating compressors. Work input through p-v diagram and steady state steady flow analysis.	T2(212)	L	BB	1	41	16/6/2021

42	Effect of Clearance and Volumetric efficiency.	T2(212-213)	L	BB	1	42	16/6/2021
43	Adiabatic, Isothermal and Mechanical efficiencies.	T2(194)	L	BB	1	43	18/6/2021
44	Multistage compressor, saving in work, Optimum intermediate pressure,	T2(240)	L	BB	1	44	19/6/2021
45	Inter-cooling, Minimum work for compression	T2(159-160)	L	BB	1	45	21/6/2021
Module5: Unit-10 Steam Nozzles							
46	Flow of steam through nozzles,	T2(161-167)	L	BB	1	46	22/6/2021
47	Shape of nozzles, effect of friction	T2(285-314)	L	BB	1	47	23/6/2021
48	Critical pressure ratio	T2(75-76)	L	BB	1	48	25/6/2021
49	Supersaturated flow.	T2(77)	L	BB	1	49	28/6/2021
TEST-3							2/7/2021
50	Problems on steam nozzles	T2(77)	L	BB+LCD	1	50	5/7/2021
51	Problems on steam nozzles	T2(354)	L	BB+LCD	1	51	6/7/2021
52	Problems on steam nozzles	T2(355)	L	BB+LCD	1	52	7/7/2021
53	REVISION MODULE-1	T2(355)	L	BB+LCD	1	53	7/7/2021
54	REVISION MODULE-1	-	L	BB+LCD	1		9/7/2021
55	REVISION MODULE-1	-	L	BB+LCD	1		12/7/2021
56	REVISION MODULE-1	-	L	BB+LCD	1		13/7/2021
57	REVISION MODULE-2	-	L	BB+LCD	1		14/7/2021
58	REVISION MODULE-2	-	L	BB+LCD	1		14/7/2021
59	REVISION MODULE-2	-	L	BB+LCD	1		16/7/2021
60	REVISION MODULE-2	-	L	BB+LCD	1		17/7/2021
61	REVISION MODULE-3	-	L	BB+LCD	1		19/7/2021
62	REVISION MODULE-3	-	L	BB+LCD	1		23/7/2021
63	REVISION MODULE-3	-	L	BB+LCD	1		26/7/2021
64	REVISION MODULE-3	-	L	BB+LCD	1		27/7/2021
65	REVISION MODULE-4	-	L	BB+LCD	1		28/7/2021
66	REVISION MODULE-4		L	BB+LCD	1		28/7/2021

67	REVISION MODULE-4	-	L	BB+LCD	1		29/7/2021
68	REVISION MODULE-5	-	L	BB+LCD	1		6/8/2021
69	REVISION MODULE-5	-	L	BB+LCD	1		7/8/2021
70	REVISION MODULE-5	-	L	BB+LCD	1		7/8/2021

TEXT BOOK:

1. Thermodynamics an engineering approach, by Yunus A. Cenegal and Michael A. Boles. Tata McGraw hill Pub. Sixth edition, 2008.

2. Basic and Applied Thermodynamics" by P .K. Nag, Tata McGraw Hill, 2nd Edi. 2009
3. Fundamentals of Thermodynamics by G.J. Van Wylen and R.E. Sonntag, Wiley Eastern. Fourth edition 19993.

Reference Books:

1. Thermodynamics for engineers, Kenneth A. Kroos and Merle C. Potter, Cengage Learning, 2016
2. Principles of Engineering Thermodynamics, Michael J,Moran, Howard N. Shapiro, Wiley, 8th Edition
3. An Introduction to Thermo Dynamics by Y.V.C.Rao, Wiley Eastern Ltd, 2003.
4. Thermodynamics by Radhakrishnan. PHI, 2nd revised edition.
5. I.C Engines by Ganeshan.V. Tata McGraw Hill, 4rth Edi. 2012.
6. I.C.Engines by M.L.Mathur & Sharma. Dhanpat Rai& sons- India

WEB MATERIALS:
  Useful Websites:https://nptel.ac.in/course.php
Journ

Useful Journals
- Journal of Fluid Mechanics
- Journal of Applied Fluid Mechanics
- Journal of Applied Thermal Engineering

Course In charge   **HOD/ME**

KS INSTITUTE OF TECHNOLOGY BANGALORE

DEPARTMENT OF MECHANICAL ENGINEERING

NAME OF THE STAFF : SALEEM KHAN

SUBJECT NAME & CODE : FLUID MECHANICS (18ME43)

SEMESTER/YEAR : IV

ACADEMIC YEAR : 2020-2021

Sl. No.	Topic to be covered	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date
	Module-1					
1	**Introduction**: Properties of fluids-mass density, weight density, specific volume, specific gravity	L+ D	BB	1	1	19-04-2021
2	Viscosity, surface tension	L+ D	BB	1	2	20-04-2021
3	Capillarity, vapour pressure, compressibility and bulk modulus.	L+ D	BB	1	3	21-04-2021
4	Concept of continuum, types of fluids	L+D	BB	1	4	22-04-2021
5	Pressure at a point in the static mass of fluid, variation of pressure.	L+ D	BB	1	5	24-04-2021
6	Pascal's law, absolute, gauge, atmospheric and vacuum pressures	L+ D	BB	1	6	26-04-2021
7	Pressure measurement by simple, differential manometers and mechanical gauges.	L+D	BB	1	7	27-04-2021
8	**Fluid Statics:** Total pressure and centre of pressure for horizontal plane	L+D	BB	1	8	28-04-2021

9	Total pressure and centre of pressure for vertical plane surface	L+ D	BB	1	9	29-04-2021
10	Total pressure and centre of pressure for inclined plane surface submerged in static fluid.	L+D	BB	1	10	03-05-2021
Module-2						
11	**Buoyancy:** Centre of buoyancy	L+ D	BB	1	11	04-05-2021
12	Meta centre	L+D	BB	1	12	05-05-2021
13	Meta centric height its application	L+D	BB	1	13	06-05-2021
14	**Fluid Kinematics:** Velocity of fluid particle, types of fluid flow	L+ D	BB	1	14	08-05-2021
15	Description of flow, continuity equation	L+D	BB	1	15	10-05-2021
16	Coordinate free form, acceleration of fluid particle	L+D	BB	1	16	11-05-2021
17	Rotational & Irrotational flow	L+ D	BB	1	17	12-05-2021
18	Laplace's equation in velocity potential	L+D	BB	1	18	17-05-2021
19	Poisson's equation in stream function	L+D	BB	1	19	18-05-2021
20	Flow net	L+D	BB	1	20	19-05-2021
Module-3						
21	**Fluid Dynamics:** Introduction, Forces acting on fluid in motion.	L+ D	BB	1	21	20-05-2021
22	Euler's equation of motion along a streamline. Integration of Euler's equation to obtain Bernoulli's equation, Assumptions and limitations of Bernoulli's equation.	L+ D	BB	1	22	22-05-2021
23	Introduction to Navier-Stokes equation, Application of Bernoulli's theorem such as venturi-meter	L+D	BB	1	23	27-05-2021
24	Orifice meter, rectangular notch	L+D	BB	1	24	31-05-2021

25	Triangular notch, pitot tube	L+D	BB	1	25	01-06-2021
26	**Laminar and turbulent flow**: Flow through circular pipe	L+D	BB	1	26	02-06-2021
27	Flow through between parallel plates	L+D	BB	1	27	03-06-2021
28	Power absorbed in viscous flow in bearings, Poiseuille equation – velocity profile loss of head due to friction in viscous flow	L+D	BB	1	28	05-06-2021
29	Reynolds's experiment, frictional loss in pipe flow.	L+D	BB	**1**	29	07-06-2021
30	Introduction to turbulence, characteristics of turbulent flow, laminar turbulent transition major and minor losses.	L+D	BB	1	30	08-06-2021
Module-4						
31	**Flow over bodies**: Development of boundary layer, Prandtl"s boundary layer equations,	L+D	BB	1	31	09-06-2021
32	Blasius solution, integral momentum equation, drag on a flat plate	L+D	BB	1	32	10-06-2021
33	Boundary layer separation and its control	L+D	BB	1	33	14-06-2021
34	Streamlined and bluff bodies -flow around circular bodies and aero foils	L+D	BB	1	34	15-06-2021
35	Calculation of lift and drag	L+D	BB	1	35	16-06-2021
36	**Dimensional analysis**: Introduction, derived quantities	L+D	BB	1	36	17-06-2021
37	Dimensions of physical quantities, dimensional homogeneity,	L+D	BB	1	37	19-06-2021
38	Rayleigh's method	L+D	BB	1	38	21-06-2021
39	Buckingham Pi-theorem.	L+D	BB	1	39	22-06-2021
40	Dimensionless numbers, similitude, types of similitude.	L+D	BB	1	40	23-06-2021
Module-5						
41	**Compressible Flows:** Introduction	L+ D	BB	1	41	24-06-2021
42	Thermodynamic relations of perfect gases	L+D	BB	1	42	01-07-2021
43	Internal energy and enthalpy	L+D	BB	1	43	05-07-2021
44	Speed of sound	L+ D	BB	1	44	06-07-2021
45	Pressure field due to a moving source	L+D	BB	1	45	07-07-2021

46	Basic Equations for one-dimensional flow	L+D	BB	1	46	08-07-2021
47	Stagnation and sonic properties	L+ D	BB	1	47	12-07-2021
48	Normal and oblique shocks	L+D	BB	1	48	13-07-2021
49	**Introduction to CFD**: Necessity, limitations	L+D	BB	1	49	14-07-2021
50	Philosophy behind CFD, applications.	L+D	BB	1	50	15-07-2021
51	Revision class	L+D	BB	1	51	17-07-2021
52	Revision class	L+D	BB	1	52	19-07-2021
53	Revision class	L+D	BB	1	53	20-07-2021
54	Revision class	L+D	BB	1	54	22-07-2021
55	Revision class	L+D	BB	1	55	26-07-2021
56	Revision class	L+D	BB	1	56	27-07-2021
57	Revision class	L+D	BB	1	57	28-07-2021

Signature of Faculty   Signature of Module Coordinator   Signature of HOD

KS INSTITUTE OF TECHNOLOGY BANGALORE

DEPARTMENT OF MECHANICAL ENGINEERING

NAME OF THE STAFF   : Mr. HARISH U

SUBJECT CODE/NAME   : 18ME45B/METAL CASTING & WELDING

SEMESTER/YEAR   : IV / II

ACADEMIC YEAR   : 2020-2021

Sl. No.	Topic to be covered	Proposed Date
O	Introduction to MCW Introduction & Basic Materials Used In Foundry	19.04.2021
2	Definition, Classification of manufacturing processes. Metals cast in the foundry classification.	20.04.2021
3	Factors that determine the selection of a casting alloy.	22.04.2021
4	Introduction to casting process & steps involved.	23.04.2021
5	Patterns: Definition, classification, materials used for pattern, various pattern allowances and their importance.	26.04.2021
6	Sand molding: Types of base sand, requirement of base sand. Binder, Additives definition, need and types. Preparation of sand molds: Molding machines- Jolt type, squeeze type and Sand slinger.	27.04.2021
7	Study of important molding process: Green sand, core sand, dry sand,	29.04.2021
8	Sweep mold, CO2 mold, shell mold, investment mold, plaster mold, cement bonded mold.	30.04.2021
9	Cores: Definition, need, types. Method of making cores,	03.05.2021
10	Concept of gating (top, bottom, parting line, horn gate) and risering (open, blind) Functions and types.	04.05.2021
11	Melting furnaces:Classification of furnaces.	06.05.2021
12	Gas fired pit furnace, Resistance Furnace.	07.05.2021
13	Coreless Induction Furnace.	08.05.2021
14	Electric Arc Furnace.	10.05.2021

15	Constructional features & working principle of cupola furnace.	11.05.2021
16	Castings using metal molds, Gravity die casting.	17.05.2021
17	Pressure Die Casting, Centrifugal Casting.	18.05.2021
18	Squeeze Casting, Slush Casting.	20.05.2021
19	Thixocasting, and Continuous Casting Processes.	21.05.2021
20	Tutorial.	22.05.2021
21	Internal Assessment Test-1	25.05.2021
22	Solidification: Definition, Nucleation.	31.05.2021
23	Solidification variables.	07.06.2021
24	Directional solidification-need and methods.	08.06.2021
25	Degasification in liquid metals-Sources of gas, degasification methods.	10.06.2021
26	Fettling and cleaning of castings Basic steps involved.	11.06.2021
27	Sand Casting defects- causes, features and remedies. Advantages & limitations of casting process.	14.06.2021
28	Nonferrous foundry practice: Aluminum castings Advantages,	15.06.2021
29	Limitations, melting of aluminum using lift-out type crucible furnace.	17.06.2021
30	Hardeners used, dressing, gas absorption, fluxing and flushing.	18.06.2021
31	Grain refining, pouring temperature. Stir casting set up, procedure, uses, advantages and limitations.	19.06.2021
32	Welding process: Definition, Principles, Classification, Application.	21.06.2021
33	Advantages & limitations of welding. Arc welding: Principle, Metal arc welding (MAW).	22.06.2021
34	Flux Shielded Metal Arc Welding (FSMAW),	24.06.2021
35	Inert Gas Welding (TIG & MIG).	25.06.2021
36	Internal Assessment Test-2	29.06.2021
37	Submerged Arc Welding (SAW) and Atomic Hydrogen Welding (AHW).	01.07.2021
38	Special type of welding: Resistance welding principles,	02.07.2021
39	Seam welding, Butt welding,	03.07.2021

40	Spot welding and Projection welding.	05.07.2021
41	Friction welding, Explosive welding Thermit welding,	06.07.2021
42	Laser welding and electron beam welding.	08.07.2021
43	Structure of welds, Formation of different zones during welding, Heat Affected Zone (HAZ),	09.07.2021
44	Parameters affecting HAZ. Effect of carbon content on structure and properties of steel,	12.07.2021
45	Shrinkage in welds & Residual stresses,	13.07.2021
46	Concept of electrodes, filler rod and fluxes. Welding defects- Detection, causes & remedy.	15.07.2021
47	Soldering, brazing, gas welding: Soldering, Brazing, Gas Welding: Principle,	16.07.2021
48	oxy-Acetylene welding, oxy-hydrogen welding, air-acetylene welding, Gas cutting, powder cutting	17.07.2021
49	Inspection methods: Methods used for inspection of casting and welding. Visual,	22.07.2021
50	Magnetic particle, fluorescent particle, ultrasonic.	23.07.2021
51	Radiography, eddy current,	26.07.2021
52	Holography methods of inspection.	27.07.2021
53	Beyond Syllabus: Practical applications of metal casting and welding process- case studies.	29.07.2021
54	Practical applications of metal casting and welding process- case studies.	30.07.2021
55	Revision	31.07.2021
56	Revision	02.08.2021
57	Revision	03.08.2021
58	Internal Assessment Test-3	06.08.2021

Signature of Faculty   Signature of HOD

K. S. INSTITUTE OF TECHNOLOGY
#14, Raghuvanahalli, Kanakapura Main Road, Bengaluru-5600109
DEPARTMENT OF MECHANICAL ENGINEERING

COURSE PLAN

Academic Year	2020-2021					
Batch	2019-2023					
Year/Semester/section	II/IV					
Course Component	Professional core					
Subject Code-Title	18ME44-Kinematics of Machine					
Schedule	L	4	T	-		
Name of the Instructor	Mrs. Nirmala.L			Dept	ME	

Sl. No	Topic to be covered	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date
MODULE 1: Mechanisms						
1	Definitions: Link , types of links, joint, types of joints kinem irs	online	Microsoft teams	1	1	19-04-2021
2	Constrained motion, kinematic chain, mechanism and types, degrees of freedom of planar mechanisms, Equivalent mechanisms	online	Microsoft teams	1	2	20-04-2021
3	Groshoff's criteria and types of four bar mechanismsinversions of of four bar chain	online	Microsoft teams	1	3	22-04-2021
4	inversions single slider crank chain	online	Microsoft teams	1	4	23-04-2021
5	Doubler slider crank chain and its inversions	online	Microsoft teams	1	5	26-04-2021
6	Grashoff's chain. Mechanisms: Quick return motion mechanism link mechanism, Whitworth mechanism and Crank and slot er Mechanism	online	Microsoft teams	1	6	27-04-2021
7	Straight line motion mechanisms, Peaucellier's mechanism and Robert's mechanism	online	Microsoft teams	1	7	29-04-2021
8	Assignment 1 discussion			1	8	30-04-2021
9	Intermittent Motion mechanisms: Geneva wheel mechanism et and Pawl mechanism, ttoggle mechanism, pantograph	online	Microsoft teams	1	9	03-05-2021
10	condition for correct steering, Ackerman steering gear mechanism	online	Microsoft teams	1	10	04-05-2021
11	Classification of cams, Types of followers, Cam nomenclature, fset knife edge follower, roller follower, flat faced follower	online	Microsoft teams	1	11	06-05-2021
12	Assignment 1 discussion			1	12	07-05-2021
MODULE 2: Cams						
13	Follower motions and motion analysis, of SHM	online	Microsoft teams	1	13	08-05-2021
14	Numerical	online	Microsoft teams	1	14	10-05-2021
15	Motion with uniform acceleration and deceleration	online	Microsoft teams	1	15	11-05-2021
16	Motion with uniform velocity,	online	Microsoft teams	1	16	13-05-2021

17	Motion with cycloidal motion, Cam profile	online	Microsoft teams	1	17	14-05-2021
18	Numerical	online	Microsoft teams	1	18	17-05-2021
19	Numerical	online	Microsoft teams	1	19	18-05-2021
20	Tutorial class	online	Microsoft teams	1	20	20-05-2021
MODULE 3: Spur Gears						
21	Gear terminology	online	Microsoft teams	1	21	21-05-2021
22	Law of gearing	online	Microsoft teams	1	22	22-05-2021
23	Path of contact, arc of contact	online	Microsoft teams	1	23	24-05-2021
24	Contact ratio of spur gear.	online	Microsoft teams	1	24	25-05-2021
25	Numerical on POC, AOC	online	Microsoft teams	1	25	27-05-2021
26	Numerical on POC, AOC	online	Microsoft teams	1	26	28-05-2021
27	Interference in involute gears, methods of avoiding interference	online	Microsoft teams	1	27	31-05-2021
28	Condition and expressions for minimum number of teeth to a terference	online	Microsoft teams	1	28	01-06-2021
29	Numericals on interference	online	Microsoft teams	1	29	03-06-2021
30	Assignment 2 discussion			1	30	04-06-2021
MODULE 4: Velocity and Acceleration Analysis of Mechanisms (Graphical Method)						
31	Velocity and acceleration analysis of four bar mechanism	online	Microsoft teams	1	31	05-06-2021
32	Numerical on four bar mechanism with one force	online	Microsoft teams	1	32	07-06-2021
33	Numerical on four bar mechanism with two forces	online	Microsoft teams	1	33	08-06-2021
34	Numerical on four bar mechanism with three forces	online	Microsoft teams	1	34	10-06-2021
35	Assignment 2 discussion,	online	Microsoft teams	1	35	11-06-2021
36	Numerical on four bar mechanism	online	Microsoft teams	1	36	14-06-2021
37	Numerical on four bar mechanism	online	Microsoft teams	1	37	15-06-2021
38	Slider crank mechanism	L+D	Microsoft teams	1	38	17-06-2021
39	Numerical on slider crank mechanism	online	Microsoft teams	1	39	18-06-2021
40	Numerical on slider crank mechanism	online	Microsoft teams	1	40	19-06-2021
41	Numerical on slider crank mechanism	online	Microsoft teams	1	41	21-06-2021
42	Assignment 3 discussion,	online	Microsoft teams	1	42	22-06-2021
43	Angular velocity and angular acceleration of links	online	Microsoft teams	1	43	24-06-2021
44	Mechanism illustrating Corioli's component of acceleration	online	Microsoft teams	1	44	25-06-2021
45	Tutorial	online	Microsoft teams	1	45	28-06-2021
46	Numericals on acceleration analysis and coriolis component accleration	online	Microsoft teams	5	50	29-06-2021to 05.07.2021
51	Module 5:Velocity and Acceleration Analysis of Mechanisms (Analytical Method):	online	Microsoft teams	1	51	06-07-2021
52	Velocity analysis of four bar mechanism, using complex algebra method	online	Microsoft teams	1	52	08-07-2021

5 3	acceleration analysis of four bar mechanism, using complex algebra method	online	Microsoft teams	1	53	09-07-2021
5 4	Velocity analysis of slider crank mechanism, using complex algebra method	online	Microsoft teams	1	54	12-07-2021
5 5	acceleration analysis of slider crank mechanism, using complex algebra method	online	Microsoft teams	1	55	13-07-2021
5 6	Numericals on four bar mechanism and slider crank mechanism	online	Microsoft teams	6	61	15-07-2021to 22.07.2021
6 2	Assignment 3 discussion, quiz Tutorial class	online	Microsoft teams	1	62	23-07-2021
6 3	Freudenstein's equation for four bar mechanism and slider crank mechanism.	online	Microsoft teams	1	63	26-07-2021
6 4	Function Generation for four bar mechanism	online	Microsoft teams	1	64	27-07-2021
6 5	Tutorial	online	Microsoft teams	1	65	29-07-2021
6 6	Revision	online	Microsoft teams	1	66	30-07-2021

COURSE PLAN

Academic Year	**2020-2021**
Batch	**2018-2022**
Year/Semester	**III/VI**
Course Component	**ELECTIVE**
Subject Code-Title	**18ME641-** Non –Traditional machining

Schedule	**L**	**4**	**T**	**-**	

Name of the Instructor	**Dr. Nirmala.L**		**Dept**	**ME**

Sl. No.	Topic to be covered	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date
MODULE 1: Basics, Mechanical Behavior, Failure of Materials						
1	Introduction to Non-traditional machining, Need for Non-traditional machining process,	online	Microsoft teams	1	1	19-04-2021
2	Comparison between traditional and non-traditional machining, general classification Non-traditional machining processes, classification based on nature of energy employed in machining,	online	Microsoft teams	1	2	20-04-2021
3	selection of non-traditional machining processes, Specific advantages, limitations and applications of non-traditional machining processes.	online	Microsoft teams	1	3	21-04-2021
4	**Ultrasonic Machining (USM):** Introduction, Equipment and material process,	online	Microsoft teams	1	4	23-04-2021
5	Effect of process parameters: Effect of amplitude and frequency, Effect of abrasive grain diameter, effect of slurry, tool & work material.	online	Microsoft teams	1	5	26-04-2021
6	Process characteristics: Material removal rate, tool wear, accuracy, surface finish, applications, advantages & limitations of USM.	online	Microsoft teams	1	6	27-04-2021
7	**Abrasive Jet Machining (AJM):** Introduction, Equipment and	online	Microsoft teams	1	7	28-04-2021
8	process of material removal, process variables: carrier gas, type of abrasive, work material, stand-off distance (SOD).	online	Microsoft teams	1	8	30-04-2021
9	Process characteristics-Material	online	Microsoft teams	1	9	03-05-2021
10	**ELECTROCHEMICAL MACHINING (ECM):** Introduction, Principle of electro chemical machining, ECM equipment, elements of ECM operation,	online	Microsoft teams	1	10	04-05-2021
11	Chemistry of ECM. ECM Process characteristics: Material removal rate, accuracy, surface finish. Process parameters: Current density, Tool feed rate,	online	Microsoft teams	1	11	05-05-2021
12	Gap between tool & workpiece, velocity of	online	Microsoft	1	12	07-05-2021

	electrolyte flow, type of electrolyte, its concentration temperature, and choice of electrolytes.		teams			
13	ECM Tooling: ECM tooling technique & example, Tool & insulation materials. Applications ECM: Electrochemical grinding and electrochemical honing process. Advantages, disadvantages and application ofECG, ECH.	online	Microsoft teams	1	13	10-05-2021
14	**CHEMICAL MACHINING (CHM):** Elements of the process, Resists (maskants), Etchants.	online	Microsoft teams	1	14	11-05-2021
15	Types of chemical machining process-chemical blanking process,	online	Microsoft teams	1	15	12-05-2021
16	advantages and limitations of chemical blanking process,	online	Microsoft teams	1	16	17-05-2021
17	applications of chemical blanking process	online	Microsoft teams	1	17	18-05-2021
18	advantages of chemical milling process.	online	Microsoft teams	1	18	19-05-2021
19	Process characteristics of CHM: material removal rate,	online	Microsoft teams	1	19	21-05-2021
20	Process characteristics of CHM :accuracy, surface finish,	online	Microsoft teams	1	20	28-05-2021
21	Advantages and limitations of CHM .	online	Microsoft teams	1	21	31-05-2021
22	Applications of chemical machining process	online	Microsoft teams	1	22	01-06-2021
23	**ELECTRICAL DISCHARGE MACHINING (EDM):** Introduction, mechanism of metal removal,	online	Microsoft teams	1	23	02-06-2021
24	EDM equipment: spark erosion generator	online	Microsoft teams	1	24	04-06-2021
25	Relaxation type Circuit	online	Microsoft teams	1	25	07-06-2021
26	Dielectric medium-its functions &	online	Microsoft teams	1	26	08-06-2021
27	Desirable properties,	online	Microsoft teams	1	27	09-06-2021
28	Electrode feed control system	online	Microsoft teams	1	28	11-06-2021
29	Flushing types; pressure flushing	online	Microsoft teams	1	29	14-06-2021
30	Suction flushing, side flushing,	online	Microsoft teams	1	30	15-06-2021
31	Pulsed flushing. EDM	online	Microsoft teams	1	31	16-06-2021
32	Process parameters: Spark frequency	online	Microsoft teams	1	32	18-06-2021
33	Current & spark gap, surface finish, of EDM	online	Microsoft teams	1	33	21-06-2021
34	Heat Affected Zone of EDM	online	Microsoft teams	1	34	22-06-2021
35	Advantages and limitations of EDM	online	Microsoft teams	1	35	23-06-2021
36	Applications of EDM	online	Microsoft teams	1	36	25-06-2021
37	Applications of EDM	online	Microsoft teams	1	37	02-07-2021
38	Electrical discharge grinding	online	Microsoft teams	1	38	05-07-2021
39	Traveling wire EDM	online	Microsoft teams	1	39	06-07-2021

Sl.No.	Topic	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date
40	Plasma torch working principle	online	Microsoft teams	1	40	07-07-2021
41	process parameters of PAM	online	Microsoft teams	1	41	09-07-2021
42	Safety precautions OF PAM	online	Microsoft teams	1	42	12-07-2021
43	Process characteristics. OF PAM	online	Microsoft teams	1	43	13-07-2021
44	applications, advantages and limitations	online	Microsoft teams	1	44	14-07-2021
45	**LASER BEAM MACHINING (LBM):** Introduction, generation of LASER, .	online	Microsoft teams	1	45	16-07-2021
46	Equipment and mechanism of metal removal,	online	Microsoft teams	1	46	19-07-2021
47	LBM parameters and characteristics, Applications, Advantages & limitations.	online	Microsoft teams	1	47	20-07-2021
48	LBM, Applications, Advantages & limitations.	online	Microsoft teams	1	48	23-07-2021
49	**ELECTRON BEAM MACHINING (EBM):** Introduction, Principle,	online	Microsoft teams	1	49	26-07-2021
50	Equipment and mechanism of metal removal, applications, advantages and limitations	online	Microsoft teams	1	50	27-07-2021

NAME OF THE STAFF : Dr. NIRMALA L

SUBJECT CODE/NAME : 18ME53/ DYNAMICS OF MACHINES

SEMESTER/YEAR V / III

ACADEMIC YEAR:2020-2021

Sl.No. / Topic to be covered	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date
MODULE 1:Static force Analysis & Dynamic force Analysis					
1 **Static force Analysis:** Static equilibrium	ONLINE	ZOOM	1	1	02-09-2020
2 Equilibrium of two and three force members. Members with two forces and torque, Free body diagrams	ONLINE	ZOOM	1	2	04-09-2020
3 Static force analysis of four bar mechanism and Slider-crank mechanism with and without friction.	ONLINE	ZOOM	1	3	05-09-2020
4 Numerical Problems on Static Force analysis	ONLINE	ZOOM	1	4	07-09-2020
5 Numerical Problems on Static Force analysis	ONLINE	ZOOM	1	5	09-09-2020
6 **Dynamic force Analysis:** D'Alembert principle, Inertia force, Inertia torque	ONLINE	ZOOM	1	6	11-09-2020
7 **Dynamic force analysis of four-bar mechanism and Slider crank mechanism without friction, numerical problems.**	ONLINE	ZOOM	1	7	12-09-2020
8 Numerical Problems on Dynamic Force analysis	ONLINE	ZOOM	1	8	14-09-2020
9 Numerical Problems on Dynamic Force analysis	ONLINE	ZOOM	1	9	16-09-2020
MODULE 4: FREE VIBRATIONS					
10 Free vibrations: Basic elements of vibrating system, Types of free vibrations, Longitudinal vibrations	ONLINE	ZOOM	1	10	18-09-2020

11	Equilibrium method, D'Alembert's principle,	ONLINE	ZOOM	1		11	19-09-2020
12	Energy method, Rayleigh's method	ONLINE	ZOOM	1		12	03-10-2020
13	Determination of natural frequency of single degree freedom systems, Effect of spring mass,	ONLINE	ZOOM	1		13	05-10-2020
14	Damped free vibrations: Under damped	ONLINE	ZOOM	1		14	07-10-2020
15	over damped	ONLINE	ZOOM	1		15	09-10-2020
16	critically damped systems logarithmic decrement.	ONLINE	ZOOM	1		16	10-10-2020
17	Numericals	ONLINE	ZOOM	1		17	12-10-2020
MODULE 3:Governors & Gyroscope							
18	**Governors:** Types of governors	ONLINE	ZOOM	1		18	14-10-2020
19	Controlling force, Stability, Sensitiveness, Isochronism, Effort and Power of a Governor.	ONLINE	ZOOM	1		19	16-10-2020
20	Force analysis of Porter Governor Hartnell Governor.	ONLINE	ZOOM	1		20	17-10-2020
21	Numerical Problems	ONLINE	ZOOM	1		21	19-10-2020
22	**Gyroscope:** Vectorial representation of angular motion, Gyroscopic couple	ONLINE	ZOOM	1		22	21-10-2020
23	Effect of gyroscopic couple on plane disc, aeroplane, ship	ONLINE	ZOOM	1		23	23-10-2020
24	Stability of two wheelers and four wheelers	ONLINE	ZOOM	1		24	24-10-2020
25	Numerical problems.	ONLINE	ZOOM	1		25	28-10-2020
MODULE 2:Balancing of Rotating Masses & Balancing of Reciprocating Masses							
26	**Balancing of Rotating Masses:** Static and dynamic balancing	ONLINE	ZOOM	1		26	02-11-2020
27	Balancing of single rotating mass by balancing masses in same plane and in different planes	ONLINE	ZOOM	1		27	04-11-2020
28	Balancing of several rotating masses by balancing masses in same plane and in different planes.	ONLINE	ZOOM	1		28	06-11-2020
29	Numerical Problems on Rotating Masses in same plane.	ONLINE	ZOOM	1		29	13-11-2020
30		ONLINE	ZOOM	1		30	18-11-2020
31	**Balancing of Reciprocating Masses:** Inertia effect of crank and connecting rod	ONLINE	ZOOM	1		31	20-11-2020
32	Balancing of Single cylinder engine	ONLINE	ZOOM	1		32	21-11-2020
33	Balancing in multi cylinder-inline engine (primary and secondary forces)	ONLINE	ZOOM	1		33	23-11-2020
MODULE 5: FORCED VIBRSTIONS							
34	Forced vibrations: Undamped forced vibration of spring mass system	ONLINE	ZOOM	1		34	25-11-2020
35	Damped forced vibrations	ONLINE	ZOOM	1		35	27-11-2020
36	Rotating unbalance, Vibration isolation	ONLINE	ZOOM	1		36	30-11-2020
37	Reciprocating unbalance	ONLINE	ZOOM	1		37	02-12-2020
38	Support motion(absolute and relative motion),	ONLINE	ZOOM	1		38	05-12-2020
39	Transverse vibration of shaft with single concentrated load,Criticalspeed	ONLINE	ZOOM	1		39	07-12-2020
40	several loads, uniformly distributed load	ONLINE	ZOOM	1		40	07-12-2020

COURSE PLAN

Academic Year	2020-2021						
Batch	2018-24						
Year/Semester	II/III						
Course Component	Professional core						
Subject Code-Title	18ME34-MATERIAL SCIENCE						
Schedule	L	4	T	-			
Name of the Instructor	Dr. Nirmala.L					Dept	ME

Sl. No.	Topic to be covered	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date
MODULE 1: Basics, Mechanical Behavior, Failure of Materials						
1	Introduction to Crystal Structure – Coordination number	online	zoom	1	1	01-09-2020
2	Atomic packing factor, Simple Cubic, BCC	online		1	2	02-09-2020
3	FCC and HCP Structures, Crystal	online	zoom	1	3	03-09-2020
4	Imperfections – point, line,	online	zoom	1	4	07-09-2020
5	Surface ,volume imperfections, Atomic Diffusion	online	zoom	1	5	08-09-2020
6	Fick's laws of diffusion; Factors affecting diffusion.	online	zoom	1	6	09-09-2020
7	Stress-strain diagrams showing ductile and brittle behavior of materials	online	zoom	1	7	10-09-2020
8	Engineering and true strains, Linear and non-linear elastic behavior	online	zoom	1	8	14-09-2020
9	Properties, Mechanical properties in plastic range. Stiffness, Yield strength, Offset Yield strength.	online	zoom	1	9	15-09-2020
10	Plastic deformation of single crystal by slip and twinning, Mechanisms of strengthening in metals.	online	zoom	1	10	16-09-2020
11	**Fracture:** Type I, Type II and Type III	online	zoom	1	11	21-09-2020
12	**Fatigue:** Types of fatigue loading with examples, Mechanism of fatigue	online	zoom	1	12	22-09-2020
13	Fatigue properties, S-N diagram, Fatigue testing.	online	zoom	1	13	23-09-2020
14	**Creep:** Description of the phenomenon with examples, three stages of creep, creep properties.	online	zoom	1	14	24-09-2020
15	Stress relaxation. Concept of fracture toughness.	online	zoom	1	15	01-10-2020
16	Substitutional and interstitial solid solutions and factors affecting solid solubility	online	zoom	1	16	05-10-2020
17	Hume Rothery rules Solidification: Mechanism of solidification	online	zoom	1	17	06-10-2020
18	Homogenous and Heterogeneous nucleation, Crystal growth	online	zoom	1	18	07-10-2020

19	Binary phase diagrams: Eutectic, and Eutectoid systems	online	zoom	1	19	08-10-2020
20	Lever rule,Intermediate phases, Gibbs phase rule Effect of nonequilibrium cooling,	online	zoom	1	20	12-10-2020
21	Coring and Homogenization Iron-Carbon (Cementite) diagram	online	zoom	1	21	13-10-2020
22	Description of phases, Specifications of steels.,	online	zoom	1	22	14-10-2020
23	Numerical on lever rule.	online	zoom	1	23	15-10-2020
24	Numerical on lever rule.	online	zoom	1	24	19-10-2020
25	Time-Temperature-Transformation (TTT) curves	online	zoom	1	25	20-10-2020
26	Continuous Cooling Transformation (CCT) curves	online	zoom	1	26	21-10-2020
27	Annealing: Recovery, Recrystallization and Grain growth	online	zoom	1	27	22-10-2020
28	Types of annealing	online	zoom	1	28	27-10-2020
29	Normalizing, Hardening	online	zoom	1	29	28-10-2020
30	Tempering, Martempering, Austempering	online	zoom	1	30	29-10-2020
31	Concept of hardenability	online	zoom	1	31	05-11-2020
32	Factors affecting hardenability, surface hardening methods	online	zoom	1	32	09-11-2020
33	carburizing, cyaniding,	online	zoom	1	33	10-11-2020
34	nitriding, flame hardening and induction hardening,	online	zoom	1	34	11-11-2020
35	hardening of aluminum-copper alloys and PH steels	online	zoom	1	35	12-11-2020
36	Ferrous materials: Properties, Compositions and uses of Grey cast iron	online	zoom	1	36	17-11-2020
37	SG iron and steel	online	zoom	1	37	18-11-2020
38	**Ceramics:** Structure types and properties	online	zoom	1	38	19-11-2020
39	Applications of ceramics. Mechanical / Electrical behavior	online	zoom	1	39	23-11-2020
40	Processing of Ceramics.	online	zoom	1	40	24-11-2020
41	**Plastics:** Various types of polymers/plastics and their applications	online	zoom	1	41	25-11-2020
42	Mechanical behaviors and processing of plastics	online	zoom	1	42	26-11-2020
43	Failure of plastics	online	zoom	1	43	01-12-2020
44	**Other materials:** Smart materials and Shape Memory alloys	online	zoom	1	44	02-12-2020
45	Properties and applications.	online	zoom	1	45	10-12-2020
46	Composite materials - Definition, classification, types of matrix materials	online	zoom	1	46	14-12-2020
47	Reinforcements, Metal Matrix Composites (MMCs), Ceramic Matrix Composites	online	zoom	1	47	15-12-2020
48	Polymer Matrix Composites (PMCs), Particulate-reinforced	online	zoom	1	48	16-12-2020
49	fiber-reinforced composites, Fundamentals of production of composites	online	zoom	1	49	17-12-2020
50	Processes for production of composites	online	zoom	1	50	17-12-2020
51	Constitutive relations of composites,	online	zoom	1	51	17-12-2020

K.S. INSTITUTE OF TECHNOLOGY BANGALORE

#14, Raghuvanahalli, Kanakapura Main Road, Bengaluru-5600109

DEPARTMENT OF MECHANICAL ENGINEERING

Design of Machine Elements-1 - Course Plan

COURSE INCHARGE	**: Mr. Anilkumar A**
COURSE CODE/NAME	**: 18ME52 / DESIGN OF MACHINE ELEMENTS-1**
SEMESTER/SEC/YEAR	**: V 'B'/ III**
ACADEMIC YEAR	**: 2020-2021**

Sl. No.	Topic to be covered	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date
	MODULE 1					
1.	**Introduction to Mechanical engineering design:** Design Process: Definition of design, phases of design	L+AV	Microsoft Teams	1	1	1/9/2020
2.	Review of engineering materials and their properties and manufacturing processes; use of codes and standards, selection of preferred sizes. Factor of safety & Service factor.	L+D	Microsoft Teams	3	4	2/9/2020 4/9/2020 7/9/2020
3.	Review of axial, bending, shear and torsion loading on machine components, combined loading, two- and three dimensional stresses, principal stresses, stress tensors, Mohr's circles. Numericals on Static stresses	L+ D	BB	3	7	8/9/2020 9/9/2020 11/9/2020
4.	Failure mode: definition and types. , Failure of brittle and ductile materials; even and uneven materials;	L+ D	BB	1	8	14/09/2020
5.	Theories of failure: maximum normal stress theory, maximum shear stress theory, distortion energy theory, strain energy theory, Columba –Mohr theory and modified Mohr's theory.	L+D	BB	2	10	15/9/2020 16/09/2020
6.	Stress concentration, stress concentration factor and methods of reducing stress concentration.	L+D	BB	1	11	18/09/2020

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7.	Numericals on stress concentration factor	L+D	BB	1	12	21/09/2020

MODULE 2						
8.	**Impact Strength:** Introduction, Impact stress due to Axial, Bending and Torsional loads	L+D	Microsoft Teams	1	13	22/09/2020
9.	Numericals on Impact stresses	L+D	BB	2	15	23/09/2020 25/09/2020
10.	**CIE-1**		Microsoft Teams	1	16	28/09/2020
11.	**Fatigue failure**: Endurance limit, S-N Diagram**,** Low cycle fatigue, High cycle fatigue	L+D	Microsoft Teams	1	17	5/10/2020
12.	Fatigue loading: Introduction to fatigue failure, Mechanism of fatigue failure, types of fatigue loading, S-N Diagram, Low cycle fatigue, High cycle fatigue, Endurance limit.	L+D	Microsoft Teams	1	18	6/10/2020
13.	Modifying factors: size effect, surface effect, Stress concentration effects Notch sensitivity	L+D	BB	1	19	7/10/2020
14.	Goodman and Soderberg relationship, stresses due to combined loading, cumulative fatigue damage, and Miner′s equation.	L+D	BB	1	20	9/10/2020
15.	Numericals on Fatigue loading	L+D	BB	2	22	12/10/2020 13/10/2020

MODULE 3						
16.	**Design of Shafts:** Torsion of shafts, solid and hollow shaft design with steady loading based on strength and rigidity	L+D	Microsoft Teams	1	23	14/10/2020
17.	ASME and BIS codes for power transmission shafting, design of shafts subjected to combined bending, torsion and axial loading. Design of shafts subjected to fluctuating loads.	L+D	Microsoft Teams	1	24	16/10/2020

18.	Numericals on design of shafts	L+D	BB	2	26	19/10/2020 20/10/2020
19.	Design of keys and couplings: Keys: Types of keys and their applications, design considerations in parallel and tapered sunk keys, Design of square and rectangular sunk keys.	L+D	Microsoft Teams	1	27	21/10/2020
20.	Couplings: Rigid and flexible coupling-types and applications, design of Flange coupling, and Bush and Pin type coupling.	L+D	BB	1	28	23/10/2020
21.	Numericals on Design of Keys and Couplings	L+D	BB	3	31	24/10/2020 27/10/2020 28/10/2020
MODULE 4						
22.	Design of Permanent Joints: Types of permanent joints-Riveted and Welded Joints.	L+D	Microsoft Teams	1	32	2/11/2020
23.	**Riveted joints:** Types of rivets, rivet materials, Caulking and Fullering, analysis of riveted joints, joint efficiency, Failures of riveted joints, boiler joints, riveted brackets.	L+D	Microsoft Teams	2	34	3/11/2020 4/11/2020
24.	Numericals on Riveted Joints	L+D	BB	1	35	6/11/2020
25.	**CIE-2**		Microsoft Teams	1	36	9/11/2020
26.	**Welded joints:** Types, strength of butt and fillet welds, eccentrically loaded welded joints	L+D	BB	1	37	13/11/2020
27.	Numericals on welded Joints	L+D	BB	2	39	17/11/2020 18/11/2020
MODULE 5						
28.	Design of Temporary Joints: Types of temporary joints-cotter joints, knuckle joint and fasteners. Design of Cotter and Knuckle Joint.	L+D	Microsoft Teams	1	40	20/11/2020
29.	**Numericals on Design of cotter & Knuckle joint**	L+D	BB	3	43	21/11/2020 23/11/2020

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						24/11/2020
30.	Threaded Fasteners: Stresses in threaded fasteners, effect of initial tension, design of threaded fasteners under static, dynamic and impact loads, design of eccentrically loaded bolted joints.	L+D	BB	1	44	25/11/2020
31.	Numericals on Threaded Fasteners.	L+D	BB	2	46	27/11/2020 30/11/2020
32.	Power screws: Mechanics of power screw, stresses in power screws, efficiency and self-locking, design of power screws.	L+D	BB	2	48	1/12/2020 2/12/2020
33.	Numericals on Power screws & Complete Design of Screw Jack.	L+D	BB	4	52	4/12/2020 5/12/2020 7/12/2020 8/12/2020
34.	**CIE-3**			1	53	14/12/2020

Text Books:

1. Design of Machine Elements, V.B. Bhandari, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2nd Edition 2007

2. Mechanical Engineering Design, Joseph E Shigley and Charles R. Mischke. McGraw Hill International edition, 6th Edition, 2009.

Reference Books:

1. Machine Design, Robert L. Norton, Pearson Education Asia, 2001

2. Engineering Design, George E. Dieter, Linda C Schmidt, McGraw Hill Education, Indian Edition, 2013.

Web Materials:

W1: https://nptel.ac.in/downloads/112105125/

W2: https://proceedings.asmedigitalcollection.asme.org/

W3: https://stemez.com/subjects/technology_engineering/1GMachineDesign/1GMachineDesign.php

Details for the teaching Aids

LCD projectors will be used where ever necessary and since this is problematic subject Black Board Teaching will be used.

Signature of Course In charge   **Signature of   HOD**

KS INSTITUTE OF TECHNOLOGY BANGALORE

DEPARTMENT OF MECHANICAL ENGINEERING

NAME OF THE STAFF   : Mr. Ranganath N

SUBJECT CODE/NAME   : 18ME53/ DYNAMICS OF MACHINERY

SEMESTER/YEAR   : V / III

ACADEMIC YEAR   : 2020-21

Sl. No.	Topic to be covered	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date
MODULE 1: Static force Analysis & Dynamic force Analysis					
1	**Static force Analysis:** Static equilibrium	L+D	BB+LCD	1	1	1/9/2020
2	Equilibrium of two and three force members. Members with two forces and torque, Free body diagrams	L+D	BB+LCD	1	2	2/9/2020
3	Static force analysis of four bar mechanism and Slider-crank mechanism with and without friction.	L+D	BB	1	3	3/9/2020
4	Numerical Problems on Static Force analysis	PS	BB	1	4	5/9/2020
5	Numerical Problems on Static Force analysis	PS	BB	1	5	8/9/2020
6	Numerical Problems on Static Force analysis	PS	BB	1	6	9/9/2020
7	Numerical Problems on Static Force analysis	PS	BB	1	7	10/9/2020
8	**Dynamic force Analysis:** D'Alembert principle, Inertia force, Inertia torque	L+D	BB	1	8	12/9/2020
9	Dynamic force analysis of four-bar mechanism and Slider crank mechanism without friction, numerical problems.	L+D	BB	1	9	15/9/2020
10	Numerical Problems on Dynamic Force analysis	L+D	BB	1	10	16/9/2020
11	Numerical Problems on Dynamic Force analysis	L+D	BB	1	11	19/9/2020
12	Numerical Problems on Dynamic Force analysis	L+D	BB	1	12	22/9/2020
13	Numerical Problems on Dynamic Force analysis	L+D	BB	1	13	23/9/2020
14	Numerical Problems on Dynamic Force analysis	L+D	BB	1	14	24/9/2020
MODULE 2: Balancing of Rotating Masses & Balancing of Reciprocating Masses					
15	**Balancing of Rotating Masses:** Static and dynamic balancing	L+ D	LCD	1	15	26/9/2020
16	Balancing of single rotating mass by balancing masses in same plane and in different planes	L+D	BB	1	16	1/10/2020
17	Balancing of several rotating masses by balancing masses in same plane and in different planes.	L+D	BB, Lab Visit	1	17	3/10/2020

18	Numerical Problems on Rotating Masses in same plane.	L+D	BB	1	18	6/10/2020
19	Numerical Problems on Rotating Masses in Different planes.	L+D	BB	1	19	7/9/2020
20	Numerical Problems on Rotating Masses in Different planes.	L+D	BB	1	20	8/10/2020
21	Numerical Problems on Rotating Masses in Different planes.	L+D	BB	1	21	10/10/2020
22	Numerical Problems on Rotating Masses in Different planes.	L+D	BB	1	22	13/10/2020
23	Numerical Problems on Rotating Masses in Different planes.	L+D	BB	1	23	14/10/2020
24	**Balancing of Reciprocating Masses:** Inertia effect of crank and connecting rod	L+D	BB	1	24	15/10/2020
25	Balancing of Single cylinder engine	PS	BB	1	25	20/10/2020
26	Balancing of Single cylinder engine	PS	BB	1	26	21/10/2020
27	Balancing in multi cylinder-inline engine (primary and secondary forces)	L+D, LW	BB	1	27	22/10/2020
28	Numerical Problems on Balancing of Reciprocating Masses.	L+D	BB, PS	1	28	24/10/2020
MODULE 3: Governors & Gyroscope						
29	**Governors:** Types of governors	L+D	LCD	1	29	27/10/2020
30	Controlling force, Stability, Sensitiveness, Isochronism, Effort and Power of a Governor.	L+ D	BB	1	30	28/10/2020
31	Force analysis of Porter Governor.	L+ D	BB	1	31	29/10/2020
32	Numerical Problems on Porter Governor	L+D	BB	1	32	3/11/2020
33	Numerical Problems on Porter Governor	L+D	BB	1	33	4/11/2020
34	Numerical Problems on Porter Governor	L+D	BB	1	34	5/11/2020
35	Force analysis of Hartnell Governor.	L+D	BB	1	35	7/11/2020
36	Numerical Problems on Hartnell Governor	L+D	BB	1	36	10/11/2020
37	Numerical Problems on Hartnell Governor	L+D	BB	1	37	11/11/2020
38	Numerical Problems on Hartnell Governor	L+D	BB	1	38	12/11/2020
39	**Gyroscope:** Vectorial representation of angular motion, Gyroscopic couple	L+D	LCD	1	39	21/11/2020
40	Effect of gyroscopic couple on plane disc, aeroplane, ship	L+D	BB, Lab Visit	1	40	24/11/2020
41	Stability of two wheelers and four wheelers	L+D	BB	1	41	25/11/2020
42	Numerical problems.	L+ D	BB, PS	1	42	26/11/2020
MODULE 4: Introduction & Undamped free Vibrations (Single Degree of Freedom)						
43	Types of vibrations, Definitions, Simple Harmonic Motion (SHM)	L+D	LCD	1	43	1/12/2020

44	Work done by harmonic force; Principle of super position applied to SHM	L+D	LCD	1	44	5/12/2020
45	Numerical Problems on SHM & Principle of Superposition	L+D	BB	1	45	8/12/2020
46	Methods of analysis – (Newton's, Energy & Rayleigh's methods). Derivations for spring mass systems, Natural frequencies of simple systems, Springs in series and parallel, Torsional and transverse vibrations, Effect of mass of spring and Numerical problems	L+D	BB	1	46	9/12/2020
47	Effect of mass of spring and Numerical problems	L+D	BB	1	47	10/12/2020
48	Numerical Problems on Newton's method.	L+D	BB	1	48	15/12/2020
49	Numerical Problems on Energy method.	L+D, PS	BB	1	49	16/12/2020
50	Numerical Problems on Rayleigh's method.	L+D	BB, PS	1	50	17/12/2020
MODULE 5: Damped free Vibrations (Single Degree of Freedom) & Forced Vibration						
51	Types of damping, Analysis with viscous damping	L+D	BB, Lab Visit	1	51	22/12/2020
52	Derivations for over, critical and under damped systems	L+D	BB, LCD	1	52	23/12/2020
53	Logarithmic decrement and numerical problems.	L+D	BB	1	53	24/12/2020
54	Numerical Problems.	L+D	BB, PS	1	54	29/12/2020
55	**Forced Vibrations (Single Degree of Freedom):** Analysis of forced vibration with constant harmonic excitation	L+D	BB, LCD	1	55	30/12/2020
56	Magnification factor (M.F.), Vibration isolation - Transmissibility ratio	L+D	BB	1	56	31/12/2020
57	Magnification factor (M.F.), Vibration isolation - Transmissibility ratio	L+D	BB	1	57	2/1/2021
58	Excitation of support (absolute and relative), Numerical problems.	L+D	BB	1	58	5/1/2021
59	Numerical problems.	L+D	BB	1	59	5/1/2021
60	Numerical problems.	L+D	BB	1	60	8/1/2021
61	Numerical problems.	L+D	BB	1	61	9/1/2021
62	Numerical problems.	L+D	BB	1	62	15/1/2021
63	Numerical problems.	L+D	BB	1	63	16/1/2021

Signature of course in charge   **Signature of HOD/ME**

K.S. INSTITUTE OF TECHNOLOGY BANGALORE

#14, Raghuvanahalli, Kanakapura Main Road, Bengaluru-5600109

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE INCHARGE : SALEEM KHAN
COURSE CODE/NAME : 18ME56
SEMESTER/SEC/YEAR : V/A/ III
ACADEMIC YEAR : 2020-2021

S No	Topic to be covered	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date
MODULE 1						
1	**Introduction of O.M**	L+D	BB	1	1	01/09/2020
2.	Functions within business organizations.	L+D	BB	1	2	03/09/2020
3.	Operation management function, factors affecting productivity.	L+D	BB	1	3	04/09/2020
4.	Classification of production systems,	L+D	BB	1	4	07/09/2020
5.	Productivity	L+D	BB	1	5	08/09/2020
6.	Affecting productivity.	L+D	BB	1	6	10/09/2020
7.	**Decision Making:** The decision process	L+D	BB	1	7	11/09/2020

8.	Characteristics of operations decisions	L+D	BB	1	8	14/09/2020
9.	Use of models, decision making environments	L+D	BB	1	9	15/09/2020
10.	Graphical linear programming,	L+D	BB	1	10	18/09/2020
11	Graphical linear programming,	L+D	BB	1	11	21/09/2020
12	Analysis and trade-offs.	L+D	BB	1	12	22/09/2020
MODULE 2						
13.	**Forecasting:** Introduction to Forecasting process.	L+D	BB	1	13	24/09/2020
14.	Steps in forecasting process	L+D	BB	1	14	25/09/2020
15.	Approaches to forecasting	L+D	BB	1	15	01/10/2020
16.	Forecasts based on judgment and opinion	L+D	BB	1	16	05/10/2020
17.	Analysis of time series	L+D	BB	1	17	06/10/2020
18.	Analysis. of time series	L+D	BB	1	18	08/10/2020
19.	Problems on analysis of time series	PS	BB	1	19	09/10/2020
20.	Problems on regression analysis	PS	BB	1	20	12/10/2020
21.	Problems on regression analysis	L+D	BB	1	21	13/10/2020
MODULE 3						

22	**Capacity & Location Planning:** Importance of capacity decisions.	L+D	BB	1	22	15/10/2020
23	Defining and measuring capacity.	L+D	BB	1	23	16/10/2020
24	Determinants of effective capacity, determining capacity requirement.	L+D	BB	1	24	19/10/2020
25	Developing capacity alternatives.	L+D	BB	1	25	20/10/2020
26	Evaluating alternatives, types of processing	L+D	BB	1	26	22/10/2020
27	Need for location decisions, nature of locations decisions.	L+D	BB	1	27	23/10/2020
28	General procedure for making locations decisions	L+D	BB	1	28	24/10/2020
29	Evaluating locations decisions	L+D	BB	1	29	27/10/2020
30	Facilities layout – need for layout decisions	L+D	BB	1	30	29/10/2020
31	Problems on facility location	L+D	BB	1	31	02/11/2020
32	Problems on facility location	L+D	BB		32	03/11/2020
MODULE 4						
33	**Aggregate Planning & Master Scheduling :** Introduction	L+D	BB	1	33	05/11/2020
34	Aggregate planning – Nature and scope of aggregate planning	L+D	BB	1	34	06/11/2020
35	Strategies of aggregate planning	L+D	BB	1	35	09/11/2020
36	Techniques for aggregate planning	L+D	BB	1	36	10/11/2020
37	Graphical and charting techniques	L+D	BB	1	37	12/11/2020
38	Mathematical techniques	PS	BB	1	38	13/11/2020
39	The master production schedule	PS	BB	1	39	20/11/2020

40	Master scheduling process	L+D	BB	1	40	21/11/2020
41	Master scheduling methods	L+D	BB	1	41	23/11/2020
42	Problems on Master production schedule	L+D	BB	1	42	24/11/2020
43	Problems on Master production schedule	L+D	BB	1	43	26/11/2020
	MODULE 5					
44	**Material Requirement Planning (MRP): Introduction,** Dependent versus independent demand.	L+D	BB	1	44	27/11/2020
45	an overview of MRP – MRP inputs and outputs,	L+D	BB	1	45	30/11/2020
46	MRP processing,	L+D	BB	1	46	01/12/2020
47	ERP capacity requirement planning,	L+D	BB	1	47	04/12/2020
48	Benefits and limitations of MRP.	L+D	BB	1	48	05/12/2020
49	**Purchasing and Supply Chain Management (SCM):** Introduction,	L+D	BB	1	49	07/12/2020
50	Importance of purchasing and SCM,	L+D	BB	1	50	08/12/2020
51	the procurement process, Concept of tenders,	L+D	BB	1	51	10/12/2020
52	Approaches to SCM, Vendor development.	L+D	BB	1	52	11/12/2020
53	Revision	L+D	BB	1	53	14/12/2020

54	Revision	L+D	BB	1	54	15/12/2020
55	Revision	L+D	BB	1	55	17/12/2020
56	Revision	L+D	BB	1	56	18/12/2020
57	Revision	L+D	BB	1	57	19/12/2020
58	Revision	L+D	BB	1	58	20/12/2020
59	Revision	L+D	BB	1	59	22/12/2020
60	Revision	L+D	BB	1	60	24/12/2020
61	Revision	L+D	BB	1	61	28/12/2020
62	Revision	L+D	BB	1	62	29/12/2020
63	Revision	L+D	BB	1	63	31/12/2020
64	Revision	L+D	BB	1	64	01/01/2021
65	Revision	L+D	BB	1	65	02/11/2021

TEXT BOOK:
T1: William J. Stevenson, "Production & Operations Management", Ninth Edition, Tata McGraw Hill.
T2: B. Mahadevan, "Operations Management – Theory & Practice", Pearson Education, 2007.

REFERENCES:
R1: Norman Gaither & Greg Frazier, "Production and Operations Management".

R2: R. B. Chase, N.J. Aquilino, "Operations Management for Competitive Advantage" McGraw Hill Companies Inc., Ninth Edition.
R3: Joseph G Monks, "Production/Operations Management" McGraw Hill Books.

Signature of Course In charge   **Signature of   HOD**

K.S. INSTITUTE OF TECHNOLOGY BANGALORE

#14, Raghuvanahalli, Kanakapura Main Road, Bengaluru-5600109

DEPARTMENT OF MECHANICAL ENGINEERING
FLUID POWER ENGINEERING - Course Plan

NAME OF THE STAFF   : HARISH U
SUBJECT CODE/NAME   : 18ME55/ FLUID POWER ENGINEERING
SEMESTER/YEAR   : V/III
ACADEMIC YEAR   : 2020-2021

Sl. No.	Topic to be covered	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date
MODULE 1:Introduction to Fluid Power Systems					
1	Fluid power system: components, advantages and applications	L+D	BB+LCD	1	1	01-09-2020
2	Transmission of power at static and dynamic states. Pascal's law and its applications	L+ D	BB+LCD	1	2	02-09-2020
3	Fluids for hydraulic system: types, properties, and selection	L+ D	BB+LCD	1	3	04-09-2020
4	Additives, effect of temperature and pressure on hydraulic fluid	L+D	BB+LCD	1	4	05-09-2020
5	Seals, sealing materials, compatibility of seal with fluids	L+D	BB+LCD	1	5	08-09-2020
6	Types of pipes, hoses, and quick acting couplings	L+D	BB+LCD	1	6	09-09-2020
7	Pressure drop in hoses/pipes	L+D	BB+LCD	1	7	11-09-2020
8	Fluid conditioning through filters & strainers	L+D	BB+LCD	1	8	12-09-2020
9	sources of contamination & contamination control	L+D	BB+LCD	1	9	15-09-2020
10	heat exchangers	L+D	BB+LCD	1	10	16-09-2020
MODULE 2: Pumps and Actuators					
11	Classification of pumps, Pumping theory of positive displacement pumps	L+D	BB+LCD	1	11	18-09-2020
12	construction and working of Gear pumps, Vane pumps, Piston pumps	L+D	BB+LCD	1	12	19-09-2020

13	construction and working of fixed and variable displacement pumps, Pump performance characteristics	L+ D	BB+LCD	1	13	22-09-2020
14	pump selection factors, problems on pumps	L+D	BB+LCD	1	14	23-09-2020
15	Accumulators: Types, selection/ design procedure	L+D	BB+LCD	1	15	25-09-2020
16	Applications of accumulators. Types of Intensifiers	L + D	BB+LCD	1	16	26-09-2020
17	INTERNAL ASSESMENT - I					29-09-2020
18	Pressure switches /sensor, Temperature switches/sensor, Level sensor.	L+D	BB+LCD	1	17	03-10-2020
19	Actuators: Classification cylinder and hydraulic motors	L+D	BB+LCD	1	18	06-10-2020
20	Hydraulic cylinders, single and double acting cylinder	L+D	BB+LCD	1	19	07-10-2020
21	mounting arrangements, cushioning, special types of cylinders	L+D	BB+LCD	1	20	09-10-2020
22	problems on cylinders	L+D	BB+LCD	1	21	10-10-2020
23	Construction and working of rotary actuators such as gear, vane, piston motors, and Hydraulic Motor	L+D	BB+LCD	1	22	13-10-2020
24	Theoretical torque, power, flowrate, and hydraulic motor performance; numerical problems	L+D	BB+LCD	1	23	14-10-2020
25	Symbolic representation of hydraulic actuators (cylinders and motors).	L+D	BB+LCD	1	24	16-10-2020
MODULE 3: Components and Hydraulic Circuit Design						
26	Classification of control valves, Directional Control Valves-symbolic representation	L+D	BB+LCD	1	25	20-10-2020
27	constructional features of poppet, sliding spool, rotary type valves	L + D	BB+LCD	1	26	21-10-2020
28	constructional features of solenoid and pilot operated DCV, shuttle valve, and check valves	L+D	BB+LCD	1	27	23-10-2020
29	Pressure control valves - types, direct operated types and pilot operated types	L+D	BB+LCD	1	28	24-10-2020
30	Flow Control Valves -compensated and non-compensated FCV	L+D	BB+LCD	1	29	27-10-2020
31	needle valve, temperature compensated, pressure compensated	L+D	BB+LCD	1	30	28-10-2020
32	Pressure and temperature compensated FCV, symbolic representation.	L+D	BB+LCD	1	31	03-11-2020

33	Hydraulic Circuit Design: Control of single and Double - acting hydraulic cylinder	L+D	BB+LCD	1	32	04-11-2020
34	regenerative circuit, pump unloading circuit, double pump hydraulic system	L+D	BB+LCD	1	33	06-11-2020
35	counter balance valve application, hydraulic cylinder sequencing circuits	L+D	BB+LCD	1	34	07-11-2020
36	cylinder synchronizing circuit using different methods	L+D	BB+LCD	1	35	10-11-2020
37	hydraulic circuit for force multiplication; speed control of hydraulic cylinder- metering in, metering out and bleed off circuits	L+D	BB+LCD	1	36	11-11-2020
38	Pilot pressure operated circuits	L+D	BB+LCD	1	37	13-11-2020
39	INTERNAL ASSESMENT - II					18-11-2020
40	Hydraulic circuit examples with accumulator.	L+D	BB+LCD	1	38	20-11-2020
MODULE 4: Pneumatic Power Systems						
41	Introduction to Pneumatic systems: Pneumatic power system	L+D	BB+LCD	1	39	21-11-2020
42	Pneumatic power system: advantages, limitations, applications, Choice of working medium	L+D	BB+LCD	1	40	24-11-2020
43	Characteristics of compressed air and air compressors	L+D	BB+LCD	1	41	25-11-2020
44	Structure of pneumatic control System	L+D	BB+LCD	1	42	27-11-2020
45	fluid conditioners-dryers and FRL unit	L+D	BB+LCD	1	43	01-12-2020
46	Pneumatic Actuators: Linear cylinder, types of cylinders, working, end position cushioning, seals, mounting arrangements, and applications	L+D	BB+LCD	1	44	02-12-2020
47	Rotary cylinders- types, construction and application, symbols.	L+D	BB+LCD	1	45	04-12-2020
48	Pneumatic Control Valves: DCV such as poppet, spool, suspended seat type slide valve	L+D	BB+LCD	1	46	05-12-2020
49	pressure control valves, flow control valves, types and construction	L+D	BB+LCD	1	47	08-12-2020
50	use of memory valve, Quick exhaust valve	L+D	BB+LCD	1	48	09-12-2020
51	time delay valve, shuttle valve, twin pressure valve, symbols	L+D	BB+LCD	1	49	11-12-2020
Module 5: Pneumatic control circuits						

52	Simple Pneumatic Control: Direct and indirect actuation pneumatic cylinders	L+D	BB+LCD	1	50	15-12-2020
53	speed control of cylinders - supply air throttling and exhaust air throttling	L+D	BB+LCD	1	51	16-12-2020
54	Signal Processing Elements: Use of Logic gates - OR and AND gates in pneumatic applications	L+D	BB+LCD	1	52	18-12-2020
55	Practical examples involving the use of logic gates.	L+D	BB+LCD	1	53	19-12-2020
56	Multi- Cylinder Application: Coordinated and sequential motion control, motion and control diagrams	L+D	BB+LCD	1	54	22-12-2020
57	Signal elimination methods, Cascading method- principle	L+D	BB+LCD	1	55	23-12-2020
58	Practical application examples (up to two cylinders) using cascading method (using reversing valves).	L+D	BB+LCD	1	56	29-12-2020
59	Electro- Pneumatic Control: Principles, signal input and output.	L+D	BB+LCD	1	57	30-12-2020
60	Pilot assisted solenoid control of directional control valves.	L+D	BB+LCD	1	58	01-01-2021
61	Use of relay and contactors, Control circuitry for simple signal cylinder application.	L+D	BB+LCD	1	59	02-01-2021
62	INTERNAL ASSESMENT - III					12-01-2021
63	Revision	L+D	BB+LCD	1	60	15-01-2021
64	Revision	L+D	BB+LCD	1	61	16-01-2021

Text Books:

1. Anthony Esposito, "Fluid Power with applications", Pearson edition, 2000.
2. Majumdar S.R., "Oil Hydraulics", Tala McGRaw HllL, 2002.
3. Majumdar S.R., "Pneumatic systems - Principles and Maintenance", Tata McGraw-Hill, New Delhi, 2005

Reference Books:
1. 1. John Pippenger, Tyler Hicks, "Industrial Hydraulics", McGraw Hill International Edition, 1980.
2. Andrew Par, Hydraulics and pneumatics, Jaico Publishing House, 2005.
3. FESTO, Fundamentals of Pneumatics, Vol I, II and III.
4. Herbert E. Merritt, "Hydraulic Control Systems", John Wiley and Sons, Inc.
5. Thomson, Introduction to Fluid power, Prentcie HaIl, 2004

6. John Watton, "Fundamentals of fluid power control", Cambridge University press, 2012.

<u>Web Materials:</u>

- fluidpowerjournal.com
- https://www.tandfonline.com/toc/tjfp20/current
- https://www.sciencedirect.com/science/book/9780750600156

<u>Details for the teaching Aids</u>

Use of projector to show students videos in order to enhance their perception.

Signature of course incharge   **Signature of HOD**

K S INSTITUTE OF TECHNOLOGY
Bengaluru-560109
Department of Mechanical Engineering

Academic year: 2020-2021   **Sem: VI**   Section: A
Subject: FINITE ELEMENT METHODS   **Sub code: 18ME61**
Faculty: RANGANATH N

Course Objectives:

1. To learn basic principles of finite element analysis procedure.

2. To learn the theory and characteristics of finite elements that represent engineering structures.

3. To learn and apply finite element solutions to structural, thermal, dynamic problem to develop the knowledge and skills needed to effectively evaluate finite element analyses

Course Outcomes:

CO1	Identify the basic procedures implemented in FEM along with reduction of execution time and memory requirements for given engineering problem
CO2	Construct the basic algorithms or numerical procedures to solve simple bar and truss problems subjected to axial loading
CO3	Make use of finite element matrix to solve lateral and torsional loaded members confined to regular shapes
CO4	Construct the fundamental numerical procedures required to solve thermal and fluid flow problems confined to simple loading conditions
CO5	Establish a relation between mass and stiffness matrix to solve dynamic problems along with axisymmetric ring elements

Lesson Planning

SLNO	Module	Topics	Date planned	CO Mapping
		MODULE-1		
1	1	**Introduction to Finite Element Method** : General description of the finite element method	19/4/2021	
2	1	Engineering applications of finite element method	20/4/2021	
3	1	Boundary conditions: homogeneous and non homogeneous for structural, heat transfer and fluid flow problems	21/4/2021	
4	1	Boundary conditions: homogeneous and non homogeneous for structural, heat transfer and fluid flow problems	22/4/2021	CO1
5	1	Potential energy method, Rayleigh Ritz method, Galerkin's method,	24/4/2021	
6	1	Potential energy method, Rayleigh Ritz method, Galerkin's method,	26/4/2021	
7	1	Displacement method of finite element formulation. Convergence criteria, Discretisation process,	27/4/2021	
8	1	Displacement method of finite element formulation. Convergence criteria, Discretisation process,	28/4/2021	

9	1	Plain stress and Plain strain conditions, temperature effects	29/4/2021	CO1
10	1	Plain stress and Plain strain conditions, temperature effects	3/5/2021	
11	1	**Interpolation models**: Simplex, complex and multiplex elements,	4/5/2021	
12	1	Linear interpolation polynomials in terms of global coordinates 1D, 2D, 3D Simplex Elements.	5/5/2021	
13	1	Linear interpolation polynomials in terms of global coordinates 1D, 2D, 3D Simplex Elements.	6/5/2021	
14	1	Linear interpolation polynomials in terms of global coordinates 1D, 2D, 3D Simplex Elements.	8/5/2021	
15	1	Linear interpolation polynomials in terms of global coordinates 1D, 2D, 3D Simplex Elements.	10/5/2021	
16	2	**One-Dimensional Elements-Analysis of Bars and Trusses**: Linear interpolation polynomials in terms of local coordinate's for 1D, 2D elements	11/5/2021	CO2
17	2	Constant strain triangle, Four-Nodded Tetrahedral Element (TET 4)	12/5/2021	
18	2	Eight-Nodded Hexahedral Element (HEXA 8), 2D isoparametric element, Lagrange interpolation functions	17/5/2021	
19	2	Numerical integration: Gaussian quadrature one point, two point formulae, 2D integrals	18/5/2021	
20	2	Numerical integration: Gaussian quadrature one point, two point formulae, 2D integrals	19/5/2021	
21	2	Force terms: Body force, traction force and point loads, conduction, convection, radiation	20/5/2021	
22	2	stepped bars and tapered bars using elimination approach and penalty approach	22/5/2021	
23	2	**1st INTERNAL TEST**	24/5/2021	
24	2	stepped bars and tapered bars using elimination approach and penalty approach	27/5/2021	
25	2	stepped bars and tapered bars using elimination approach and penalty approach	31/5/2021	
26	2	Analysis of trusses.	1/6/2021	
27	2	Analysis of trusses.	2/6/2021	
28	2	Analysis of trusses.	3/6/2021	
29	3	**Beams and Shafts:** Boundary conditions, Load vector, Hermite shape functions	5/6/2021	CO3
30	3	Beam stiffness matrix based on Euler-Bernoulli beam theory,	7/6/2021	
31	3	Numerical problems on simply supported, fixed straight and stepped beams using direct stiffness method with concentrated and UDL	8/6/2021	
32	3	Numerical problems on simply supported, fixed straight and	9/6/2021	

		stepped beams using direct stiffness method with concentrated and UDL		
33	3	Numerical problems on simply supported, fixed straight and stepped beams using direct stiffness method with concentrated and UDL	10/6/2021	
34	3	Numerical problems on simply supported, fixed straight and stepped beams using direct stiffness method with concentrated and UDL	14/6/2021	
35	3	**Torsion of Shafts:** Finite element formulation of shafts	15/6/2021	
36	3	Determination of stress and twists in circular shafts.	16/6/2021	
37	3	Determination of stress and twists in circular shafts. Consistent element mass matrix of one dimensional bar element	17/6/2021	
38	4	**Heat Transfer:** Basic equations of heat transfer: Energy balance equation,	19/6/2021	
39	4	Rate equation: conduction, convection, radiation,	21/6/2021	
40	4	energy generated in solid, energy stored in solid, 1D finite element formulation using vibrational method	22/6/2021	
41	4	energy generated in solid, energy stored in solid, 1D finite element formulation using vibrational method	23/6/2021	
42	4	Problems with temperature gradient and heat fluxes, heat transfer in composite sections, straight fins.	24/6/2021	
43		**2nd INTERNAL TEST**	28/6/2021	
44	4	Problems with temperature gradient and heat fluxes, heat transfer in composite sections, straight fins.	1/7/2021	CO4
45	4	**Fluid Flow**: Flow through a porous medium	3/7/2021	
46	4	Flow through pipes of uniform and stepped sections.	5/7/2021	
47	5	**Axi-symmetric Solid Elements**: Derivation of stiffness matrix of axisymmetric bodies with triangular elements,	6/7/2021	
48	5	Axi-symmetric Solid Elements: Derivation of stiffness matrix of axisymmetric bodies with triangular elements,	7/7/2021	
49	5	Numerical solution of axisymmetric triangular element(s) subjected to point loads.	8/7/2021	
50	5	Numerical solution of axisymmetric triangular element(s) subjected to point loads.	12/7/2021	
51	5	**Dynamic Considerations**: Formulation for point mass,	13/7/2021	
52	5	Consistent element mass matrix of one dimensional bar element,	15/7/2021	
53	5	Truss element, Lumped mass matrix of bar element, truss element.	17/7/2021	CO5
54		**3rd INTERNAL TEST**		

55	5	Truss element, Lumped mass matrix of bar element, truss element.	19/7/2021	
56	5	Truss element, Lumped mass matrix of bar element, truss element.	20/7/2021	
57	5	Truss element, Lumped mass matrix of bar element, truss element.	22/7/2021	
58	5	Truss element, Lumped mass matrix of bar element, truss element.	26/7/2021	
59		Revision	27/7/2021	
60		Revision	28/7/2021	
61		Revision	7/8/2021	

Signature of Faculty   **Signature of HOD**

K.S. INSTITUTE OF TECHNOLOGY BANGALORE

#14, Raghuvanahalli, Kanakapura Main Road, Bengaluru-5600109

DEPARTMENT OF MECHANICAL ENGINEERING

Design of Machine Elements-2 - Course Plan

COURSE INCHARGE   : **Mr. Anilkumar A**
COURSE CODE/NAME   : **18ME62 / DESIGN OF MACHINE ELEMENTS-2**
SEMESTER/SEC/YEAR   : **VI 'B'/ III**
ACADEMIC YEAR   : **2020-2021**

Sl. No.	Topic to be covered	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date
	MODULE-1					
1.	Springs: Types of springs, spring materials, stresses in helical coil springs of circular and non-circular cross sections, Tension and compression, springs, concentric springs; springs under fluctuating loads.	L+D	BB	2	2	19-04-2021 21-04-2021
2.	Leaf Springs: Stresses in leaf springs, equalized stresses, and nipping of leaf springs. Introduction to torsion and Belleville springs. Numerical Problems	L+D	BB	3	5	22-04-2021 23-04-2021 24-04-2021
3.	Numerical Problems on Springs	L+DE	BB	4	9	26-04-2021 28-04-2021 29-04-2021 30-04-2021
4.	Belts: Materials of construction of flat and V belts, power rating of belts, concept of slip and creep, Initial tension, effect of centrifugal tension, maximum power condition	L+AV	LCD	2	11	03-05-2021 05-05-2021
5.	Selection of flat and V belts-length & cross section from manufacturers' catalogues. Construction and application of timing belts. Numerical Problems	L+D	BB	2	13	06-05-2021 07-05-2021
6.	Wire ropes: Construction of wire ropes, stresses in wire ropes, and selection of wire ropes.	L+ D	BB	1	14	08-05-2021

7.	Chain drive: Types of power transmission chains, modes of failure for chain, and lubrication of chains	L+ D	BB	1	15	10-05-2021
MODULE 2						
8.	Gear drives: Classification of gears, materials for gears, standard systems of gear tooth, gear tooth failure modes and lubrication of gears.	L+D	LCD	2	17	12-05-2021 17-05-2021
9.	Spur Gears: Definitions, stresses in gear tooth: Lewis equation, form factor, design for strength, dynamic load and wear.	L+D	BB	2	19	19-05-2021 20-05-2021
10.	Numerical Problems on Spur Gears	L+D	BB	4	23	21-05-2021 27-05-2021 28-05-2021 31-05-2021
11.	FIRST CIE			1	26	24-05-2021
12.	Helical Gears: Definitions, transverse and normal module, formative number of teeth	L+D	LCD	1	27	02-06-2021
13.	Design based on strength, dynamic load and wear.	L+D	BB	1	28	03-06-2021
14.	Numerical Problems on Helical Gears	L+D	BB	4	32	04-06-2021 05-06-2021 07-06-2021 09-06-2021
MODULE 3						
15.	Bevel Gears: Definitions, formative number of teeth, design based on strength, dynamic load and wear.	L+D	BB	2	34	10-06-2021 11-06-2021
16.	Numerical Problems Based on Bevel Gears	L+D	BB	3	37	14-06-2021 16-06-2021 17-06-2021
17.	Worm Gears: Definitions, types of worm and worm gears, and materials for worm and worm wheel, Design based on strength, dynamic, wear loads and efficiency of worm gear drives	L+D	LCD	1	38	18-06-2021

18.	Numerical Problems Based on Worm Gears	L+D	BB	3	41	19-06-2021 21-06-2021 23-06-2021
MODULE 4						
19.	Design of Clutches: Necessity of a clutch in automobile, Types of clutches, friction materials and their applications.	L+D	LCD	1	42	24-06-2021
20.	Design of single plate, multi-plate and cone clutches based on uniform pressure and uniform wear theories.	L+D	LCD	1	43	25-06-2021
21.	SECOND CIE			1	44	28-06-2021
22.	Numerical examples on single and multi-plate clutches	L+D	BB	2	46	01-07-2021 02-07-2021
23.	Design of Brakes: Different Types of Brakes, Concept of self-energizing and self-locking of brakes. Practical examples	L+D	BB	3	49	03-07-2021 05-07-2021 07-07-2021
24.	Design of band brakes, block brakes and internal expanding brakes.	L+D	LCD	1	50	08-07-2021
25.	Numerical Problems based on Brakes	L+D	BB	3	53	09-07-2021 12-07-2021 14-07-2021
MODULE 5						
26.	Lubrication and Bearings: Lubricants and their properties, bearing materials, properties; mechanisms of lubrication, hydrodynamic lubrication, pressure development in oil film, bearing modulus, coefficient of friction	L+D	LCD	2	55	15-07-2021 16-07-2021
27.	Minimum oil film thickness, heat generated, and heat dissipated	L+D	LCD	1	56	17-07-2021
28.	Numerical examples on hydrodynamic journal bearing	L+D	BB	4	60	22-07-2021 23-07-2021 26-07-2021 28-07-2021

29.	THIRD CIE			1	61	29-07-2021
30.	Anti-friction bearings: Types of rolling contact bearings and their applications, static and dynamic load carrying capacities, equivalent bearing load, load life relationship, selection of deep grove ball bearings from the manufacturers' catalogue, election of bearings subjected to cyclic loads and speeds; probability of survival.	L+D	LCD + BB	1	62	06-08-2021
31.	Numerical on Anti friction Bearings	L+D	BB	1	63	07-08-2021

Text Books:

1. Design of Machine Elements, V.B. Bhandari, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2nd Edition 2007

2. Richard G. Budynas,and J. Keith Nisbett,**"Shigley's Mechanical Engineering Design",** McGraw-Hill Education, 10th Edition, 2015.

Reference Books:

1. Robert L. Norton "Machine Design- an integrated approach", Pearson Education, 2nd edition.

2. Hall, Holowenko, Laughlin (Schaum's Outline Series), "Machine design" adapted by S.K.Somani, Tata McGrawHill Publishing Company Ltd., Special Indian Edition, 2008.

Web Materials:

W1: https://nptel.ac.in/downloads/112105125/

W2: https://proceedings.asmedigitalcollection.asme.org/

W3: https://stemez.com/subjects/technology_engineering/1GMachineDesign/1GMachineDesign.php

Details for the teaching Aids

LCD projectors will be used where ever necessary and since this is problematic subject Black Board Teaching will be used

Signature of Course In charge   **Signature of Module Coordinator**   **Signature of   HOD**

4

K.S. INSTITUTE OF TECHNOLOGY BANGALORE

#14, Raghuvanahalli, Kanakapura Main Road, Bengaluru-5600109

DEPARTMENT OF MECHANICAL ENGINEERING
Supply Chain Management – Lesson Plan

NAME OF THE STAFF   : RAJESH G L
SUBJECT CODE/NAME   : 18ME653/ Supply Chain Management
SEMESTER/YEAR   : VIth / 3rd / A Section
ACADEMIC YEAR   : 2020-2021 [Even semester]

Sl. No.	Topic to be covered	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date
		MODULE 1				
1	Introduction to Supply Chain	ONLINE	Microsoft Teams	1	1	19-04-2021
2	Supply Chain Fundamentals –- Importance	ONLINE	Microsoft Teams	1	2	20-04-2021
3	Importance of Supply Chain	ONLINE	Microsoft Teams	1	3	21-04-2021
4	Evolution- Role in Economy	ONLINE	Microsoft Teams	1	4	26-04-2021
5	Decision Phases	ONLINE	Microsoft Teams	1	5	27-04-2021
6	Supplier Manufacturer-Customer chain.	ONLINE	Microsoft Teams	1	6	28-04-2021
7	Enablers/ Drivers of Supply Chain Performance.	ONLINE	Microsoft Teams	1	7	30-04-2021
8	Supply chain strategy	ONLINE	Microsoft Teams	1	8	03-05-2021
9	Supply Chain Performance Measures	ONLINE	Microsoft Teams	1	9	04-05-2021
10	Case Studies	ONLINE	Microsoft Teams	1	10	07-05-2021
		MODULE 2				
11	Strategic Sourcing Outsourcing	ONLINE	Microsoft Teams	1	11	08-05-2021
12	Make Vs buy	ONLINE	Microsoft Teams	1	12	10-05-2021

13	Identifying core processes	ONLINE	Microsoft Teams	1	13	11-05-2021
14	Market Vs Hierarchy	ONLINE	Microsoft Teams	1	14	12-05-2021
15	Make Vs buy continuum	ONLINE	Microsoft Teams	1	15	17-05-2021
16	Sourcing strategy	ONLINE	Microsoft Teams	1	16	18-05-2021
17	Supplier Selection and Contract Negotiation	ONLINE	Microsoft Teams	1	17	19-05-2021
18	Creating a world class supply base	ONLINE	Microsoft Teams	1	18	21-05-2021
19	Supplier Development	ONLINE	Microsoft Teams	1	19	28-05-2021
20	World Wide Sourcing	ONLINE	Microsoft Teams	1	20	31-05-2021
MODULE 3						
21	Warehouse Management & Stores management	ONLINE	Microsoft Teams	1	21	01-06-2021
22	Store's systems and procedures	ONLINE	Microsoft Teams	1	22	02-06-2021
23	Incoming materials control	ONLINE	Microsoft Teams	1	23	04-06-2021
24	stores accounting and stock verification	ONLINE	Microsoft Teams	1	24	05-06-2021
25	Obsolete, surplus and scrap-value analysis in material handling	ONLINE	Microsoft Teams	1	25	07-06-2021
26	Transportation and Traffic management	ONLINE	Microsoft Teams	1	26	08-06-2021
27	-operational efficiency-productivity-cost effectiveness-performance measurement.	ONLINE	Microsoft Teams	1	27	09-06-2021
28	Supply Chain Network Distribution Network Design – Role - Factors Influencing Options, Value Addition –	ONLINE	Microsoft Teams	1	28	11-06-2021
29	-stores systems and procedures-	ONLINE	Microsoft Teams	1	29	14-06-2021
30	Distribution Strategies - Models for Facility Location and Capacity allocation	ONLINE	Microsoft Teams	1	30	15-06-2021
31	Distribution Center Location Models	ONLINE	Microsoft Teams	1	31	16-06-2021

MODULE 4						
32	Supply Chain Network optimization models	ONLINE	Microsoft Teams	1	32	18-06-2021
33	Impact of uncertainty on Network Design	ONLINE	Microsoft Teams	1	33	19-06-2021
34	Network Design decisions using Decision trees	ONLINE	Microsoft Teams	1	34	21-06-2021
35	Planning Demand	ONLINE	Microsoft Teams	1	35	22-06-2021
36	Multiple item - multiple location inventory management.	ONLINE	Microsoft Teams	1	36	23-06-2021
37	Pricing Management	ONLINE	Microsoft Teams	1	37	25-06-2021
38	Revenue Management	ONLINE	Microsoft Teams	1	38	02-07-2021
39	Supply Chain restructuring	ONLINE	Microsoft Teams	1	39	03-07-2021
40	Supply Chain Mapping	ONLINE	Microsoft Teams	1	40	05-07-2021
41	Case Studies	ONLINE	Microsoft Teams	1	41	06-07-2021
MODULE 5						
42	Current Trends: Supply Chain Integration	ONLINE	Microsoft Teams	1	42	07-07-2021
43	Building partnership and trust in Supply chain Value of Information	ONLINE	Microsoft Teams	1	43	16-07-2021
44	Bullwhip Effect	ONLINE	Microsoft Teams	1	44	17-07-2021
45	Effective forecasting - Coordinating the supply chain	ONLINE	Microsoft Teams	1	45	19-07-2021
46	Supply Chain process restructuring,	ONLINE	Microsoft Teams	1	46	20-07-2021
47	Postpone the point of differentiation –	ONLINE	Microsoft Teams	1	47	23-07-2021
48	IT in Supply Chain	ONLINE	Microsoft Teams	1	48	26-07-2021
49	Agile Supply Chains -Reverse Supply chain	ONLINE	Microsoft Teams	1	49	27-07-2021
50	Future of IT in supply chain- E Business in supply chain.	ONLINE	Microsoft Teams	1	50	28-07-2021

51	Revision	ONLINE	Microsoft Teams	1	51	30-07-2021
52	Revision	ONLINE	Microsoft Teams	1	52	31-07-2021
53	Revision	ONLINE	Microsoft Teams	1	53	02-08-2021
54	Revision	ONLINE	Microsoft Teams	1	54	03-08-2021
55	Revision	ONLINE	Microsoft Teams	1	55	04-08-2021

Signature of faculty incharge   **Signature of HOD**

K.S. INSTITUTE OF TECHNOLOGY BANGALORE

#14, Raghuvanahalli, Kanakapura Main Road, Bengaluru-5600109

DEPARTMENT OF MECHANICAL ENGINEERING

Theory of Elasticity - Course Plan

COURSE INCHARGE   **: Mr. Anilkumar A**
COURSE CODE/NAME   **: 18ME643 / THEORY OF ELASTICITY**
SEMESTER/SEC/YEAR   **: VI 'A & B'/ III**
ACADEMIC YEAR   **: 2020-2021**

Sl. No.	Topic to be covered	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date
			MODULE-1			
1.	**Analysis of Stress:** Definition and notation of stress, Equations of equilibrium in differential form	L+AV	LCD	3	3	19-04-2021 20-04-2021 21-04-2021
2.	Stress components on an arbitrary plane, Equality of cross shear, Numerical.	L+D	BB	3	6	23-04-2021 24-04-2021 26-04-2021
3.	Stress invariants, Principal stresses & Numerical	L+ D	BB	3	9	27-04-2021 28-04-2021 30-04-2021
4.	Octahedral stress, Planes of maximum shear, Stress transformation, Numericals.	L+ D	BB	2	11	03-05-2021 04-05-2021
5.	Plane state of stress, Mohr's diagram for 3dimensional state of stress.	L+D	BB	2	13	05-05-2021 07-05-2021
6.	Numerical Examples.	L+D	BB	2	15	08-05-2021 10-05-2021

1

	MODULE 2					
7.	**Analysis of Strain:** Displacement field, Strains in term of displacement field, Infinitesimal strain at a point	L+D	LCD	2	17	11-05-2021 12-05-2021
8.	shear strains, Strain invariants, Principal strains, Numerical Examples.	L+D	BB	2	19	17-05-2021 18-05-2021
9.	Octahedral strains, Plane state of strain, Compatibility equations, Numerical Examples	L+D	BB	2	21	19-05-2021 21-05-2021
10.	Strain transformation. Principle of super position, Saint Venant principle.	L+D	LCD	2	23	22-05-2021 28-05-2021
11.	FIRST CIE			1	24	26-05-2021
12.	Numerical Examples.	L+D	BB	3	27	31-05-2021 01-06-2021 02-06-2021
	MODULE 3					
13.	Two-Dimensional classical elasticity: Cartesian co-ordinates, Relation between plane stress and plane strain,	L+D	LCD	1	28	04-06-2021
14.	stress functions for plane stress and plane strain state, Airy's stress functions, investigation of Airy's stress function for simple beams.	L+D	BB	2	30	05-06-2021 07-06-2021
15.	Bending of a narrow cantilever beam of rectangular cross section under edge load. Bending of simply supported beam under UDL	L+D	LCD	2	32	08-06-2021 09-06-2021
16.	stress concentration, stress distribution in an infinite plate with a circular hole subjected to uniaxial and biaxial loads	L+D	BB	2	34	11-06-2021 14-06-2021
17.	General equations in polar coordinates, stress distribution symmetrical about an axis, Thick wall cylinder subjected to internal and external pressures.	L+D	BB	2	36	15-06-2021 16-06-2021

18.	Numerical Examples	L+D	BB	3	39	18-06-2021 19-06-2021 21-06-2021
	MODULE 4					
19.	**Stress analysis in Axisymmetric body:** Stresses in rotating discs of uniform thickness	L+D	LCD	2	41	22-06-2021 23-06-2021
20.	Stresses in rotating discs of uniform thickness and cylinders			2	43	25-06-2021 02-07-2021
21.	SECOND CIE			1	44	30-06-2021
22.	Numerical Problems.	L+D	LCD	2	46	05-07-2021 06-07-2021
23.	**Torsion:** Torsion of circular, elliptical and triangular bars	L+D	BB	3	49	07-07-2021 09-07-2021 12-07-2021
24.	Prandtl's membrane analogy, Torsion of thin walled thin tubes, Torsion of thin walled multiple cell closed sections	L+D	LCD + BB	2	51	13-07-2021 14-07-2021 16-07-2021
25.	Numerical Problems	L+D	BB	3	54	17-07-2021 19-07-2021 20-07-2021
	MODULE 5					
26.	**Thermal stress:** Thermo elastic stress strain relations	LCD	LCD	1	55	23-07-2021
27.	equations of equilibrium, thermal stresses in thin circular discs	L+D	BB	2	57	26-07-2021 27-07-2021
28.	equations of equilibrium, thermal stresses in long circular cylinders	L+D	BB	2	59	28-07-2021 06-08-2021
29.	THIRD CIE			1	60	
30.	Numerical Problems.			2	61	07-08-2021

Text Books:

1. Theory of Elasticity, S. P. Timoshenko and J. N Gordier, Mc-Graw Hill International 3rd edition,2010

2. Advanced Mechanics of solids, L. S. Srinath, Tata Mc. Graw Hill, 2009.

Reference Books:

1. Theory of Elasticity, Sadhu Singh, Khanna Publications 2004.

2. Applied Elasticity T.G. Seetharamu and Govindaraju, Interline Publishing 2008.

Details for the teaching Aids

LCD projectors will be used where ever necessary and since this is problematic subject Black Board Teaching will be used

Signature of Course In charge   **Signature of Module Coordinator**   **Signature of   HOD**

KS INSTITUTE OF TECHNOLOGY BANGALORE

DEPARTMENT OF MECHANICAL ENGINEERING

Date: 01-09-2020

COURSE PLAN

Academic Year	2020-2021						
Batch	2017-2021						
Year/Semester/section	IV/VII/ B						
Course Component	Core						
Subject Code-Title	17ME71-ENERGY ENGINEERING						
No. of Students	63						
Schedule	L	4	T	-	P	-	
Name of the Instructor	Mr. PARASHURAM A K				Dept	Mech	

Prerequisite Courses	• Basic knowledge in Energy engineering
Course Objectives	The course objective is to make students of mechanical engineering to learn the basics of automobile engineering and its application.
Course Outcomes (Min 4 Max 6. Out of which one for content beyond syllabus)	CO1 — Summarize the basic concepts of thermal energy systems,
	CO2 — Identify renewable energy sources and their utilization
	CO3 — Understand the basic concepts of solar radiation and analyze the working of solar PV and thermal systems.
	CO4 — Understand principles of energy conversion from alternate sources including wind, geothermal, ocean, biomass, biogas.
	CO5 — Understand the concepts and applications of fuel cells, thermoelectric convertor and MHD generator
Assessment pattern	• Internal Assessment1, Internal Assessment2 & Internal Assessment3 for 60 marks • Model examination for 100 marks • Assignment for 20 marks Portions Covered: • Internal Test1- Module 1 & First Half of Module2. • Internal Test2- Second Half of Module2 & 3rd Module. • Internal Test3- 4th Module and First Half of 5th Module. Model examination- All 5 Modules.

Sl.No	Topic to be covered	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date	Execution Date
1	**Module-1** **Thermal Energy conversion system:** Review of energy scenario in India, General Philosophy and need of Energy, Different Types of Fuels used for steam generation.	L	LCD	1	1	3-9-2020	7/9/2020
2	Equipment for burning coal in lump form, strokers,	L	LCD	1	2	4-9-2020	9/9/2020
3	different types, Oil burners, Advantages and Disadvantages of using pulverized fuel,	L	LCD	1	3	7-9-2020	25/9/2020
4	Equipment for preparation and burning of pulverized coal, unit system and bin system	L	LCD	1	4	9-9-2020	2/10/2020
5	Pulverized fuel furnaces, cyclone furnace, Coal and ash handling,	L	LCD	1	5	10-9-2020	2/10/2020
6	**Generation of steam** using forced circulation, high and supercritical pressures	L	LCD	1	6	11-9-2020	3/10/2020
7	Chimneys: Natural, forced, induced and balanced draft,	L	LCD	1	7	14-9-2020	5/10/2020
8	Calculations and numerical involving height of chimney to produce a given draft. Cooling towers and Ponds.	L	LCD	1	8	16-9-2020	8/10/2020
9	Accessories for the Steam generators such as Superheaters,	L	LCD	1	9	18-9-2020	9/10/2020
10	De-super heater, control of superheaters, Economizers, Air preheatersand re-heaters	L	LCD	1	10	21-9-2020	9/10/2020
11	**Hydro-Electric Energy:** Hydrographs, flow duration and mass curves	L	LCD	1	11	23-9-2020	12/10/2020
12	Unit hydrograph and numerical.	L	LCD	1	12	24-9-2020	14/10/2020
13	Storage and pondage, pumped storage	L	LCD	1	13	25-9-2020	14/10/2020
14	Low, medium and high head plants,	L	LCD	1	14	3-10-2020	15/10/2020

	Penstock, water hammer, surge tanks, gates and valves.						
15	General layout of hydel power plants.	L	LCD	1	15	5-10-2020	16/10/2020
	TEST-1						5-10-2020
16	**Module-2** **Diesel Engine Power System:** Applications of Diesel Engines in Power field.	L	LCD	1	16	8-10-2020	16/10/2020
17	Method of starting Diesel engines.	L	LCD	1	17	9-10-2020	19/10/2020
18	Auxiliaries like cooling and lubrication system,	L	LCD	1	18	12-10-2020	20/10/2020
19	filters, centrifuges, Oil heaters, intake and exhaust system	L	LCD	1	19	14-10-2020	22/10/2020
20	Layout of diesel power plant.	L	LCD	1	20	15-10-2020	23/10/2020
21	**Module-3** **Solar Energy:** Fundamentals; Solar Radiation; Estimation of solar radiation on horizontal and inclined surfaces;	L	LCD	1	21	16-10-2020	23/10/2020
22	Measurement of solar radiation data, Solar	L	LCD	1	22	19-10-2020	28/10/2020
23	Thermal systems: Introduction; Basics of thermodynamics and heat transfer;	L	LCD	1	23	20-10-2020	28/10/2020
24	Flat plate collector; Evacuated Tubular Collector; Solar air collector; S	L	LCD	1	24	22-10-2020	28/10/2020
25	Solar concentrator; Solar distillation; Solar cooker; Solar refrigeration and air conditioning;	L	LCD	1	25	23-10-2020	29/10/2020
26	Thermal energy storage systems, Solar	L	LCD	1	26	28-10-2020	5/11/2020
27	Photovoltaic systems: Introduction; Solar	L	LCD	1	27	29-10-2020	6/11/2020

	cell Fundamentals;						
28	Characteristics and classification; Solar cell:	L	LCD	1	28	5-11-2020	6/11/2020
29	Module, panel and Array construction;	L	LCD	1	29	6-11-2020	7/11/2020
30	Photovoltaic thermal systems	L	LCD	1	30	7-11-2020	9/11/2020
31	**Module-4** **Wind Energy:** Properties of wind, availability of wind energy in India,	L	LCD	1	31	9-11-2020	9/11/2020
32	wind velocity and power from wind; major problems associated with wind power, wind machines;	L	LCD	1	32	12-11-2020	27/11/2020
33	Types of wind machines and their characteristics,	L	LCD	1	33	13-11-2020	27/11/2020
34	horizontal and vertical axis wind mills	L	LCD	1	34	14-11-2020	28/11/2020
	TEST-2						17-11-2020
35	Coefficient of performance of a wind mill rotor(Numerical Examples).	L	LCD	1	35	18-11-2020	28/11/2020
36	Coefficient of performance of a wind mill rotor(Numerical Examples).	L	LCD	1	36	19-11-2020	30/11/2020
37	Tidal Power: Tides and waves as energy suppliers and their mechanics	L	LCD	1	37	20-11-2020	30/11/2020
38	fundamental characteristics of tidal power,	L	LCD	1	38	21-11-2020	2/12/2020
39	fundamental characteristics of tidal power,	L	LCD	1	39	23-11-2020	2/12/2020
40	harnessing tidal energy,	L	LCD	1	40	25-11-2020	4/12/2020
41	**Module-5** **Biomass Energy:** Introduction; Photosynthesis Process;	L	LCD	1	41	26-11-2020	4/12/2020

42	Biofuels; Biomass Resources;	L	LCD	1	42	27-11-2020	5/12/2020
43	Biomass conversion technologies;	L	LCD	1	43	28-11-2020	5/12/2020
44	Urban waste to energy conversion;	L	LCD	1	44	30-11-2020	5/12/2020
45	Biomass gasification	L	LCD	1	45	2-12-2020	14/12/2020
46	**Green Energy:** Introduction: Fuel cells: Overview;	L	LCD	1	46	4-12-2020	14/12/2020
47	Classification of fuel cells;	L	LCD	1	47	5-12-2020	17/12/2020
48	Operating principles; Fuel cell thermodynamics Nuclear, ocean, MHD	L	LCD	1	48	14-12-2020	17/12/2020
49	thermoelectric and geothermal energy applications;	L	LCD	1	49	17-12-2020	18/12/2020
50	Origin and their types; Working principles, Zero energy Concepts.	L	LCD	1	50	17-12-2020	18/12/2020
51	Revision	L	LCD	1	51	18-12-2020	24/12/2020
52	Revision	L	LCD	1	52	18-12-2020	24/12/2020
	TEST-3						4/1/2020

TEXT BOOK:

1. B H Khan, Non-conventional energy resources, 3rd Edition, McGraw Hill Education
2. Principles of Energy conversion, A. W. Culp Jr., McGraw Hill. 1996

REFERENCES:

1. S.P. Sukhatme, Solar Energy: principles of Thermal Collection and Storage, Tata McGraw-Hill (1984).
2. C. S. Solanki, "Solar Photovoltaic's: Fundamental Applications and Technologies, Prentice Hall of India, 2009.
3. L.L. Freris, Wind Energy Conversion Systems, Prentice Hall, 1990.

Course In charge   **HOD/ME**

K.S. INSTITUTE OF TECHNOLOGY BANGALORE

#14, Raghuvanahalli, Kanakapura Main Road, Bengaluru-5600109

DEPARTMENT OF MECHANICAL ENGINEERING

FLUID POWER SYSTEM - Course Plan

NAME OF THE STAFF : Ranganath N

SUBJECT CODE/NAME : 17ME72/ FLUID POWER SYSTEM

SEMESTER/YEAR : VIIth / 4th

ACADEMIC YEAR : 2020-2021

Sl. No.	Topic to be covered	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date
MODULE 1:Introduction to Fluid Power Systems						
1	Fluid power system: components, advantages and applications	L+D	BB+LCD	1	**1**	01-09-2020
2	Transmission of power at static and dynamic states. Pascal's law and its applications	L+ D	BB+LCD	1	2	03-09-2020
3	Fluids for hydraulic system: types, properties, and selection	L+ D	BB+LCD	1	3	04-09-2020
4	Additives, effect of temperature and pressure on hydraulic fluid	L+D	BB+LCD	1	4	05-09-2020
5	Seals, sealing materials, compatibility of seal with fluids	L+D	BB+LCD	1	5	07-09-2020
6	Types of pipes, hoses, and quick acting couplings	L+D	BB+LCD	1	6	08-09-2020
7	Pressure drop in hoses/pipes	L+D	BB+LCD	1	7	10-09-2020
8	Fluid conditioning through filters & strainers	L+D	BB+LCD	1	8	11-09-2020
9	sources of contamination & contamination control	L+D	BB+LCD	1	9	12-09-2020
10	heat exchangers	L+D	BB+LCD	1	10	14-09-2020
MODULE 2: Pumps and Actuators						
11	Classification of pumps, Pumping theory of positive displacement pumps	L+D	BB+LCD	1	11	15-09-2020
12	construction and working of Gear pumps, Vane pumps, Piston pumps	L+D	BB+LCD	1	12	18-09-2020
13	construction and working of fixed and variable displacement pumps, Pump performance characteristics	L+ D	BB+LCD	1	13	19-09-2020
14	pump selection factors, problems on pumps	L+D	BB+LCD	1	14	21-09-2020
15	Accumulators: Types, selection/ design procedure	L+D	BB+LCD	1	15	22-09-2020
16	Applications of accumulators. Types of Intensifiers	L + D	BB+LCD	1	16	24-09-2020

17	Pressure switches /sensor, Temperature switches/sensor, Level sensor.	L+D	BB+LCD	1	17	25-09-2020
18	Actuators: Classification cylinder and hydraulic motors	L+D	BB+LCD	1	18	01-10-2020
19	Hydraulic cylinders, single and double acting cylinder	L+D	BB+LCD	1	19	03-10-2020
20	mounting arrangements, cushioning, special types of cylinders	L+D	BB+LCD	1	20	05-10-2020
21	problems on cylinders	L+D	BB+LCD	1	21	06-10-2020
22	Construction and working of rotary actuators such as gear, vane, piston motors, and Hydraulic Motor	L+D	BB+LCD	1	22	08-10-2020
23	Theoretical torque, power, flowrate, and hydraulic motor performance; numerical problems	L+D	BB+LCD	1	23	09-10-2020
24	Symbolic representation of hydraulic actuators (cylinders and motors).	L+D	BB+LCD	1	24	12-10-2020
MODULE 3: Components and Hydraulic Circuit Design						
25	Classification of control valves, Directional Control Valves-symbolic representation	L+D	BB+LCD	1	25	13-10-2020
26	constructional features of poppet, sliding spool, rotary type valves	L + D	BB+LCD	1	26	15-10-2020
27	constructional features of solenoid and pilot operated DCV, shuttle valve, and check valves	L+D	BB+LCD	1	27	16-10-2020
28	Pressure control valves - types, direct operated types and pilot operated types	L+D	BB+LCD	1	28	19-10-2020
29	Flow Control Valves -compensated and non-compensated FCV	L+D	BB+LCD	1	29	20-10-2020
30	needle valve, temperature compensated, pressure compensated	L+D	BB+LCD	1	30	22-10-2020
31	Pressure and temperature compensated FCV, symbolic representation.	L+D	BB+LCD	1	31	23-10-2020
32	Hydraulic Circuit Design: Control of single and Double -acting hydraulic cylinder	L+D	BB+LCD	1	32	24-10-2020
33	regenerative circuit, pump unloading circuit, double pump hydraulic system	L+D	BB+LCD	1	33	27-10-2020
34	counter balance valve application, hydraulic cylinder sequencing circuits	L+D	BB+LCD	1	34	29-10-2020
35	cylinder synchronizing circuit using different methods	L+D	BB+LCD	1	35	02-11-2020

36	hydraulic circuit for force multiplication; speed control of hydraulic cylinder- metering in, metering out and bleed off circuits	L+D	BB+LCD	1	36	03-11-2020
37	Pilot pressure operated circuits	L+D	BB+LCD	1	37	05-11-2020
38	Hydraulic circuit examples with accumulator.	L+D	BB+LCD	1	38	06-11-2020
MODULE 4: Pneumatic Power Systems						
39	Introduction to Pneumatic systems: Pneumatic power system	L+D	BB+LCD	1	39	12-11-2020
40	Pneumatic power system: advantages, limitations, applications, Choice of working medium	L+D	BB+LCD	1	40	13-11-2020
41	Characteristics of compressed air and air compressors	L+D	BB+LCD	1	41	17-11-2020
42	Structure of pneumatic control System	L+D	BB+LCD	1	42	19-11-2020
43	fluid conditioners-dryers and FRL unit	L+D	BB+LCD	1	43	20-11-2020
44	Pneumatic Actuators: Linear cylinder, types of cylinders, working, end position cushioning, seals, mounting arrangements, and applications	L+D	BB+LCD	1	44	21-11-2020
45	Rotary cylinders- types, construction and application, symbols.	L+D	BB+LCD	1	45	23-11-2020
46	Pneumatic Control Valves: DCV such as poppet, spool, suspended seat type slide valve	L+D	BB+LCD	1	46	24-11-2020
47	pressure control valves, flow control valves, types and construction	L+D	BB+LCD	1	47	26-11-2020
48	use of memory valve, Quick exhaust valve	L+D	BB+LCD	1	48	27-11-2020
49	time delay valve, shuttle valve, twin pressure valve, symbols	L+D	BB+LCD	1	49	30-11-2020
Module 5: Pneumatic control circuits						
50	Simple Pneumatic Control: Direct and indirect actuation pneumatic cylinders	L+D	BB+LCD	1	50	01-12-2020
51	speed control of cylinders - supply air throttling and exhaust air throttling	L+D	BB+LCD	1	51	04-12-2020
52	Signal Processing Elements: Use of Logic gates - OR and AND gates in pneumatic applications	L+D	BB+LCD	1	52	05-12-2020
53	Practical examples involving the use of logic gates.	L+D	BB+LCD	1	53	07-12-2020
54	Multi- Cylinder Application: Coordinated and sequential motion control, motion and control diagrams	L+D	BB+LCD	1	54	08-12-2020
55	Signal elimination methods, Cascading method- principle	L+D	BB+LCD	1	55	08-12-2020

56	Electro- Pneumatic Control: Principles, signal input and output. pilot assisted solenoid control of directional control valves, use of relay and contactors, Control circuitry for simple signal cylinder application	L+D	BB+LCD	1	56	17-12-2020

Text Books:
1. Anthony Esposito, "Fluid Power with applications", Pearson edition, 2000.
2. Majumdar S.R., "Oil Hydraulics", Tala McGRaw HllL, 2002.
3. Majumdar S.R., "Pneumatic systems - Principles and Maintenance", Tata McGraw-Hill, New Delhi, 2005

Reference Books:
1. 1. John Pippenger, Tyler Hicks, "Industrial Hydraulics", McGraw Hill International Edition, 1980.
2. Andrew Par, Hydraulics and pneumatics, Jaico Publishing House, 2005.
3. FESTO, Fundamentals of Pneumatics, Vol I, II and III.
4. Herbert E. Merritt, "Hydraulic Control Systems", John Wiley and Sons, Inc.
5. Thomson, Introduction to Fluid power, Prentcie HaIl, 2004
6. John Watton, "Fundamentals of fluid power control", Cambridge University press, 2012.

Web Materials:
- fluidpowerjournal.com
- https://www.tandfonline.com/toc/tjfp20/current
- https://www.sciencedirect.com/science/book/9780750600156

Signature of course Incharge   **Signature of HOD**

K.S. INSTITUTE OF TECHNOLOGY BANGALORE

#14, Raghuvanahalli, Kanakapura Main Road, Bengaluru-5600109

DEPARTMENT OF MECHANICAL ENGINEERING

Tribology - Course Plan

COURSE INCHARGE **: Mr. Anilkumar A**
COURSE CODE/NAME **: 17ME742 / TRIBOLOGY**
SEMESTER/SEC/YEAR **: VII 'B'/ IV**

Sl. No.	Topic to be covered	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date
MODULE 1						
1.	**Introduction to Tribology:** Historical background, practical importance, and subsequent use in the field.	L+AV	Microsoft Teams	2	2	3/9/2020
2.	**Lubricants:** Types and specific field of applications. Properties of lubricants.	L+D	Microsoft Teams	4	6	4/9/2020 5/9/2020 7/9/2020 10/09/2020
3.	viscosity, its measurement, effect of temperature and pressure on viscosity	L+ D	Microsoft Teams	3	9	11/9/2020 12/9/2020 14/9/2020
4.	lubrication types, standard grades of lubricants, and selection of lubricants.	L+ D	Microsoft Teams	2	11	18/09/2020 19/09/2020
MODULE 2						
5.	**Friction:** Origin, friction	L+D	Microsoft Teams	1	12	21/09/2020
6.	Theories, measurement methods	L+D	Microsoft Teams	3	15	24/09/2020 25/09/2020 26/09/2020

ACADEMIC YEAR **: 2020-2021**

7.	FIRST CIE			1	16	29/09/2020
8.	Friction of metals and non-metals		Microsoft Teams	1	17	01/10/2020
9.	**Wear:** Classification and mechanisms of wear	L+D	Microsoft Teams	2	19	03/10/2020 05/10/2020
10.	delamination theory, debris analysis, testing methods and standards	L+D	Microsoft Teams	2	21	08/10/2020 09/10/2020
MODULE 3						
11.	Hydrodynamic journal bearings: Friction forces and power loss in a lightly loaded journal bearing, Petroff's equation	L+D	Microsoft Teams	3	24	10/10/2020 12/10/2020 15/10/2020
12.	Mechanism of pressure development in an oil film	L+D	Microsoft Teams	1	25	16/10/2020
13.	Reynolds's equation in 2D	L+D	Microsoft Teams	2	27	19/10/2020 22/10/2020
14.	Introduction to idealized journal bearing, load carrying capacity	L+D	Microsoft Teams	2	28	23/10/2020
15.	condition for equilibrium, Somerfield's number and it's significance	L+D	Microsoft Teams	2	30	24/10/2020 29/10/2020
16.	partial bearings, end leakages in journal bearing, numerical examples on full journal bearings only.	L+D	Microsoft Teams	2	32	02/11/2020 05/11/2020
MODULE 4						
17.	**Plane slider bearings with fixed/pivoted shoe:** Pressure distribution, Load carrying capacity, coefficient of friction	L+D	Microsoft Teams	2	34	06/11/2020 09/11/2020

18.	frictional resistance in a fixed/pivoted shoe bearing, center of pressure	L+D	Microsoft Teams	2	36	12/11/2020 13/11/2020
19.	SECOND CIE			1	37	18/11/2020
20.	Numerical examples	L+D	Microsoft Teams	2	39	20/11/2020 21/11/2020
21.	**Hydrostatic Lubrication:** Introduction to hydrostatic lubrication, hydrostatic step bearings		Microsoft Teams	2	41	23/11/2020 26/11/2020
22.	load carrying capacity and oil flow through the hydrostatic step bearing	L+D	Microsoft Teams	2	42	27/11/2020
23.	Numerical examples	L+D	Microsoft Teams	3	45	30/11/2020 04/12/2020 05/12/2020
MODULE 5						
24.	**Bearing Materials**: Commonly used bearings materials, and properties of typical bearing materials	L+D	Microsoft Teams	2	47	07/12/2020 10/12/2020
25.	Advantages and disadvantages of bearing materials	L+D	Microsoft Teams	1	48	11/12/2020
26.	**Introduction to Surface engineering:** Concept and scope of surface engineering.	L+D	Microsoft Teams	2	50	14/12/2020 17/12/2020
27.	Surface modification – transformation hardening, surface melting, thermo chemical processes	L+D	Microsoft Teams	2	52	18/12/2020 19/12/2020
28.	Surface Coating – plating, fusion processes, vapour phase processes	L+D	Microsoft Teams	2	54	21/12/2020 24/12/2020
29.	Selection of coating for wear and corrosion resistance.	L+D	Microsoft Teams	2	56	28/12/2021 31/12/2021
30.	THIRD CIE			1	57	16/01/2021

Text Books:

1. Introduction to Tribology", B. Bhushan, John Wiley & Sons, Inc., New York, 2002.

2. Engineering Tribology", Prasanta Sahoo, PHI Learning Private Ltd, New Delhi, 2011

Reference Books:

1. Introduction to Tribology in bearings", B. C. Majumdar, Wheeler Publishing.

2. "Tribology, Friction and Wear of Engineering Material", I. M.Hutchings, Edward Arnold, London,1992.

Details for the teaching Aids

LCD projectors will be used where ever necessary and since this is problematic subject Black Board Teaching will be used.

Signature of Course In charge   **Signature of Module Coordinator**   **Signature of   HOD**

KS INSTITUTE OF TECHNOLOGY BANGALORE

DEPARTMENT OF MECHANICAL ENGINEERING

NAME OF THE STAFF : MANJUNATHA.B.R

SUBJECT CODE/NAME : 17ME82/Additive Manufacturing

SEMESTER/YEAR : VIII/4th

ACADEMIC YEAR : 2020-2021

Sl. No.	Topic to be covered	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date
	Module-1. Introduction to Additive Manufacturing					
1	Introduction to AM, AM evolution, Distinction between AM & CNC machining, Advantages of AM	L+ D	BB	1	1	19/04/2021
2	**AM process chain:** Conceptualization, CAD, conversion to STL, Transfer to AM, STL file.	L+ D	BB	1	2	20/04/2021
3	Manipulation, Machine setup, build, removal and clean up, post processing	L+ D	BB	1	3	20/04/2021
4	**Classification of AM processes:** Liquid polymer system, Discrete particle system, Molten material systems and Solid sheet system.	L+D	BB	1	4	21/04/2021
5	**Post processing of AM parts:** Support material removal, surface texture improvement, Accuracy improvement, aesthetic improvement	L+ D	BB	1	5	26/04/2021
6	Preparation for use as a pattern, property, Enhancements using non-thermal and thermal techniques	L+ D	BB	1	6	27/04/2021

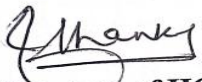| 7	**Guidelines for process selection**: Introduction, selection methods for a part, challenges of process selection	L+D	BB	1	7	27/04/2021
8	**AM Applications:** Functional models, Pattern for investment and vacuum casting, Medical models, art models, Engineering analysis models	L+D	BB	1	8	28/04/2021
9	Rapid tooling, new materials, Development, Bi-metallic parts, Re-manufacturing.	L+ D	BB	1	9	03/05/2021
10	Application examples for Aerospace, Defense, automobile, Bio-medical and general engineering industries	L+D	BB	1	10	04/05/2021
11	Hydraulic System drives and their features	L+ D	BB	1	11	04/05/2021
12	Electrical motors AC/DC and their features	L+D	BB	1	12	05/05/2021
13	**Actuators:** Electrical Actuators; Solenoids, Relays, Diodes, Thrusters, Triacs	L+D	BB	1	13	10/05/2021
14	Hydraulic actuators and their features	L+ D	BB	1	14	11/05/2021
15	Pneumatic actuators and their features	L+D	LCD	1	15	11/05/2021
16	Design of Hydraulic and Pneumatic circuits	L+D	BB	1	16	12/05/2021
17	Piezoelectric actuators and their features	L+ D	BB	1	17	17/05/2021
18	Shape memory alloys and their Characteristics'	L+D	BB	1	18	18/05/2021
Module-2						
19	**General concepts:** Introduction and History of Powder metallurgy	L+D	BB+LCD	1	19	18/05/2021
20	**Powder Production Techniques** Different Mechanical and Chemical methods, Atomization of Powder, other emerging processes	L+D	BB+LCD	1	20	19/05/2021
21	Filters, Tungsten Filaments, Self-Lubricating Bearings, Porous Materials,	L+ D	BB	1	21	31/05/2021

22	Importance of Nano-technology, Emergence of Nanotechnology, Bottom up and Top-down approaches, challenges in Nanotechnology	L+ D	BB	1	22	01/06/2021
23	**POLYMERS: Basic Concepts:** Introduction to Polymers used for additive manufacturing: polyamide, PF resin, polyesters etc. Classification of polymers, Concept of functionality, Polydispersity and Molecular weight [MW], Molecular Weight Distribution [MWD]	L+D	LCD	1	23	01/06/2021
24	**Polymer Processing:** Methods of spinning for additive manufacturing: Wet spinning, Dry spinning. Biopolymers, Compatibility issues with polymers. Moulding and casting of Polymers, Polymer processing techniques	L+D	LCD	1	24	01/06/2021
25	Video on different Polymer Processing Techniques	L+D	BB	1	25	02/06/2021
26	**Microstructure Control in Powder:** Importance of Microstructure Study, Microstructures of Powder by Different techniques	L+D	BB	1	26	07/06/2021
27	**Powder Shaping:** Particle Packing Modifications, Lubricants & Binders, Powder Compaction & Process Variables	L+D	BB	1	27	08/06/2021
28	Pressure & Density Distribution during Compaction, Isotactic Pressing, Injection Molding, Powder Extrusion, Slip Casting, Tape Casting	L+D	BB	1	28	08/06/2021
29	**Sintering:** Theory of Sintering, Sintering of Single & Mixed Phase Powder, Liquid Phase Sintering	L+D	BB	1	29	09/06/2021
30	Modern Sintering Techniques, Physical & Mechanical Properties Evaluation, Structure-Property Correlation Study	L+D	BB	1	30	14/06/2021
31	Modern Sintering techniques, Defects Analysis of Sintered Components	L+D	BB	1	31	15/06/2021
32	**Application of Powder Metallurgy:** Filters, Tungsten Filaments, Self-Lubricating Bearings, Porous Materials, Biomaterials etc.	L+D	LCD	1	32	15/06/2021

	Module-4					
33	**NANO MATERIALS & CHARACTERIZATION TECHNIQUES:** **Introduction:** Importance of Nano-technology, Emergence of Nanotechnology, Bottom up and Top-down approaches, challenges in Nanotechnology	L+D	BB	1	33	21/06/2021
34	Synthesis of Nano-materials sol-gel process; Gas Phase synthesis of Nano-materials- Flame assisted ultrasonic spray pyrolysis	L+D	BB	1	34	22/06/2021
35	GasCondensationProcessing(GPC),ChemicalVapourCondensation(CVC) **Optical Microscopy -** principles, Imaging Modes, Applications, Limitations	L+D	BB	1	35	22/06/2021
36	**Scanning Electron Microscopy (SEM) -** principles, Imaging Modes, Applications, Limitations. **Transmission Electron Microscopy (TEM) -** principles, Imaging Modes, Applications, Limitations	L+D	BB	1	36	23/06/2021
37	.**X- Ray Diffraction (XRD) -** principles, Imaging Modes, Applications, Limitations. **Scanning Probe Microscopy (SPM) -** principles, Imaging Modes, Applications, Limitations	L+D	LCD	1	37	05/07/2021
38	**Atomic Force Microscopy (AFM)** - basic principles, instrumentation, operational modes, Applications, Limitations	L+D	LCD	1	38	06/07/2021
39	**Electron Probe Micro Analyzer (EPMA) -** Introduction, Sample preparation, Working procedure, Applications, Limitations.	L+D	BB	1	39	06/07/2021

	Module-5					
40	Introduction to NC/CNC/DNC machine tools	L+ D	BB	1	40	07/07/2021
41	Classification of NC /CNC machine tools, Advantage, disadvantages of NC	L+D	BB	1	41	12/07/2021
42	Application of NC/CNC Part programming**:** CNC programming and introduction,	L+D	BB	1	42	13/07/2021

43	Manual part programming: Basic (Drilling, milling, turning etc.)	L+ D	BB	1	43	13/07/2021
44	Manual part programming: Basic (Drilling, milling, turning etc.)	L+ D	BB	1	43	14/07/2021
44	Special part programming, Advanced part programming, Computer aided part programming (APT)of automation,	L+D	LCD	1	44	19/07/2021
45	Basic Elements of an automated system. Advanced Automation	L+D	BB	1	45	20/07/2021
46	Levels of Automations, introduction to automation productivity	L+ D	BB	1	46	20/07/2021
47	Industrial control system. Process industry vs discrete manufacturing industries.	L+D	BB	1	47	26/07/2021
48	Continuous and Discrete Control processes and its forms	L+D	BB	1	48	27/07/2021
49	Non Continuous and Discrete System components	L+D	BB	1	49	27/07/2021
50	Video on working of 3D Printer, AM Processes	L+D	LCD	1	50	30/07/2021
51	Video on working of Powder Metallurgy Techniques	L+D	LCD	1	51	30/07/2021
52	Video on working of Optical, Scanning and Transmission Microscope	L+D	LCD	1	52	30/07/2021

Signature of Course in-Charge

Signature of HOD

Head of the Department
Dept. of Mechanical Engg.
K.S. Institute of Technology
Bengaluru - 560 109

Principal

KS INSTITUTE OF TECHNOLOGY BANGALORE

DEPARTMENT OF MECHANICAL ENGINEERING

NAME OF THE STAFF   : HARISH U

SUBJECT CODE/NAME   : 17ME81 / OPERATIONS RESEARCH

SEMESTER/YEAR   : VIII(B) / IV

ACADEMIC YEAR   : 2020-2021

Sl No.	Topic to be covered	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date
1	**Introduction:** Evolution of OR, Definitions of OR	L+D	BB	1	1	19.04.2021
2	Scope of OR, Applications of OR, Phases in OR study. Characteristics and limitations of OR	L+D	BB	1	2	20.04.2021
3	models used in OR, Linear Programming Problem (LPP), Generalized LPP	L+D	BB	1	3	21.04.2021
4	**Introduction of LPP :** Formulation of problems as L.P.P.	L+D	BB	1	4	21.04.2021
5	Numerical problems using mathematical models	L+T	BB	1	5	26.04.2021
6	Numerical problems using mathematical models	L+T	BB	1	6	27.04.2021
7	Numerical problems using mathematical models	L+T	BB	1	7	28.04.2021
8	Solutions to LPP by graphical method (Two Variables).	L+T	BB	1	8	28.04.2021
9	Solutions to LPP by graphical method (Two Variables).	L+T	BB	1	9	03.05.2021
10	Numerical problems on Solutions to LPP by graphical method.	L+T	BB	1	10	04.05.2021
11	**Game Theory**: Definition, Pure Strategy problems	L+D	BB	1	11	05.05.2021
12	Saddle point, Max-Min and Min-Max criteria, Principle of Dominance	L+T	BB	1	12	10.05.2021
13	Solution of games with Saddle point. Mixed Strategy problems.	L+D	BB	1	13	11.05.2021
14	Solution of 2X2 games by Arithmetic method, Solution of 2Xn	L+T	BB	1	14	12.05.2021
15	mX2 games by graphical method. Formulation of games.	L+T	BB	1	15	12.05.2021

16	**Sequencing:** Basic assumptions, Johnson's algorithm,	L+T	BB	1	16	17.05.2021
17	Numerical problems	L+T	BB	1	17	18.05.2021
18	Numerical problems	L+T	BB	1	18	19.05.2021
19	Numerical problems	L+T	BB	1	19	19.05.2021
20	Internal Assessment Test-1					24.05.2021
21	Numerical problems	L+T	BB	1	20	31.05.2021
22	Sequencing 'n' jobs on 2 machines.	L+T	BB	1	21	01.06.2021
23	Sequencing 'n' jobs on'3' jobs on 'm' using priority rules, graphical method.	L+T	BB	1	22	02.06.2021
24	**Simplex method**, Canonical and Standard form of LP problem, slack, surplus and artificial variables	L+D	BB	1	23	02.06.2021
25	Solutions to LPP by Simplex method	L+T	BB	1	24	07.06.2021
26	Solutions to LPP by Simplex method	L+T	BB	1	25	08.06.2021
27	Big-M Method and Two Phase Simplex Method	L+T	BB	1	26	09.06.2021
28	Numerical on Big-M method	L+D	BB	1	27	09.06.2021
29	Degeneracy in LPP. Concept of Duality	L+T	BB	1	28	14.06.2021
30	Concept of Duality, writing Dual of given LPP	L+T	BB	1	29	15.06.2021
31	Solutions to L.P.P by Dual Simplex Method	L+T	BB	1	30	16.06.2021
32	Numerical on Dual Simplex Method	L+T	BB	1	31	16.06.2021
33	Numerical on Dual Simplex Method	L+T	BB	1	32	21.06.2021
34	Analysis of real world problem using Mathematical software.	L+D	LAB	1	33	22.06.2021
35	**Network analysis**: Introduction, Construction of networks, Fulkerson's rule for numbering the nodes, AON and AOA diagrams	L+T	BB	1	35	23.06.2021
36	Critical path method to find the expected completion time of a project	L+T	BB	1	36	23.06.2021
37	Internal Assessment Test-2					28.06.2021
38	determination of floats in networks	L+T	BB	1	37	05.07.2021
39	Numerical on CPM	L+T	BB	1	38	06.07.2021
40	PERT networks, determining the probability of completing a project	L+T	BB	1	39	07.07.2021
41	predicting the completion time of project	L+T	BB	1	40	07.07.2021
42	Problems on PERT	L+T	BB	1	41	12.07.2021
43	Problems on PERT.	L+T	BB	1	42	13.07.2021
44	Cost analysis in networks. Crashing of networks- Problems	L+T	BB	1	43	14.07.2021
45	Cost analysis in networks. Crashing of networks- Problems	L+T	BB	1	44	14.07.2021

46	**Queuing systems** and their characteristics, Pure-birth and Pure-death models	L+T	BB	1	45	19.07.2021
47	Kendall & Lee's notation of Queuing, empirical queuing models	L+T	BB	1	46	20.07.2021
48	Numerical on M/M/1 and M/M/C Queuing models.	L+T	BB	1	47	21.07.2021
49	Numerical on queuing models	L+T	BB	1	48	21.07.2021
50	**Introduction to Transportation Problem**: Formulation of transportation problem, types, initial basic feasible solution using North-West Corner rule	L+T	BB	1	49	26.07.2021
51	Vogel's Approximation method. Optimality in Transportation problem by Modified Distribution(MODI) method	L+D	BB	1	50	27.07.2021
52	Numerical on MODI method	L+T	BB	1	52	27.07.2021
53	Internal Assessment Test-3					29.07.2021
54	Degeneracy in transportation problems, application of transportation problem.	L+T	BB	1	54	2.08.2021
55	Degeneracy in transportation problems, application of transportation problem.	L+T	BB	1	55	3.08.2021
56	**Assignment Problem**-Formulation, Solutions to assignment problems by Hungarian method, Special cases in assignment problems	L+D	BB	1	56	4.08.2021
57	Travelling Salesman Problem (TSP). Difference between assignment and T.S.P,Finding best route by Little's method.	L+T	BB	1	57	4.08.2021

Signature of HOD   **Signature of Principal**