SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

DEPARTMENT MECHANICAL ENGINEERING	LP: **CM18151** Rev. No: 00 Date: 10/11/2022
B.E/B.Tech/M.E/M.Tech : **Elcetrical and Electronics Engineering** Regulation: **2022** PG Specialisation : -NA- Sub. Code / Sub. Name : **CM22151 / BASIC CIVIL AND MECHANICAL ENGINEERING** Unit : I- PART B: OVERVIEW OF MECHANICAL ENGINEERING	

Syllabus:

Overview of Mechanical Engineering - Mechanical Engineering Contributions to the welfare of Specialized sub disciplines in Mechanical Engineering – Manufacturing, Automation, Automobile and Energy Engineering - Interdisciplinary concepts in Mechanical Engineering

Objective:

After the end of this topic students will know the significance of the Mechanical Engineering Profession in satisfying the societal needs

Session No	Topics to be covered	Books Referred	Teaching Method
6	Overview of Mechanical Engineering	R.1, PP:1.69	PPT
7	Mechanical Engineering Contributions to the welfare of Society	R.1, PP:1.69 R.5, PP:4.17-4.20,	PPT
8	Specialized sub disciplines in Mechanical Engineering – Manufacturing, Automation, Automobile and Energy Engineering	R.1, PP:1.75	PPT
9	Interdisciplinary concepts in Mechanical Engineering.	R.1, PP:1.75	PPT
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: **CM22151 / BASIC CIVIL AND MECHANICAL ENGINEERING**

Unit : **IV - INTERNAL COMBUSTION ENGINES AND POWER PLANTS**

Syllabus:

Classification of Power Plants- Working principle of steam, Gas, Diesel, Hydro -electric and Nuclear Power plants- Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines. Working principle of Boilers-Turbines, Reciprocating Pumps (single acting and double acting) and Centrifugal Pumps, Concept of hybrid engines. Industrial safety practices and protective devices.

Objective:

After the end of this topic students will know the working principle of internal combustion engine, Diesel and petrol engines, 2-Stroke and 4-Stroke engines and components and working principle of power plant.

Session No	Topics to be covered	Books Referred	Teaching Method
28	Classification of Power Plants	R.5, PP:4.1-4.5	PPT,BB
29	Working principle of steam Power plants	R.4, PP:4.11-4.12,4.14.	PPT,BB
30	Working principle of Gas and Diesel Power plants	R.4, PP:4.13-4.15,4.16.	PPT,BB
31	Working principle of Hydro -electric and Nuclear Power plants	R.5, PP:4.39-4.44	PPT,BB
	CAT - I		
32	Internal combustion engines as automobile power plant	R.5, PP:4.12-4.16	PPT,BB
33	Working principle of Petrol and Diesel Engines	R.5, PP:4.11-4.12	PPT,BB
34	Working principle Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines.	R.5, PP:4.17-4.20, R.1, PP:4.7-4.8,4.11-4.11	PPT,BB
35	Working principle of Boilers-Turbines	R.5, PP:2.1-2.4, R.1, PP:2.12-2.12	PPT,BB
36	Reciprocating Pumps (single acting and double acting) and Centrifugal Pumps, Concept of hybrid engines. Industrial safety practices and protective devices	R.5, PP:2.4-2.22	PPT,BB
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

Sub. Code / Sub. Name: **CM22151 / BASIC CIVIL AND MECHANICAL ENGINEERING**

Unit : **V - REFRIGERATION AND AIR CONDITIONING SYSTEM**

Syllabus:

Principles of Refrigeration and Air Conditioning. Vapour compression and absorption system–Layout of typical domestic refrigerator–Window and Split type room Air conditioner. Tonnage calculations for refrigerator and air conditioning systems

OBJECTIVE:

After the end of this topic students will have the knowledge about Air-Conditioning, Refrigeration system.

Session No	Topics to be covered	Books Referred	Teaching Method
37	Principle and Terminology used in Refrigeration,	R.5,PP:5.1-5.4	PPT,BB
38	Properties of refrigerants	R.4,PP:4.46-4.48	PPT,BB
39	Working principle of Vapour compression system, merits, demerits and applications.	R.5,PP:5.5-5.7	PPT,BB
	CAT - II		
40	Working principle of Vapour absorption system, merits, demerits and applications.	R.5,PP:5.7-5.10	PPT,BB
41	Comparison of vapour absorption and vapour compression system.	R.5,PP:5.10, R.1, PP:5.6	PPT,BB
42	Brief introduction about Air-Conditioning.	R.5,PP:5.11-5.22	PPT,BB
43	Working principle of Window air-conditioner , Working principle of Split type Air-conditioner	R.1,PP:5.5.8-5.9	PPT,BB
44	Working principle of Central Air-Conditioning System, Comparison of all air-conditioners	R.1,PP:5.5.9-5.10	PPT,BB
45	Tonnage calculations for refrigerator and air conditioning systems	R.1,PP:5.1, 5.5.10-5.11	PPT,BB
	CAT - III		

Content beyond syllabus covered (if any):

* Session duration: 50 mins

OUTCOMES:

The students will be able to

CO1: Summarize the importance of Mechanical engineering towards the welfare of society.
CO4: Explain about the various power plants and the working principles of internal combustion engines used in automotive vehicles.
CO5: Elaborate the working of domestic refrigerator and air conditioners.

TEXT BOOKS:

1. G Shanmugam, M S Palanichamy, Basic Civil and Mechanical Engineering, McGraw Hill Education; First edition, 2018.

REFERENCES:

1. Palanikumar, K. Basic Mechanical Engineering. ARS Publications, 2018.
2. Ramamrutham S., "Basic Civil Engineering", Dhanpat Rai Publishing Co.(P) Ltd, 2013.
3. Seetharaman S., "Basic Civil Engineering", Anuradha Agencies, 2005.
4. Shantha Kumar SRJ., "Basic Mechanical Engineering", Hi-tech Publications, Mayiladuthurai, 2000.
5. Nag P.K, "Power Plant Engineering", Tata McGraw Hill Publishing Co., New Delhi, 2014.
6. Ganesan V, "Internal Combustion Engines", 4th edition, Tata McGraw Hill Publishing Co., New Delhi, 2012.
7. Arora C.P, "Refrigeration and Air Conditioning", Tata McGraw Hill Publishing Co, New Delhi, 2009.

	Prepared by	Approved by
Signature		
Name	**Dr. M. Gajendiran / Dr. V. Arun Prasad Raja**	**Dr. M. Mohandass**
Designation	**ASSISTANT PROFESSOR**	**A.H.O.D**
Date	**10/11/2022**	**10/11/2022**
Remarks *:		
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

Department of Mechanical Engineering	LP: ME 22101
B.E/B.Tech/~~M.E/M.Tech~~ : Common to ME/MN/MAR branches Regulation:2022 CBCS PG Specialization : NA Sub. Code / Sub. Name : ME 22101 - ENGINEERING DRAWING Unit : 0 and 1	Rev. No: 00 Date: 13-11-2022

Unit Syllabus: **CONCEPTS AND CONVENTIONS AND GEOMETRIC CONSTRUCTION (NOT FOR EXAM)**

UNIT 0 2

Importance of drawing in Engineering applications - Use of drafting instruments - BIS conventions and specifications - Size, layout and folding of drawing sheets - Lettering and dimensioning. Geometric construction - to draw perpendiculars, parallel lines, divide a line and circle, to draw equilateral triangle, square, regular polygons.

UNIT 1 CYCLOIDAL CURVES, INVOLUTE AND PROJECTIONS OF POINTS, LINES 10

Basic construction of cycloid, epicycloid and hypocycloid - Drawing of tangents and normal to the above curves. Construction of involutes of square, pentagon and circle - Drawing of tangents and normal to the above involutes.

Orthographic projection – Introduction to Principal Planes of projections - First angle projection - projection of points. Projections of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method.

Session No *	Topics to be covered	Ref	Teaching Aids
1,2	Importance of graphics in Engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Title Block, Usage of Drawing Pencils, Geometrical Constructions. Lettering and dimensioning, Dimensioning system- Aligned and Unilateral system of dimensioning, chain and parallel dimensioning, , Types of lines. https://nptel.ac.in/courses/112103019, https://youtu.be/2uWYn9-M1AU	Ref 2 (Chapter 1&3, pp.1-32 & 33-40 , pp 57-78)	ICT & BB
3,4	Descriptive Drawing- Practice of tutorial Sheet No-1 (lettering and Dimensioning Practice)	Ref 2 (Chapter 1&3, pp.1-32 & 33-40 , pp 57-78)	BB
5,6	Construction of Engineering Curves: Conic Sections – Ellipse, Parabola, Hyperbola using Eccentricity method, Practice of Tutorial Sheet No-II (Conics and special curves)	Ref 2 (Chapter 5, pp.57-78)	BB
7,8	Construction of Cycloid, Epicycloid and Hypo-cycloid and Involute of Circle and Pentagon.	Ref 2 (Chapter 6, pp.79-91)	ICT & BB
9,10	Practice of Tutorial Sheet No.III (Projection of points and straight lines)	Ref 2 (Chapter 7,8,9,) pp.(92-100 ,131-141)	BB
11,12	Projection: Principal Planes, Projection of Points using Four Angles of Projection, Projection of points in first, second, third and fourth quadrants. Introduction to straight lines, Position of straight line in first quadrant with respect to principle planes of	Ref 2 (Chapter 8&9 p.(130-141)	ICT & BB

	projections ,Projection of straight lines (1) Parallel to both HP and VP (2) Parallel to HP and Perpendicular to VP.Projection of straight lines (3) Parallel to VP and perpendicular to HP (4) Parallel to VP and inclined to HP (5) Parallel to HP and inclined to VP (6) Inclined to both HP and VP Practice of Tutorial Sheet No.IV https://youtu.be/ZIZyQbCX30E ,https://youtu.be/8mbLMu1IvUI, https://youtu.be/PgoEg4V-J4Y		

* Session duration: 50 mins :ICT-Power Point presentation, You Tube videos, Google classroom, Assessment tools & DB - Black Board

Sub. Code / Sub. Name: ME 22101 - **ENGINEERING DRAWING**
Unit: II

Unit Syllabus:

UNIT II **PROJECTIONS OF PLANES AND PROJECTIONS OF SOLIDS** 12

Projections of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.
Projections of regular solids like prisms, pyramids, cylinder, cone when the axis is inclined to one of the principal planes and parallel to the other by rotating object method.

Objective: To develop in students graphic skill for to do projection of plane surfaces and solids.

Session No *	Topics to be covered	Ref	Teaching Aids
13,14	Introduction to Projection of planes. Projection of planes Parallel to HP and Perpendicular to VP Parallel to VP and Perpendicular to HP Inclined to HP and Perpendicular to VP,	Ref 2 (Chapter 10, pp.(201-227)	ICT & BB
15,16	Descriptive Drawing -Practice of T utorial sheet no. V (Projection of Planes)	Ref 2 (Chapter 10, pp. (201-227)	BB
	First Assessment Test		
17,18	Projection of solids (1)Solid axis perpendicular to HP and parallel to VP (2) Solid axis perpendicular to VP and parallel to HP (3)Solid axis parallel to both HP and VP	Ref 2 (Chapter 11, pp.(228-295)	ICT & BB
19,20	Practice of tutorial sheet no. VI	Ref 2 (Chapter 11, pp.(228-295)	BB
21,22	Projection of solids (4) Solid axis inclined to HP and parallel to VP (5) Solid axis inclined to VP and parallel to HP	Ref 2 (Chapter 11, pp.(250-295)	ICT & BB
23,24	Practice of Tutorial sheet no. VII- Projections of solids (Axis inclined to one plane)	Ref 2 (Chapter 11, pp.(250-295)	BB

* Session duration: 50 mins: PPT - PowerPoint Presentation: BB - Black Board: DB - Drawing Boar

Sub. Code / Sub. Name: ME 22101- ENGINEERING DRAWING
Unit: III

Unit Syllabus:

UNIT III SECTION OF SOLIDS & DEVELOPMENT OF SURFACES 12

Sectioning of regular solids like prisms, pyramids, cylinder and cone in vertical position when the section plane is inclined to one of the principal planes and perpendicular to the other - Drawing of sectional front and top views and true shape of section.

Development of surfaces of simple and sectioned solids - prisms, pyramids cylinders and cones.

Objective: To develop the students' graphic skill to draw sections of solids and development of surfaces.

Session No *	Topics to be covered	Ref	Teaching Aids
25,26	Section of solids- Introduction, Projection of section of solids • Section plane is parallel to HP and Perpendicular to VP • Section plane is parallel to VP and Perpendicular to HP • Section plane is inclined to HP and Perpendicular to VP	Ref 2 (Chapter 12, pp.(296-348)	ICT & BB
27,28	Descriptive Drawing -Practice of tutorial sheet no. VIII (Sections of solids)	Ref 2 (Chapter 12, pp.(296-348)	BB
29,30	Section of solids- Introduction, Projection of section of solids • Section plane is inclined to VP and Perpendicular to HP • Section plane is perpendicular to both HP and VP https://youtu.be/mvl_AVGuZIA	Ref 2 (Chapter 12, pp.(296-348)	ICT & BB
31,32	Experimental Practice of Tutorial sheet no. VIII (Sections of solids)	Ref 2 (Chapter 12, pp.(296-348)	BB
	Second Assessment Test		
33,34	Development of surfaces – Introduction Development of lateral surfaces of sectioned Prisms and cylinders , sectioned Pyramids and cones, Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.	Ref 2 (Chapter 13, 14pp.(349-401 ,402 -420))	ICT & BB
35,36	Practice of tutorial sheet no. IX (Development of surfaces)	Ref 2 (Chapter 14, pp.(402-420)	BB

* Session duration: 50 mins : PPT - Power Point Presentation : BB - Black Board : DB - Drawing Board

Sub. Code / Sub. Name: ME 22101- ENGINEERING DRAWING
Unit: IV

Unit Syllabus:

UNIT IV ISOMETRIC PROJECTION AND INTERSECTION OF SURFACES 12

Introduction to Pictorial Projection - Principles of isometric projection - Isometric scales - Isometric projection of regular solids (prisms, pyramids, cylinder, cone), truncated solids and their combination in vertical position.

Line of intersection - Determining the line of intersection between surfaces of two interpenetrating solids with axes of the solids intersecting each other perpendicularly, using line method - Intersection of two square prisms and Intersection of two cylinders are only to be considered

Objective: To develop in student's graphic skill to draw isometric projections and intersection of Surfaces

Session No *	Topics to be covered	Ref	Teaching Aids
37,38	Principles of Isometric projection-Isometric scale-, Isometric view Vs Isometric Projection, Isometric projection of simple solids.	Ref. 2 (Chapter 15, pp.(421-472)	ICT & BB
39,40	Experimental Practice of tutorial sheet no.X (Isometric Projection)	Ref. 2 (Chapter 15, pp.(421-472)	BB
41,42	Isometric projection of simple solids,Isometric projection of truncated prisms, cylinders and cones	Ref. 2 (Chapter 15, pp.(421-472)	ICT & BB
43,44	Practice of tutorial sheet no.X (Isometric Projection)	Ref. 2 (Chapter 15, pp.(421-472)	BB
45,46	Line of intersection between surfaces of two interpenetrating solids with axes of the solids intersecting each other perpendicularly, using line method	Ref. 2 (Chapter 15, pp.(421-472)	ICT & BB
47,48	Practice of tutorial sheet no.X (Isometric Projection) https://youtu.be/LcqCeOW1mi4	Ref. 2 (Chapter 15, pp.(421-472)	BB

* Session duration: 50 mins: PPT - Power Point Presentation: BB - Black Board: DB - Drawing Board

Sub Code / Sub Name: **ME 22101-ENGINEERING DRAWING**

Unit Syllabus:

UNIT V FREE-HAND SKETCHING **12**

Free-hand sketching – Sketching procedures – Steps in sketching - Orthographic views (front, top and side views) of simple blocks from their Isometric view, Isometric view of simple blocks from their Orthographic views (front, top and side views)

Objective: To develop the student's graphic skill to draw Free hand Sketching

Session No *	Topics to be covered	Ref	Teaching Aids
49,50	Free-hand sketching – Sketching procedures – Steps in sketching -	Ref. 2 (Chapter 15, pp.(421-472)	ICT & BB
51,52	Experimental Practice of Tutorial sheet no – XII (Free Hand Drawing)	Ref. 2 (Chapter 15, pp.(421-472)	BB
53,54	Orthographic views (front, top and side views) of simple blocks from their Isometric view,	Ref. 2 (Chapter 15, pp.(421-472)	ICT & BB
55,56	Descriptive Drawing Practice of Tutorial sheet no – XII (Free Hand Drawing)	Ref. 2 (Chapter 15, pp.(421-472)	BB
57,58	Isometric view of simple blocks from their Orthographic views (front, top and side views) https://youtu.be/qFSlv3-I7Fo	Ref 2 (Chapter 18, pp. (518-534)	ICT & BB
59,60	Practice of Tutorial sheet no – XII (Free Hand Drawing)	Ref 2 (Chapter 18, pp. (518-534)	BB
.-	**Third Assessment Test**	---	--

* Session duration: 50 mins: PPT - Power Point Presentation: BB - Black Board: DB - Drawing Board

REFERENCES:

Text Books

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019.
2. Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.
3. Venugopal K. and Prabhu Raja V., "Engineering Drawing+AutoCAD", New Age International (P) Limited, 6th edition, 2022.

References:

4. Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2nd Edition, 2019.
5. Parthasarathy N. S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.

Website Resources

1) Engineering Drawing by Dr. Anupam Saxena,Department of Mechanical Engineering,IIT Kanpur,NPTEL
2) https://archive.nptel.ac.in/courses/112/103/112103019/
   Engineering drawing by Dr. Robi P.S.Department of Mechanical Engineering,IIT ,Guwahati, NPTEL

COURSE ARTICULATION MATRIX

	PROGRAM OUTCOMES												PSO		
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1										1					
CO2										2					
CO3										2					
CO4										3					
CO5										3					

	Prepared by	Approved by
Signature	M.Balakumar	
Name	Mr. M.Balakumar	Dr.M.Mohandass
Designation	Assistant Professor	A.H.O.D / Mechanical Engineering
Date	13.11.2022	13.11.2022
Remarks *:		
Remarks *: This Lesson Plan is to be followed for the Academic Year 2021-22 (Odd Sem).		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

DEPARTMENT MECHANICAL ENGINEERING	LP: ME22152 Rev. No: 00 Date: 17/11/2022
B.Tech : **Biotechnology & Chemical Engineering** Regulation: **2022** PG Specialisation : -NA- Sub. Code / Sub. Name : **ME22152 / BASIC MECHANICAL ENGINEERING** Unit : **1 - ENERGY RESOURCES**	

Syllabus:

Classification of Energy Resources - Non-renewable and renewable energy resources. Nonrenewable energy resources – Steam power plant, Nuclear power plant, Hydroelectric power plant, Gas Turbine power plant. Diesel Power plant. Renewable Energy resources Solar Energy, Wind Energy, Bio energy, tidal energy, fuel cells

Objective:

To teach the fundamentals of various energy resources

Session No	Topics to be covered	Books Referred	Teaching Method
1	Classification of Energy Resources - Renewable energy resources	R.3, PP:3.89-3.91	PPT, BB
2	Non-renewable energy resources	R.3, PP:3.91-3.92	PPT, BB
3	Working of a Steam power plant. **Demonstration in Thermal Engineering Lab.**	R.3, PP:3.75-3.76	PPT, BB
4	Nuclear power plant	R.3, PP:3.76-3.80	PPT, BB
5	Hydroelectric power plant	R.3, PP:3.76-3.76	PPT, BB
6	Gas Turbine power plant	R.3, PP:3.76-3.76	PPT, BB
7	Diesel Power plant.	R.3, PP:3.80-3.82	PPT, BB
8	Solar Energy, tidal energy	R.3, PP:3.76-3.76	PPT, BB
9	Wind Energy, Bio energy	R.3, PP:3.85-3.88	PPT, BB
10	Fuel cells	R.3, PP:3.85-3.88	PPT, BB

Content beyond syllabus covered (if any):

Prime movers, Boilers - Requirements of a Good Boiler - Lamont and Benson Boiler, Boiler Accessories, Turbines

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: **ME22152 / BASIC MECHANICAL ENGINEERING**

Unit : **II - INTERNAL COMBUSTION ENGINES**

Syllabus:

Classification, I.C. Engines parts and their function, working of 2 Stroke and 4 stroke engines. Basic terms - Indicated power, brake power frictional power, thermal efficiency, mechanical efficiency (simple problems).

Objective:

To impart the concepts in internal combustion Engines

Session No	Topics to be covered	Books Referred	Teaching Method
11	Introduction and brief discussion about Engines, External combustion engine and Internal combustion engines in automobile power plant, Lubrication system and Classification of IC Engines. **Demonstration in Thermal Engineering Lab.**	R.4, PP:4.319-4.321	PPT, BB
12	Brief explanation about Petrol engines, Merits, Demerits and its applications. **Demonstration in Thermal Engineering Lab.**	R.3, PP:6.192-6.197	PPT, BB
13	Brief explanation about Diesel engines, Merits, Demerits and its applications. **Demonstration in Thermal Engineering Lab.**	R.3, PP:6.192-6.197	PPT, BB
14	Basic terms - Indicated power, brake power, frictional power, thermal efficiency, mechanical efficiency	R.3, PP:6.209-6.211	PPT, BB
	CAT - I		
15	Brief explanation about 2-Stroke engines, Merits, Demerits and its applications.	R.3, PP:6.188-6.197	PPT, BB
16	Brief explanation about 4-stroke engines, Merits, Demerits and its applications.	R.3, PP:6.188-6.197	PPT, BB
17	Simple problems in Diesel Engines	R.3, PP:6.209-6.211	PPT, BB
18	Simple problems in Petrol Engines	R.3, PP:6.209-6.211	PPT, BB

Content beyond syllabus covered (if any): Development of IC Engines, Engine Performance parameters, Combustion and Emission characteristics. Some Recent Developments in Automotive Technology

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: **ME22152 / BASIC MECHANICAL ENGINEERING**

Unit : **III - REFRIGERATION AND AIR CONDITIONING SYSTEM**

Syllabus:

Refrigeration: Types of refrigerants and properties of good refrigerant, Refrigerating effect and unit of Refrigeration (definition). Working principle of vapor Compression refrigeration and vapor absorption refrigeration (with a sketch). Applications areas of a refrigeration system. Basic Calculations. Air Conditioning: Definition, Types, Room air-conditioning working principle (with a sketch), Applications. Calculation of Tonnage requirement based on the room size

OBJECTIVE:

To make the students to understand the working principle of refrigeration and Air conditioning systems

Session No	Topics to be covered	Books Referred	Teaching Method
19	Terminology used in Refrigeration.	R.3, PP:8.239-8.250	PPT, BB
20	Principle of refrigeration effect , Properties of good refrigerant.	R.3, PP:8.239-8.250	PPT, BB
21	Working principle of Vapour compression system, merits, demerits and applications. **Demonstration in Thermal Engineering Lab.**	R.3, PP:8.247-8.250	PPT, BB
22	Working principle of Vapour absorption system, merits, demerits and applications. Comparison of vapour absorption and vapour compression system.	R.3, PP:8.250-8.250	PPT, BB
23	Applications areas of a refrigeration system. Basic Calculations	R.3, PP:8.250-8.250	PPT, BB
24	Brief introduction about Air-Conditioning. **Demonstration in Thermal Engineering Lab.**	R.3, PP:8.264-8.267	PPT, BB
25	Working principle of Window air-conditioner. **Demonstration in Thermal Engineering Lab.**	R.3, PP:8.264-8.267	PPT, BB
26	Working principle of Split type Air-conditioner. **Demonstration in Thermal Engineering Lab.**	R.3, PP:8.264-8.267	PPT, BB
27	Calculation of Tonnage requirement based on the room size	R.3, PP:8.264-8.267	PPT, BB
	CAT - II		

Content beyond syllabus covered (if any):

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: **ME22152 / BASIC MECHANICAL ENGINEERING**

Unit : IV - **MATERIALS AND MANUFACTURING PROCESSES**

Syllabus:

Engineering Materials: Classification – Properties – Alloys and their applications. Manufacturing Processes – classification – Casting – Pattern, Core, Green sand Mould preparation, Investment casting. Metal Joining Process – Arc welding and Gas welding process, Soldering and Brazing – introduction. Metal forming Process – Forging, rolling, Extrusion – introduction, Metal Removal process – Lathe, Milling, Drilling.

OBJECTIVE:

To impart the various engineering materials and their processing methods

Session No	Topics to be covered	Books Referred	Teaching Method
28	Engineering Materials: Classification – Properties – Alloys and their applications	R.3, PP:3.19-3.524 R.4, PP:4.365-4.390	PPT, BB
29	Manufacturing Processes – classification – Casting – Pattern, Core. **Demonstration in Manufacturing Lab.**	R.3, PP:20.597 - 20.600	PPT, BB
30	Green Sand Mould preparation, Investment casting	R.3, PP:20.597 - 20.600	PPT, BB
31	Metal Joining Process – Arc welding and Gas welding process. **Demonstration in Manufacturing Lab.**	R.3, PP:20.622 - 20.628	PPT, BB
32	Introduction about the Working Metal Joining Process – Soldering and Brazing.	R.3, PP:20.645 - 20.646	PPT, BB
33	Introduction about Metal forming Process – Forging.	R.3, PP:20.660 - 20.662	PPT, BB
34	Metal forming Process – Rolling, Extrusion.	R.3, PP:3.657-3.659, PP:3.663-3.664	PPT, BB
35	Introduction about Metal Removal process. **Demonstration in Manufacturing Lab.**	R.3, PP:19.556 - 19.557	PPT, BB
36	Working of Lathe and Milling machines. **Demonstration in Manufacturing Lab, and Basic Workshop.**	R.3, PP:3.581-3.585	PPT, BB
37	Working of a Drilling machine. **Demonstration in Basic Workshop.**	R.1, PP:5.1, 5.5.10-5.11	PPT, BB
	CAT - II		

Content beyond syllabus covered (if any):

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

TEXT BOOKS:

1. Dr Sadhu Singh, Elements of Mechanical Engineering, S. Chand Publishing, 2010.
2. Basant Agrawal, C.M. Agrawal. Basic Mechanical Engineering, Wiley India Pvt Ltd, 2008.
3. Pravin Kumar, Basic Mechanical Engineering, 2nd Edition Pearson India, 2018.
4. R.K. Rajput, Basic Mechanical Engineering, Lakshmi Publications, 2007.
5. Nag, P K, Basic Mechanical Engineering, McGraw-Hill Education (India) Pvt Limited, 2011.

	Prepared by	Approved by
Signature		
Name	**Mr. G. Kirubakaran / Mr. S. Saravanan**	**Dr. S. Ramesh Babu**
Designation	**ASSISTANT PROFESSOR**	**HEAD & PROFESSOR**
Date	**17/11/2022**	**17/11/2022**
Remarks *:		
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE OUTCOMES - THEORY

DEPARTMENT OF MECHANICAL ENGINEERING		CO: **ME22152**
B.E/B.Tech/M.E/M.Tech	: **BIO-TECHNOLOGY & CHEMICAL ENGINEERING**	Rev. No: 00
Regulation	: **2022**	Date:17/11/2022
PG Specialisation	: -	
Sub. Code / Sub. Name	: **ME22152 / BASIC MECHANICAL ENGINEERING**	

CO	STATEMENTS	RBT* Level
CO-1	Students will be able to understand the various energy resources and the principle of their operations	3
CO-2	Students will be able to identify the types of IC engines and will calculate the various parameters	3
CO-3	Students will be able to understand the principle of refrigeration and Air-conditioning	3
CO-4	Students will be able to learn the various Engineering Materials and the manufacturing processes	3
CO-5	Students will be able to know the recent trends in I.C. engines and manufacturing	3

* Revised Bloom's Taxonomy

Mapping CO – PO - PSO:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO-1														
CO-2														
CO-3														
CO-4														
CO-5														

A – Strong; B – Moderate; C - weak

Course Requirements

Assessment Methods

1. Assignment 1 + CAT 1
2. Assignment 2 + CAT 2
3. Assignment 3 + CAT 3

Internals - 40 Marks

4. End semester exam - 60 Marks

Mr.G.Kirubakaran/Mr.S Saravanan **Assistant Professor** **Signature of Faculty / Course Coordinator**	**Dr.S.Saravanan, Professor** **Signature of Module Coordinator**

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

TEXT BOOKS:

1. Dr Sadhu Singh, Elements of Mechanical Engineering, S. Chand Publishing, 2010.
2. Basant Agrawal, C.M. Agrawal. Basic Mechanical Engineering, Wiley India Pvt Ltd, 2008.
3. Pravin Kumar, Basic Mechanical Engineering, 2nd Edition Pearson India, 2018.
4. R.K. Rajput, Basic Mechanical Engineering, Lakshmi Publications, 2007.
5. Nag, P K, Basic Mechanical Engineering, McGraw-Hill Education (India) Pvt Limited, 2011.

	Prepared by	Approved by
Signature		
Name	**Mr. G. Kirubakaran / Mr. S. Saravanan**	**Dr. S. Ramesh Babu**
Designation	**ASSISTANT PROFESSOR**	**HEAD & PROFESSOR**
Date	**17/11/2022**	**17/11/2022**
Remarks *:		
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Mechanical Engineering	LP: Sub Code ME18301
B.E/B.Tech/M.E/M.Tech : Mechanical Regulation: 2018A	Rev. No: 01
PG Specialisation : NA	Date:29.08.2022
Sub. Code / Sub. Name : ME 18301/ Engineering Thermodynamics	
Unit : I	

Unit Syllabus: Basic Concepts and First Law **12**

Basic concepts -concept of continuum, comparison of microscopic and macroscopic approach. Path and point functions. Intensive and extensive properties, total and specific quantities. System and their types. Thermodynamic Equilibrium, State, path and process. Quasi-static, reversible and irreversible processes. Heat and work transfer, definition and comparison, sign convention. Displacement work and other modes of work, P-V diagram. Zeroth law of thermodynamics–concept of temperature and thermal equilibrium–relationship between temperature scales –new temperature scales. First law of thermodynamics–application to non-flow and steady systems–unsteady flow processes (Descriptive only

Objective: To gain knowledge of Thermodynamics concept, I-law of Thermodynamics and its analysis

Session No *	Topics to be covered	Ref	Teaching Aids
1.	Introduction to subject. Continuum principle, Microscopic and Macroscopic approaches. Definition of density and pressure.	1-11- All chapters	ICT
2.	Intensive & Extensive and Total & Specific properties. Pressure, Temperature, Volume, Mass, Enthalpy, Internal energy, Thermodynamic systems-types.	1-ch.1; pg.1-19 2- ch.2-6; pg.36-71 3- ch.2; pg.26-42	ICT
3.	Point & Path functions. Mechanical, Chemical, Thermal & Thermodynamic equilibriums, state, path and process. Reversible & irreversible. Quasi-static process. Cycle.	1-ch.1; pg.1-19 2- ch.2-6; pg.36-71 3- ch.2; pg.26-42	ICT
4.	Heat and Work transfer, Sign convention. Displacement work, Modes of work, p-V diagram. Zeroth law, application of Zeroth law. **Animated demonstration of Zeroth Law of Thermodynamics**	1-ch.1; pg.1-19 2- ch.8-9; pg.82-113 3- ch.2; pg.26-42	ICT
5.	Concept of temperature and thermal equilibrium, Relationship between temperature scales, New temperature scales.	1-ch.1; pg.1-19 2- ch.8-9; pg.82-113 3- ch.2; pg.26-42	ICT
6.	First law for process and cycle. Application of I-law to closed system-Isometric, Isobaric, Isothermal, Isentropic, Polytropic, Free expansion process–W & Q.	1-ch.1; pg.1-19 2- ch.10-11; pg.114-140 3- ch.5; pg.158-162	ICT
7.	Steady flow processes. Governing equations for various thermal equipments. **Power point presentation by students – Participative learning**	1-ch.1; pg.1-19 2- ch.12-13; pg.160-198 3- ch.5; pg.176-194	ICT
8.	Problems on Non-flow processes. **Calculation of Work and Heat Transfer for closed systems– Problem Solving.**	1-ch.1; pg.1-19 2- ch.11; pg.141-159 3.ch.5; pg.163-173	BB,ICT
9.	Problems on Non-flow processes	1-ch.1; pg.1-19 2- ch.12; pg.175-188 3- ch.5; pg.176-194	BB,ICT
10.	Problems on Non-flow processes	1-ch.1; pg.1-19 2- ch.12; pg.175-188 3- ch.5; pg.176-194	BB,ICT
11.	Problems on flow processes	1-ch.1; pg.1-19 2- ch.12-13; pg.160-198 3- ch.5; pg.176-194	BB,ICT
12.	Unsteady flow processes	1-ch.1; pg.1-19 2- ch.12-13; pg.160-198 3- ch.5; pg.176-194	ICT
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes

* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: ME 18301/ **Engineering Thermodynamics**

Unit : II

Unit Syllabus : SECOND LAW AND AVAILABILITY ANALYSIS **12**

Heat reservoirs -source and sink. Heat Engine, Refrigerator, Heat pump. Statements of second law and its corollaries. Carnot and reversed Carnot cycles – Performance. Clausius inequality. Concept of entropy, T-s diagram, **Tds Equations** Entropy change for ideal gases-different processes, principle of increase in entropy. Applications of Second Law. High and low grade energy. Available and unavailable energy. Exergy and Irreversibility (Descriptive Only). First law and second law Efficiency

Objective: To acquire knowledge of II- law of Thermodynamics and its applications

Session No *	Topics to be covered	Ref	Teaching Aids
13	Limitations of I-law, Heat reservoirs-Source and Sink, Heat engines, Reversed heat engines-Refrigerator & Heat Pump. Efficiency of Heat engines & COP of RHEs.	1-ch.1; pg.1-19 2- ch.14-15; pg.206-256 3- ch.6; pg.224-259	ICT
14	II-law-Kelvin-Planck statement – Clausius statement, PMM-II, Carnot cycle, reversed Carnot cycle-Efficiency & COP. Problems on heat & rev heat engines.	1-ch.1; pg.1-19 2- ch.14-15; pg.206-256 3- ch.6; pg.224-259	ICT
15	Problems on Carnot and Reversed Carnot cycles.	1-ch.1; pg.1-19 2- ch.14-15; pg.206-256 3- ch.6; pg.224-259	BB,ICT
16	Problems on Carnot and Reversed Carnot cycles.	1-ch.1; pg.1-19 2- ch.14-15; pg.206-256 3- ch.6; pg.224-259	BB,ICT
17	Clausius inequality, concept of entropy, T-s diagram	1-ch.1; pg.1-19 2- ch.16; pg.259-282 3- ch.7; pg.274-304	ICT
18	Entropy change for ideal gases-different processes, Principle of entropy increase, **Power point presentation by students – Participative learning**	1-ch.1; pg.1-19 2- ch.16; pg.259-282 3- ch.7; pg.274-304	ICT
19	Problems on Entropy change.	1-ch.1; pg.1-19 2- ch.16; pg.283-307 3- ch.7; pg.274-304	BB,ICT
20	Application of II law, High and Low grade energy. Available and Non-available energy.	1-ch.1; pg.1-19 2- ch.17-18; pg.311-367 3- ch.7; pg.319-331	ICT
21	I and II law efficiency.	1-ch.1; pg.1-19 2- ch.19-20; pg.388-419 3- ch.7; pg.319-331	ICT
22	Problems on Availability.	1-ch.1; pg.1-19 2- ch.17-18; pg.311-367 ch.7; pg.319-331	BB,ICT
23	Problems on Entropy change	1-ch.1; pg.1-19 2- ch.16; pg.283-307 3- ch.7; pg.274-304	BB,ICT
24	Exergy and Irreversibility	1-ch.1; pg.1-19 2- ch.19-20; pg.388-419 3- ch.7; pg.319-331	ICT
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes

* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: ME18301/**Engineering Thermodynamics**

Unit : III

Unit Syllabus : PROPERTIES OF PURE SUBSTANCE AND STEAM POWER CYCLE **12**

Formation of steam and its thermodynamic properties, p-v, p-T, T-v, T-s, h-s diagrams. p-v-T surface. Use of Steam Table and Mollier Chart. Determination of dryness fraction. Application of First and Second law for pure substances. Ideal and actual Rankine cycles, Cycle improvement methods-Reheat and Regenerative cycles

Objective: To gain knowledge about properties of pure substances and steam power cycles.

Session No *	Topics to be covered	Ref	Teaching Aids
25	Properties of pure substances in solid, liquid and vapour phases. Formation of steam, T-H diagram.	1-ch.1; pg.1-19 2- ch.21; pg.437-464 3- ch.3; pg.68-74	ICT
26	p-v, p-T, T-v, T-s, h-s diagrams. p-v-T surface, Thermodynamic properties-Enthalpy, entropy, specific volume & Latent heat of steam.	1-ch.1; pg.1-19 2- ch.21; pg.437-464 3- ch.3; pg.74-93	ICT
27	Use of Steam table and Mollier chart. Determination of dryness fraction.	1-ch.1; pg.1-19 2- ch.21; pg.437-464 3- ch.3; pg.74-93	ICT
28	Application of I and II law for pure substance. Problems on properties of steam.	1-ch.1; pg.1-19 2- ch.21; pg.437-464 3- ch.3; pg.74-93	ICT
29	Problems on properties of steam using steam table and chart.	1-ch.1; pg.1-19 2- ch.21; pg.464-498 3- ch.3; pg.74-93	ICT
30	Ideal and Actual Rankine Cycles, Cycle efficiency, Specific steam rate, Specific heat rate, Work ratio. **Video demonstration on Rankine Cycle**	1-ch.1; pg.1-19 2- ch.22; pg.503-576 3- ch.8; pg.377-384	ICT
31	Problems on Rankine Cycle	1-ch.1; pg.1-19 2- ch.22; pg.503-576 3- ch.8; pg.377-384	BB,ICT
32	Cycle improvement method - Reheat cycle .**Calculation of Efficiency for Reheat Cycle– Problem Solving.**	1-ch.1; pg.1-19 2- ch.22; pg.503-576 3- ch.8; pg.377-384	ICT
33	Cycle improvement method- Regenerative cycle	1-ch.1; pg.1-19 2- ch.22; pg.503-576 3- ch.8; pg.384-391	ICT
34	Problems on Reheat and Regenerative Cycles.	1-ch.1; pg.1-19 2- ch.22; pg.576-606 3- ch.8; pg.384-391	BB,ICT
35	Problems on Reheat and Regenerative Cycles	1-ch.1; pg.1-19 2- ch.22; pg.576-606 3- ch.8; pg.384-391	BB,ICT
36	Binary and Combined cycles	1-ch.1; pg.1-19 2- ch.22; pg.503-576 3- ch.8; pg.384-391	ICT

Content beyond syllabus covered (if any):

* Session duration: 50 mins

* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: ME18301/ **Engineering Thermodynamics**

Unit : IV

Unit Syllabus : IDEAL AND REAL GASES, THERMODYNAMIC RELATIONS 12

Properties of Ideal gas -Ideal and real gas comparison-Equations of state for ideal and real gases-Reduced properties-Compressibility factor-Principle of Corresponding states-Simple Calculations using Generalised Compressibility Chart. Maxwell relations, Tds Equations, Difference and ratio of heat capacities, Energy equation, Joule-Thomson Coefficient, Clausius Clapeyron equation, Phase Change Processes.

Objective: **To gain in-depth knowledge of different equations for the analysis of ideal and real gases**

Session No *	Topics to be covered	Ref	Teaching Aids
37	Properties of real and ideal gases, Assumption in ideal gas, Comparison of ideal and real gases. **Power point presentation by students – Participative learning**	1-ch.1; pg.1-19 2- ch.23-24; pg.611-636 3- ch.3; pg.93-111	BB,ICT
38	Avagadro's law. Equation of state. Vander Waals, equation, derivation of Vander Waals equation, Virial expansions, Law of corresponding states, Reduced properties.	1-ch.1; pg.1-19 2- ch.23-24; pg.611-636 3- ch.3; pg.93-111	BB,ICT
39	Compressibility factor, Compressibility factor and Chart	1-ch.1; pg.1-19 2- ch.23-24; pg.611-636 3- ch.3; pg.93-111	BB,ICT
40	Simple Calculations using Generalised Compressibility Chart	1-ch.1; pg.1-19 2- ch.23-24; pg.611-636 3- ch.3; pg.93-111	ICT
41	Problems on ideal and real gases.	1-ch.1; pg.1-19 2- ch.24; pg.637-639 3- ch.3; pg.93-111	ICT
42	Problems on ideal and real gases.	1-ch.1; pg.1-19 2- ch.24; pg.637-639 3- ch.3; pg.93-111	ICT
43	Rules on Partial derivatives, Maxwell's equations,	1-ch.1; pg.1-19 2- ch.27; pg.729-753	ICT
44	Tds equations -Derivation of Difference and Ratio of heat capacities	1-ch.1; pg.1-19 2- ch.27; pg.729-753	ICT
45	Internal energy & enthalpy equations.	1-ch.1; pg.1-19 2- ch.27; pg.729-753 3- ch.3; pg.93-111	ICT
46	Clausius Clapeyron equations	1-ch.1; pg.1-19 2- ch.27; pg.729-753	BB,ICT
47	Joule-Thomson effect and coefficient, Value for ideal and real gases, Inversion curve.	1-ch.1; pg.1-19 2- ch.27; pg.729-753	BB,ICT
48	Phase change processes	1-ch.1; pg.1-19 2- ch.27; pg.729-753	ICT
Content beyond syllabus covered (if any):			

* Session duration: 50 mins
* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: ME18301/ **Engineering Thermodynamics**
Unit : V

Unit Syllabus : GAS MIXTURES AND PSYCHROMETRY 12

Mole and Mass fraction, Dalton's and Amagat's Law. Properties of gas mixture–Molar mass, gas constant, density, change in internal energy, enthalpy, entropy and Gibbs function. Psychrometric properties, Psychrometric charts. Property calculations of air vapour mixtures by using chart and expressions. Psychrometric process –adiabatic saturation, sensible heating and cooling, humidification, dehumidification, evaporative cooling and adiabatic mixing. Simple Applications .

Objective: To gain knowledge of gas mixtures, psychrometry and psychrometric processes

Session No *	Topics to be covered	Ref	Teaching Aids
49	Mole and Mass fraction, Dalton's and Amagat's law, Properities of gas mixtures-M, R, Density, U, H, S and G.	1-ch.1; pg.1-19 2- ch.25; pg.641-656 3- ch.9; pg.420-426	ICT
50	Problems on Gas mixtures.	1-ch.1; pg.1-19 2- ch.25; pg.656-664 3- ch.9; pg.420-426	ICT
51	Psychrometry, Properties, Chart.	1-ch.1; pg.1-19 2- ch.26; pg.667-675 3- ch.9; pg.420-426	ICT
52	Property calculations of air vapour mixtures by using expressions	1-ch.1; pg.1-19 2- ch.26; pg.667-675 3- ch.9; pg.420-426	BB,ICT
53	Property calculations of air vapour mixtures by using chart	1-ch.1; pg.1-19 2- ch.26; pg.667-675 3- ch.9; pg.420-426	ICT
54	Psychrometric processes-Sensible heating, Sensible cooling, Adiabatic saturation. **Power point presentation by students – Participative learning**	1-ch.1; pg.1-19 2- ch.26; pg.676-691 3- ch.9; pg.426-436	ICT
55	Psychrometric processes – Humidification and Dehumidification, Adiabatic dehumidification & humidification,.	1-ch.1; pg.1-19 2- ch.26; pg.676-691 3- ch.9; pg.436-447	ICT
56	Evaporative cooling and Adiabatic mixing	1-ch.1; pg.1-19 2- ch.26; pg.676-691 3- ch.9; pg.436-447	ICT
57	Problems on Sensible heating and cooling using chart and tables.	1-ch.1; pg.1-19 2- ch.26; pg.691-723 3- ch.9; pg.436-447	BB,ICT
58	Problems on Adiabatic mixing of air streams using chart and tables.	1-ch.1; pg.1-19 2- ch.26; pg.691-723 3- ch.9; pg.436-447	BB,ICT
59	Problems on Evaporative cooling.	1-ch.1; pg.1-19 2- ch.26; pg.691-723 3- ch.9; pg.436-447	BB,ICT
60	Application of psychrometry in air conditioning.	1-ch.1; pg.1-19 2- ch.26; pg.691-723 3- ch.9; pg.436-447	ICT
Content beyond syllabus covered (if any):			

* Session duration: 50 mins
* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Units	I			II			III			IV			V		

REFERENCES:

1. Nag.P.K., "Engineering Thermodynamics", 4thEdition, Tata McGraw-Hill, New Delhi, 2008.
2. Natarajan E., "Engineering Thermodynamics: Fundamentals and Applications", Anuragam Publications, 2012.
3. Cengel. Y and M.Boles, "Thermodynamics - An Engineering Approach", 7th Edition, Tata McGraw Hill, 2010.
4. Holman.J.P., "Thermodynamics", 3rd Edition, McGraw-Hill, 1995.
5. Rathakrishnan. E., "Fundamentals of Engineering Thermodynamics", 2nd Edition, Prentice-Hall of India Pvt. Ltd, 2006
6. Chattopadhyay, P, "Engineering Thermodynamics", Oxford University Press, 2010.
7. Arora C.P, "Thermodynamics", Tata McGraw-Hill, New Delhi, 2003.
8. Van Wylen and Sonntag, "Classical Thermodynamics", Wiley Eastern, 1987
9. Venkatesh. A, "Basic Engineering Thermodynamics", Universities Press (India) Limited, 2007.
10. Kau-Fui Vincent Wong, "Thermodynamics for Engineers", CRC Press, 2010 Indian Reprint.
11. Prasanna Kumar, "Engineering Thermodynamics" Pearson Education, 2013

	Prepared by	Approved by
Signature	S. Sar /	
Name	**Dr.S.Saravanan/Dr.S.Natarajan**	**Dr.M.Mohandass**
Designation	**Professor/Associate Professor**	**Assistant HOD**
Date	29.08.2022	29.08.2022
Remarks *:		
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Mechanical Engineering	LP: ME18302 Rev. No: 01 Date: 29/08/2022
B.E/~~B.Tech/M.E/M.Tech~~ : Mechanical Engineering, Regulation: R2018 PG Specialisation : --- Sub. Code / Sub. Name **: ME18302 / MANUFACTUIRNG PROCESSES** Unit : **I**	

Unit Syllabus: **METAL CASTING PROCESSES** **10**

Introduction, Patterns – Materials, Types and Pattern allowances, Cores – Core Prints, Core making and Types of cores, Moulding sand – Properties, types, Moulding Machines – squeeze type, Jolt type and sand slinger, Melting Practices – Cupola and Induction Furnaces, Mould – Expendable and Permanent Mould, Green sand Mould preparation, Special casting Processes – Investment casting, Die casting – Hot chamber and Cold Chamber, Slush Casting, Centrifugal Casting – True, Semi and Centrifuging, Continuous Casting, Shell Moulding, Ceramic Mould Casting, CO_2 Process, Stir Casting Process– Defects in casting

Objective: To make the students to understand various casting process and how to select a particular process based on the applications

Session No *	Topics to be covered	References	Teaching Aids
1	Introduction to Manufacturing Processes – classification of manufacturing processes – Course objective and course outcomes	Ref.1, pp. 1-18	ICT tools
2	Introduction to casting Process – Pattern definition – Pattern materials – pattern types	Ref.1, pp. 307-312	ICT tools
3	Pattern allowances – Problems related to pattern allowances – cores – core print – types of cores – Moulding sand properties	Ref.1, pp. 320, 328-331, 345,368	ICT tools
4	Moulding machines – types – Melting practices – cupola and Induction furnaces – classification of mould – Green sand Mould preparation **(Experiential Learning)**	Ref.1, pp. 364,403-416	ICT tools
5	Special casting Processes – types based on mould and pattern – shell moulding – description	Ref.1, pp. 374	ICT tools
6	Investment casting – description, applications; Die casting – types – Hot chamber and cold chamber die casting	Ref.1, pp. 380-382	ICT tools
7	Centrifugal casting Processes – description , types of centrifugal casting-true centrifugal casting, semi centrifugal casting and centrifuge, ceramic moulding and CO_2 Process	Ref.1, pp. 375, 384, 389-391 & Ref.6	ICT tools
9	Slush casting – description, applications, Continuous casting – description and applications	Ref.1, pp. 387,391-392	ICT tools
10	Stir casting Process – Defects in casting – causes and remedies	Ref. 1, pp.419-422	ICT tools
11	**Seminar presentation / Group discussion / Quiz (Participative learning)**		

* Session duration: 50 minutes
* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

Sub. Code / Sub. Name: **ME18302 / MANUFACTUIRNG PROCESSES**
Unit : **II**

Unit Syllabus: JOINING PROCESSES 10

Fusion Welding Processes – Types of Gas Welding – Flame Characteristics , Oxy Fuel Gas Welding, Types of Gas welding Technique, Arc Welding – Arc welding Equipments, Fillers and Flux Materials, Electrodes – Coated electrode designation, Consumable Electrode – Shielded Metal Arc Welding, Submerged Arc Welding, Gas Metal Arc Welding, Flux Cored Arc Welding, Electro slag welding, Electro gas welding, Non Consumable Electrode – Gas Tungsten Arc Welding, Atomic Hydrogen Welding, Plasma Arc Welding, Electron Beam Welding, Laser Beam Welding, Solid State welding – Ultrasonic Welding, Friction Welding – Friction Stir Welding, Resistance welding – Types, Welding defects, Soldering and Brazing

Objective: To teach the various material joining process and how to select the process depending upon the material

Session No *	Topics to be covered	References	Teaching Aids
12	Material joining process – Introduction, Types – Introduction to gas welding, types of flames and applications, Introduction to arc welding – **Experiential learning**	Ref.1, pp. 211-226	ICT tools
13	Types of arc welding – Fillers, coated electrode, consumable electrode, non-consumable electrode, Manual metal arc welding **(Experiential Learning)**	Ref.1, pp. 211-230-233	ICT tools
14	Gas Metal arc welding, Tungsten inert gas welding, Submerged arc welding **(Experiential Learning)**	Ref.1, pp. 235-240,	ICT tools
15	Electro slag welding, Electro gas welding, Atomic hydrogen welding	Ref.1, pp. 237-238, 240	ICT tools
16	Plasma arc welding, electron beam welding, laser beam welding and ultrasonic welding	Ref.1, pp. 238-239,250-252 Ref. 2, pp. 892-894	ICT tools
17	Solid state welding process – introduction, resistance welding-introduction and types	Ref.1, pp. 211-226,242-245	ICT tools
18	Friction stir welding and friction welding **(Experiential learning)**	Ref. 2, pp. 915-917	ICT tools
19	Types of welding defects – causes and remedies.	Ref.3, pp. 387-389	ICT tools
20	Soldering and Brazing	Ref.3, pp. 379-384, Ref. 2, pp. 934-940	ICT tools
21	**Problem solving – case study discussion**		ICT tools

* Session duration: 50 minutes
* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

Sub. Code / Sub. Name: **ME18302 / MANUFACTUIRNG PROCESSES**

Unit : **III**

Unit Syllabus: BULK DEFORMATION PROCESSES **9**

Metal Forming Classification, Hot working, Cold Working and Warm Working of metals, Recrystallization Temperature.

Forging – Outline of Forging and related operations (Edging, Heading, Fullering, Drawing out, Upsetting, Drawing down, Swaging, Blocking, Coining, Trimming), Various Forging Processes such as Open and Closed die forging, Roll Forging, Iso thermal Forging and Orbital Forging, Defects in Forging

Extrusion Process – Types of Extrusion Process- Direct and Indirect Extrusion, Hydrostatic Extrusion, Impact Extrusion, Side extrusion, Extrusion defects

Rolling Processes – Terminology – Blooms, Billet, Slab, Plate, sheet, Foil, Types of rolling mills, Roll Pass design, Shape rolling operations, Thread Rolling, Ring Rolling, Gear Rolling, Roll piercing process, Rolling defects

Principles of rod, wire and tube drawing- Seamless tubes and Tube drawing methods

Objective: To impart knowledge on the various bulk deformation processes.

Session No *	Topics to be covered	References	Teaching Aids
22	Introduction to bulk deformation processes – Recrystallization temperature – hot working, warm working and cold working, difference between hot and cold working	Ref.1, 153-162	ICT tools
23	Forging Introduction – types of forging operations – various forging processes	Ref.2, pp. 337-358, Ref. 6	ICT tools
24	Special forging processes – roll forging, iso thermal forging and orbital forging	Ref.2, pp. 328-329, 348-349	ICT tools
25	Extrusion Process – Types of extrusion process – direct and indirect extrusion – applications **(Think Pair share)**	Ref.2 pp.364-372, Ref. 6	ICT tools
26	Hydrostatic extrusion, impact extrusion, side extrusion, application and extrusion defects	Ref.2 pp.373-376	ICT tools
27	Rolling process – Introduction, Terminology – blooms, billet, slab, plate, sheet, foil.	Ref.2 pp.316-318, Ref. 6	ICT tools
28	Types of rolling, roll pass design for shape rolling	Ref.2 pp.318-328	ICT tools
29	Special rolling process – thread rolling, ring rolling, gear rolling, roll piercing, rolling defects	Ref.2 pp.325, 329-333	ICT tools
30	Rod, wire and tube drawing Case study on extrusion process **(Participative learning)**	Ref.2, pp.377-383, Ref. 6	ICT tools

* Session duration: 50 minutes

* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

Sub Code / Sub Name: **ME18302 / MANUFACTUIRNG PROCESSES**

Unit : **IV**

Unit Syllabus : SHEET METAL FORMING PROCESSES 9

Definitions of Various Press Operations – Blanking, Punching, Shaving, Perforating, Lancing, Slitting, Trimming, Bending, Drawing, squeezing, Press working Terminology, Types of dies for Sheet metal operations, Press Tonnage calculation, Sheet Metal Forming operations – Bending and Drawing- Elastic recovery or spring back effect, Stretch forming, Rubber pad forming, Hydroforming, Metal Spinning – Types, High Energy Rate Forming Process – Explosive Forming, Magnetic Pulse Forming, Electro Hydraulic Forming, Superplastic Forming,

Objective: To teach the fundamental of various sheet metal forming processes and on high energy rate forming process

Session No*	Topics to be covered	References	Teaching Method
31	Introduction to sheet metal forming – various sheet metal forming operations – shearing operations	Ref.3, pp. 284-286, Ref.2, pp. 386-388, Ref. 7	ICT tools
32	Press working terminology, types of dies – press tonnage calculations – methods to reduce the press tonnage	Ref.3, pp. 291-293, Ref.2, 388-390	ICT tools
33	Sheet metal operations – forming operations – bending and drawing – elastic recovery – bend radius, bend allowance	Ref.2, pp. 402	ICT tools
34	Stretch forming, rubber pad forming, hydroforming	Ref.2, pp. 413-415,419-430	ICT tools
35	Metal spinning – high energy rate forming introduction – types of HERF	Ref.3, pp. 309-313, ref.2 428-431	ICT tools
36	Explosive forming – process variables and applications – Electrohydraulic forming process – process variables and applications	Ref.2, pp. 428-431	ICT tools
37	Magnetic pulse forming process – process variables and applications	Ref.2, pp. 428-431	ICT tools
38	Superplastic forming – introduction – conditions for the material to exhibit superplasticity	Ref.2, pp. 426-427	ICT tools
39	**Group discussion / Quiz**		

* Session duration: 50 minutes
* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

Sub. Code / Sub. Name: **ME18302 / MANUFACTUIRNG PROCESSES**
Unit: **V**

Unit Syllabus: PROCESSING OF PLASTICS AND POWDER METALLURGY 7

Types of plastics – Types of Moulding – Injection Moulding, Blow Moulding, Compression Moulding, Transfer Moulding, Rotational Moulding, Extrusion, Thermoforming, Calendaring

Powder Metallurgy – Production of metal Powders, Compaction – Sintering and Finishing, Advantages and disadvantages of powder metallurgy.

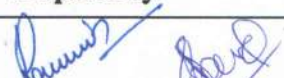
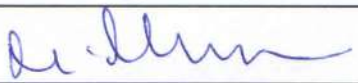
Objective: To teach the various processing methods for plastics and to give an introduction about powder metallurgy

Session No*	Topics to be covered	References	Teaching Method
40	Types of plastics – need for plastics as engineering materials – processing methods for thermoplastics and thermos setting plastics	Ref. 2. Pp.494-498, Ref. 7	ICT tools
41	Injection Moulding – compression blow moulding – transfer moulding	Ref.2, pp. 502-511,pp. 512-514, Ref. 7	ICT tools
42	Extrusion process - Blow moulding – types; Injection blow moulding, stretch blow moulding and extrusion blow moulding process – rotational moulding process	Ref.2, pp. 495, pp. 509-511, Ref. 7	ICT tools
43	Thermoforming – calendaring process – case study discussion	Ref.2, pp. 509-511, 517	ICT tools
44	Powder metallurgy process – Introduction – need for powder metallurgy process – steps involved in powder metallurgy	Ref.2, pp. 444-470, Ref.3 pp. 601-625	ICT tools
45	Advantages and drawbacks of powder metallurgy process	Ref.2, pp. 444-470	ICT tools

* Session duration: 50 minutes
* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

REFERENCES:

1. Hajra Choudhury, "Elements of Workshop Technology", Vol.I: Manufacturing Processes., Media Promoters & Publishers Pvt Ltd, 15th edition, 2012.
2. Serope Kalpakjian & Steven R. Schmid, "Manufacturing Engineering and Technology", Pearson India Education Services Pvt. Ltd, 7th edition, 2018
3. Dr. P.C. Sharma, "A Textbook of Production Technology (Manufacturing Processes), S. Chand & Company Ltd, Reprint 2011.
4. https://archive.nptel.ac.in/courses/112/107/112107219
5. https://nptel.ac.in/courses/112107083
6. https://archive.nptel.ac.in/courses/112/103/112103279
7. https://nptel.ac.in/courses/112107221

	Prepared by	Approved by
Signature		
Name	**Dr. S. Ramesh Babu/ Dr. S. Ponnuvel**	**Dr. M. Mohandass**
Designation	**Professor & HOD / Associate Professor**	**Assistant HOD**
Date	**29.08.2022**	**29.08.2022**
Remarks *:		
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Mechanical Engineering	LP: ME18303 Rev. No: 01 Date: 24/08/2022
B.E/~~B.Tech/M.E/M.Tech~~ : Mechanical Engineering, Regulation: R2018 PG Specialisation : --- Sub. Code / Sub. Name **: ME18303, MATERIAL CHARACTERIZATION AND METALLURGY** Unit : **I**	

Unit Syllabus: **ALLOYS AND PHASE DIAGRAMS** **7**

Constitution of alloys – Solid solutions, Substitutional and Interstitial –Phase Diagrams-Unary and Binary Phase diagrams of solid materials- Hume-Rothery rule, Gibbs phase rule. Invariant reactions-eutectic, eutectoid, peritectic and peritectoid reactions. Iron – carbon equilibrium diagram-micro constituents and invariant reactions.

Objective: To impart knowledge on the alloys, phase diagrams of different alloys, reactions, micro-constituents emphasis on Fe-C system.

Session No *	Topics to be covered	References	Teaching Aids
1	Metals, Alloys, Constitution of alloys	1(Chap.-5, pag.-147-154)	BB
2	Solid solutions, Types-substitutional and interstitial	2 (Chap.-4, pag.-68-71)	BB, ICT
3	Hume Ruthery's rule for substitutional and interstitial solid solutions, Phase diagrams, unary-pure substance.	1 (Chap.-6, pag.-155-180)	BB, ICT
4	Binary systems-completely soluble & partially soluble, Eutectic and eutectoid reactions. **Calculation of Phase amounts using Lever Rule – Problem Solving.**	1 (Chap.-6, pag.-181-190)	ICT, BB
5	Peritectic and Peritectoid reactions	1 (Chap.-6, pag.-213-216)	ICT
6	Iron-Iron carbide equilibrium diagrams, Phases of iron-iron carbide system. **Animation of phase change. Quiz on Iron and Iron Carbon diagram – Participative learning.**	1 (Chap.-7, pag.-225-235)	BB, ICT
7	Invariant reactions in Iron-Iron carbide system. **Animation of Invariant reactions.**	2 (Chap.-9, pag.-277-287)	ICT
Content beyond syllabus covered (if any): Crystalline and Non crystalline materials, Unit Cell, Crystallographic planes and directions. BCC, FCC & HCP Structure, Miller indices, Point, line, planar and volume defects, Grain size, ASTM grain size, Allotropy and Isomorphous system.			

* Session duration: 50 minutes
* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: **ME18303, MATERIAL CHARACTERIZATION AND METALLURGY**
Unit : **II**

Unit Syllabus : HEAT TREATMENT **11**

Definition – Full annealing, stress relief, recrystallization and spheroidizing – Normalizing, Hardening and Tempering of steels. Quenching -different quenching medium and their characteristics. Isothermal Transformation diagrams – cooling curves superimposed on I.T. diagram, CCR, Hardenability, Jominy end Quench test - Austempering, Martempering. Case hardening - Carburizing, Nitriding, Cyaniding, Carbonitriding, Vacuum and Plasma hardening. Selective hardening – Flame and Induction hardening. Sintering using powder metallurgy.

Objective: To impart knowledge on the importance of heat treatment and phase transformations with studies on surface treatment.

Session No *	Topics to be covered	References	Teaching Aids
8	Need for heat treatment. Definition of annealing, full annealing. **Laboratory demonstration of Full Annealing of Mild Steel – Experiential Learning.**	6 (Chap.-9, pag. 238-240)	ICT
9	Types of annealing-Recrystallization, stress relief, & spheroidizing,	6 (Chap.-9, pag. 238-242)	ICT
10	Normalizing, Annealing Vs Normalizing, Hardening and tempering of steel. **Laboratory demonstration of Hardening of Mild Steel – Experiential Learning.**	6 (Chap.-9, pag. 243-265)	ICT, LAB
11	Isothermal transformation diagram (TTT diagram) – construction.	1 (Chap.-8, pag.-269-276)	BB, ICT
12	Austenite, martensite, ferrite and cementite transitions, CCT diagram, CCR, Cooling curves super imposed on IT diagram. **Interpretation of TTT diagram using class quiz – Participative learning.**	3 (Chap.-9, pag.-211-220)	BB, ICT
13	Hardenability, Hardness, Jominy end quench test	5 (Chap.-43, pag.-43.22-43.25)	ICT
14	Austempering, Martempering	5 (Chap.-43, pag.-43.19-43.21)	BB, ICT
15	Case Hardening, Carburizing and Nitriding. **Video demonstration**	4 (Chap.-13, pag.-408-411)	ICT
16	Cyaniding and carbonitriding	4 (Chap.-13, pag.-411-417)	ICT
17	Flame and Induction Hardening, Vacuum and Plasma Hardening. **Video demonstration**	4 (Chap.-13, pag.-403-405) 4(Chap.-13, pag.-414-416)	ICT
18	Powder Metallurgy & Interaction with students on Unit-II contents. – **Power point presentation by students – Participative learning.**	2 (Chap-14, pag.-S122)	ICT
Content beyond syllabus covered (if any): Industrial furnaces, Applications of Continuous Cooling Transformation (CCT) diagram, Significance of Critical Cooling Rate (CCR) with the comparison of Pearlite, Bainite, Sorbite and Martensite. .			

* Session duration: 50 minutes
* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

Sub. Code / Sub. Name: **ME18303, MATERIAL CHARACTERIZATION AND METALLURGY**

Unit : **III**

Unit Syllabus : FERROUS AND NON-FERROUS METALS **9**

Effect of alloying additions on steel- α and β stabilisers– stainless and tool steels – HSLA, Maraging steels – Cast Iron - Grey, white, malleable, spheroidal – alloy cast irons. Copper and copper alloys – Brass, Bronze and Cupronickel – Aluminium and Al-Cu – precipitation strengthening treatment – Bearing alloys-Al, Cu and White metal bearing alloys, Mg-alloys, Ni-based super alloys and Titanium alloys.

Objective: To impart knowledge on the ferrous and non-ferrous metals and discuss their applications.

Session No *	Topics to be covered	References	Teaching Aids
19	Effect of alloying elements on Steel (Mn,Si,Cr)	1 (Chap.-9, pag.-350-358)	ICT
20	Effect of Alloying elements on Steel (Mo,V,Ti and W) – **Animated demonstration of changes in microstructure and mechanical properties of steel.**	1 (Chap.-9, pag.-359-362)	ICT
21	Stainless and tool steels, HSLA steel & Maraging steels	1 (Chap.-9, pag.-376-382) (Chap.-10, pag.-400-408)	ICT
22	Cast Irons-gray, white, malleable, spheroidal, Graphite-Alloy Cast Irons. **Visualization of microstructure of Steels and Cast Irons using microscope – Experiential learning**	5 (Chap.-5, pag.-5.6-5.11)	ICT, LAB
23	Copper and Copper alloys-Brass, Bronze and Cupronickel	4 (Chap.-18, pag.-573-578)	BB, ICT
24	Aluminium and its alloys , Al-Cu alloy phase diagrams and reactions	4 (Chap.-19, pag.-597-602) (Chap.-18, pag.-574-575)	ICT
25	Precipitation strengthening treatment of Al-Cu alloy	1 (Chap.-12, pag.-473-476) 4 (Chap.-18, pag.-574-575)	BB, ICT
26	Bearing Alloys and Mg-alloys	4 (Chap.-20, pag.-632-633)	ICT
27	Ni-based super alloys and Titanium alloys – **Power point presentation by students – Participative learning**	4 (Chap.-20, pag.-619-628)	ICT
Content beyond syllabus covered (if any): The refractory metals, super-alloys, noble metals, Lead and Zinc alloys.			

* Session duration: 50 minutes
* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

Sub Code / Sub Name: **ME18303, MATERIAL CHARACTERIZATION AND METALLURGY**

Unit : **IV**

Unit Syllabus : NON-METALLIC MATERIALS **7**

Polymers – types of polymer, commodity and engineering polymers – Properties and applications of various thermosetting and thermoplastic polymers (PP, PS, PVC, PMMA, PET,PC, PA, ABS, PI, PAI, PPO, PPS, PEEK, PTFE, Polymers – Urea and Phenol formaldehydes)- Engineering Ceramics – Properties and applications of Al2O3, SiC, Si3N4, PSZ and SIALON –Composites-Classifications- Metal Matrix and FRP - Applications of Composites..

Objective: To impart knowledge on the non-metallic materials such as polymers and to discuss the types and importance of composite materials.

Session No*	Topics to be covered	References	Teaching Method
28	Polymers and types	5 (Chap.-20, pag.- 1-2)	ICT
29	Commodity and engineering polymers Properties and applications of PE,PP,PS.	4 (Chap.-8, pag.-193-198)	ICT
30	Properties and applications of PVC, PMMA, PET. **Power point presentation by students on the discussions of properties and applications of PC, PA, ABS – Participative learning.**	4 (Chap.-8, pag.-193-198)	ICT
31	Properties and applications of PI, PAI, PPO, PPS, PEK, PEEK and PTFE polymers, Teflon	4 (Chap.-8, pag.-199-211)	ICT
32	Urea and Phenol Formaldehydes, Epoxies Ceramics and Engineering ceramics - Properties and applications of Al2O3,SiC,Si3,N4	4 (Chap.-8, pag.-212-215)	ICT
33	Partially Stabilized Zirconia and Sialon.	4 (Chap.-11, pag.-323-352)	ICT
34	Composites-Metal Matrix and FRP –properties and applications. **Video demonstration on applications of FRP composites.**	2 (Chap.-15, pag.-547-566)	ICT
Content beyond syllabus covered (if any): Applications of FRP in the construction of bridges, fabrication of bi-cycles & automotive components. Applications of engineering ceramics in the industrial furnace & automobile.			

* Session duration: 50 minutes
* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

Sub. Code / Sub. Name**: ME18303, MATERIAL CHARACTERIZATION AND METALLURGY**
Unit : **V**

Unit Syllabus : MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS 11

Elastic & Plastic deformation, Young's modulus, Stress-Strain diagram of steel, Aluminium. Mechanisms of plastic deformation-slip and twinning., slip and twinning – Types of fracture – Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell), Impact test - lzod and charpy, Fatigue and creep failure mechanisms, fatigue testing, creep testing of steels.

Objective: To impart knowledge on the mechanical properties of metallic materials and testing methods.

Session No*	Topics to be covered	References	Teaching Method
35	Plastic deformation of materials, Mechanism of slip and twinning	2 (Chap.-10, pag.-347-359)	BB, ICT
36	Types of fracture-brittle & ductile fractures, fracture mechanics. **Animated video of ductile & brittle fracture.**	2 (Chap.-11, pag.-387-405)	BB, ICT
37	Universal Testing Machine, Testing of materials under tension. **Video demonstration of tensile test.**	5 (Chap.-49, pag.-2-6)	BB, ICT
38	Compression test, Testing of material under Shear loads. **Performing the tensile & compressive testing of mild steel in the laboratory by students – Participative learning.**	5 (Chap.-49, pag.-6-10)	BB, ICT, LAB
39	Hardness tests – Brinell, Vickers. **Demonstration using Virtual Lab (VLAB) & Calculation of Brinell and Vickers hardness of different metallic materials – Problem Solving.**	5 (Chap.-49, pag.-6-10)	BB, ICT
40	Rockwell test, comparison of hardness testing methods.	2 (Chap.-9, pag.-325-330)	ICT
41	Impact test- Izod and Charpy. **Animated video of impact test.**	5 (Chap.-49, pag.-10-12)	ICT
42	Mechanism of Fatigue and Creep failure.	5 (Chap.-49, pag.-15-17)	BB, ICT
43	Fatigue and creep tests.	5 (Chap.-49, pag.-15-17)	BB, ICT
44	Fracture toughness test	5 (Chap.-49, pag.-17-19)	BB, ICT
45	**Demonstration on hardness test methods and Impact test methods in laboratory – Participative learning.**	8 (pag – 7,14,18)	LAB
Content beyond syllabus covered (if any): Importance of fatigue strength in dynamic loading conditions & creep strength in high temperature applications.			

* Session duration: 50 minutes
* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

Sub. Code / Sub. Name: **ME18303, MATERIAL CHARACTERIZATION AND METALLURGY**

REFERENCES:

1. Avner,, S.H., "Introduction to Physical Metallurgy", McGraw Hill Book Company,1994.
2. Williams D Callister, "Material Science and Engineering" Wiley India Pvt Ltd, Revised Indian Edition 2007.
3. Raghavan.V, "Materials Science and Engineering", Prentice Hall of India Pvt. Ltd., 1999.
4. Kenneth G.Budinski and Michael K. Budinski, "Engineering Materials", Prentice Hall of India Private Limited, 4th Indian Reprint 2002.
5. Dr. O.P. KHANNA: Materials Science and Metallurgy, Dhanpat Rai Publications (P) Ltd., 2010
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7. Srinivasan. R., Engineering Materials and Metallurgy, Tata McGraw-Hill, 2nd edition, 2010. (Recommended for slow learners)
8. Dr. M. Mohandass, MATERIAL TESTING AND METALLURGY LABORATORY MANUAL, 2019.

	Prepared by	Approved by
Signature		
Name	**Dr. M. MOHANDASS**	**Dr. S. RAMESH BABU**
Designation	**Asso. Prof.**	**HOD**
Date	24/8/2022	24/08/2022
Remarks *:		
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Mechanical Engineering	LP: ME16304 Rev. No: 00 Date: 12/07/2019
B.E/~~B.Tech/M.E/M.Tech~~ : Mechanical Engineering Regulation: 2018 PG Specialisation : NA Sub. Code / Sub. Name : ME18304 – Mechanics of Solids Unit : I	

Unit Syllabus: Tension, Compression, Shearing Stresses and Strains - Stress-Strain relationship, Hooke's law, Poisson's ratio – Elastic constants and their relations- Volumetric Strains, Thermal stresses, composite bars.
Objective: To understand the basic concepts related to deformable bodies and their properties such as stress, strain, etc.

Session No *	Topics to be covered	Ref	Teaching Aids
1	Introduction to Rigid bodies and Deformable bodies, Properties of Materials, Stress, Strain. Explanation of Hook's law	1 – Ch.1;Pg .1 - 6	PPT / BB
2	Introduction to types of loads, Deformation to simple bars,	1 – Ch.1;Pg .7 – 14	PPT / BB
3	Problems related to Stress, Strain and Hook's law	2 – Ch.2;Pg.134 - 136	PPT / BB
4	Problems related to Stress, Strain and Hook's law (Contd..),	1 – Ch.1;Pg .7 – 14	PPT / BB
5	Introduction to compound bars, Problems in compound bars	1- Ch.1;Pg. 51 to 54	PPT / BB
6	Problems related to Hook's law, compound bars - Tutorial	-	-
7	Introduction to Thermal stresses in simple and compound bars, Problems in Thermal Stresses	1 – Ch.1;Pg .42 - 50	PPT / BB
8	Problems in Thermal stresses (Contd..),	1 – Ch.1;Pg .42 – 50	PPT / BB
9	Derivation of Shear modulus, Bulk modulus, Poisson's ratio	1 – Ch.2;Pg.59-73	PPT / BB
10	Problems in Elastic constants – Tutorial	-	-
11	Problems in volumetric strains	1 – Ch.2;Pg.59-73	PPT / BB
	Course Evaluation: Evaluating the problem-solving skills of the students from Tutorials and Objective type Questions.		
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: ME18304 – Mechanics of Solids

Unit : II

Unit Syllabus: Shear force and bending moment. Relation between load, shear force and bending moment. Construction of Shear force diagrams and Bending moment diagrams for different types of static loading on cantilever, simply supported and overhanging beams.
Theory of simple bending, bending stresses, section modulus, bending stress and shear stress distribution in beams
Objective: To understand the concepts in beams, its various loading and its stress distributions.

Session No *	Topics to be covered	Ref	Teaching Aids
12	Introduction to Beams, Types of Beams and forces, Shear force diagram and Bending moment diagram and its sign conventions	1 – Ch.6;Pg. 235 - 238	PPT / BB
13	Problems in Cantilever beam, Simply supported beam with maximum bending moment	1 - Ch.6;Pg.239-270	PPT / BB
14	Problems in Overhanging beams, Point of contraflexure, Maximum Bending moment - position and value	1- Ch.6;Pg.270-279	PPT / BB
15	Shear force and Bending moment diagrams Problems – Tutorial	-	-
16	Discussion of simple bending, Theory of simple Bending and Derivation of Bending stresses for simple beam	1- Ch.7;Pg. 290-297	PPT / BB
17	Problems in bending stresses in Symmetrical sections, Section Modulus	1- Ch.7;Pg. 297-312	PPT / BB
18	Problems in bending stresses in Unsymmetrical sections, Strength of Sections	1- Ch.7;Pg. 312-326	PPT / BB
19	Problems in bending stresses – Tutorial	-	-
20	Introduction to composite beams, Problems related to flitched beams	1- Ch.7;Pg. 327-336	PPT / BB
21	Introduction to Shear stress in Beams, Basic concepts in shear stress distribution	1- Ch.8;Pg. 342-348	PPT / BB
22	Problems in Shear stress distribution for Symmetrical and unsymmetrical sections and Introduction to shear center	1- Ch.8;Pg. 348-373	PPT / BB
23	Problems in flitched beam and Shear stress in Beams – Tutorial	-	-
	Course Evaluation :- Tutorials, Assignment – consisting of short and long questions as per the university pattern, Objective type questions Continuous Assessment Test – I comprising of I & II units		
Content beyond syllabus covered (if any): -			

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: ME18304 – Mechanics of Solids

Unit : III

Unit Syllabus: Governing differential equation– Macaulay's method – Area moment method for computation of slopes and deflections in beams - Conjugate beam and strain energy method.

Objective: To understand how to identify deflection and slopes in beams using different methods

Session No *	Topics to be covered	Ref	Teaching Aids
24	Introduction to deflection in beams, Methods adopted for the deflection in beams	1- Ch.12;Pg. 511,512	PPT / BB
25	Introduction to Macaulay's method	1- Ch.13;Pg. 554-558	PPT / BB
26	Problems in Macaulay's method for Simply supported beams	1- Ch.13;Pg. 558-560 1- Ch.12;Pg. 531-545	PPT / BB
27	Problems in Macaulay's method for Overhanging beams	1- Ch.12;Pg. 535-540	PPT / BB
28	Problems in Double Integration Method, Macaulay's Method – Tutorial	-	-
29	Introduction to Moment Area Method, Problems in Moment Area Method	1- Ch.12;Pg. 546-551 1- Ch.13;Pg. 571-575	PPT / BB
30	Introduction to Conjugate beam method, Problems for varying section in beams	1- Ch.14;Pg. 578-590	PPT / BB
31	Problems in Moment Area method, Conjugate Beam Method – Tutorial	-	-
32	Deflection of beams using Strain energy approach, Derivation for deflection using Maxwell's reciprocal theorem	3- Ch.7;Pg. 244-252	PPT / BB
33	Problems in Strain energy approach for Cantilever, Simply supported and overhanging Beams	3- Ch.7;Pg. 253-260	PPT / BB
34	Problems in Strain energy approach for overhanging Beams	3- Ch.7;Pg. 253-260	PPT / BB
35	Problems in beams using Energy approach – Tutorial	-	-
	Course Evaluation :- Tutorials, Assignment – consisting of short and long questions as per the university pattern Continuous Assessment Test – II comprising of III & IV units		

Content beyond syllabus covered (if any): -

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: ME18304 – Mechanics of Solids

Unit : IV

Unit Syllabus: Torsion formulation stresses and deformation in circular and hollow shafts – Stepped shafts– Deflection in shafts fixed at the both ends-Stresses in helical springs – Deflection of helical springs subjected to tension loan only, carriage springs.

Objective: To understand about torsion in shafts and stresses in springs.

Session No *	Topics to be covered	Ref	Teaching Aids
36	Introduction to Torsion, Derivation of Torsion with stresses and deformation	1- Ch.16;Pg. 670-677	PPT / BB
37	Problems in Torsion for solid and hollow shafts	1- Ch.16;Pg. 675-680	PPT / BB
38	Problems in Torsion for Stepped shafts – Tutorial	-	-
39	Introduction to Polar Modulus, Problems related to strength of shaft	1- Ch.16;Pg. 687-690	PPT / BB
40	Composite shaft of varying section Problems	1- Ch.16;Pg. 698-710	PPT / BB
41	Torsional rigidity, Problems in Torsional Rigidity	1- Ch.16;Pg. 691-694	PPT / BB
42	Problems in Torsion of shafts - Tutorial	-	-
43	Introduction to springs, Types of springs, derivation of stresses in helical springs	1- Ch.16; Pg. 721, 724, 725	PPT / BB
44	Derivation of stresses in open coiled helical springs, Problems	3- Ch.11;Pg. 372-375	PPT / BB
45	Derivation of stresses in leaf springs, Problems	1- Ch.16;Pg. 721-724	PPT / BB
46	Problems in Springs – Tutorial	-	-
47	Introduction and discussion in Flange Coupling Problems	1- Ch.16;Pg. 695-698	PPT / BB
48	**Course Augmentation :** Problem solving skills to identify the torsion on non-circular members, Thin walled hollow shafts	2- Ch.3;Pg.219-225	PPT
	Course Evaluation: Evaluating the problem solving skills of the students from Tutorials and Objective type Questions.		

Content beyond syllabus covered (if any): NA

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: ME18304 – Mechanics of Solids

Unit : V

Unit Syllabus: Biaxial state of stress – Stress at a point – stresses on inclined planes – Principal stresses and Principal strains and Mohr's circle of stress, Theories of failure

Stresses in thin cylindrical shell due to internal pressure - circumferential and longitudinal stresses and deformation in thin and thick cylinders – spherical shells subjected to internal pressure –Deformation in spherical shells – Lame's theorem

Objective: To understand how to design the Pressure vessel base on loading conditions.

Session No *	Topics to be covered	Ref	Teaching Aids
49	Introduction to Pressure vessels, Explanation of Thin and Thick cylinders	1- Ch.17;Pg. 740	PPT / BB
50	Derivation of Stresses in thin cylindrical shells , deformation of Thin cylinders in loading condition	1- Ch.17;Pg.741-742	PPT / BB
51	Problems in Thin cylinders to identify Stresses, deformation based on loading condition	1- Ch.17;Pg.750-769	PPT / BB
52	Derivation of Spherical shells , Problems in Spherical shells	1- Ch.17;Pg.770-771 1- Ch.17;Pg.771-775	PPT / BB
53	Problems in Thin cylinders, Spherical Shells – Tutorial	-	-
54	Derivation of Thick cylinders , Concept and its Applications, Discussion of Lame's Theorem,	1- Ch.18;Pg.781-783	PPT / BB
55	Explanation related to Stresses in inclined planes, derivation of Principal stress and Principal planes for simple bars	1 – Ch.2;Pg. 74 – 82 1 – Ch.3;Pg.85 - 128	PPT / BB
56	Problems in Principal Stress and Strains	1 – Ch.3;Pg.85 - 128	PPT / BB
57	Introduction in Mohr's circle of stresses, Problems in Mohr's circle – Type 1, Type 2 & Type 3	1 – Ch.3;Pg.128 - 139	PPT / BB
58	Problems in Mohr's circle – Type 3	1 – Ch.3;Pg.128 - 139	PPT / BB
59	Practicing problems in drawing sheet – Tutorial	-	-
60	Theories of failure, Problems and its application	1 – Ch.3;Pg.121 - 124	PPT/BB
61	Revison	-	-
	Course Evaluation :- Tutorials, Assignment – consisting of short and long questions as per the university pattern, Objective type questions and Continuous Assessment Test		
Content beyond syllabus covered (if any): -			

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub Code / Sub Name: ME18304 – STRENGTH OF MATERIALS

WEEK	1					2					3					4					5					6				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
UNITS	←							I			→					←				II		→				←			III		

WEEK	7					8					9					10					11					12				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
ITS	III				→	←					IV				→	←					V				→					

REFERENCES:

1. Bansal R.K, " A textbook of STRENGTH OF MATERIALS", 4th edition, Laxmi Publications (P) Ltd, New Delhi
2. Beer Johnston, Dewolf Mazurek, "Mechanics of Materials", 6th edition, McGraw Hill Education(India) Pvt.Ltd, New Delhi
3. Rattan S S, " STRENGTH OF MATERIALS", 3rd edition, McGraw Hill Education(India) Pvt.Ltd, New Delhi
4. http://nptel.ac.in/courses/112101095/6

	Prepared by	Approved by
Signature	M. Ma	12/7/19
Name	M. MAHESWARAN	Dr. S. RAMESH BABU
Designation	Assistant Professor	Professor & Head
Date	12/07/2019	12/7/19

Remarks *: The same Lesson Plan is followed for the academic year 20-21.

M. Ma 20/9/20 R. Ramesh 20/09/2020

Remarks *: The same Lesson Plan is followed for the academic year 2021-22

M. Ma 28/1/21 27/7/21

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - LABORATORY

Department of Mechanical Engineering	LP: ME18311
B.E/B.Tech/M.E/M.Tech : Mechanical Engineering Regulation: 2018 PG Specialisation : -- Sub. Code / Sub. Name : ME18311/ Manufacturing Processes Laboratory	Rev. No: 00 Date: 05.09.2022

Experiment No*	List of Experiments
CYCLE - I	
1	Sand moulding using solid pattern – Video Demonstration using ICT
2	Sand moulding using split pattern
3	Tee joint (T fillet Joint) - Video Demonstration using ICT
4	Corner joint
5	Butt joint by metal inert gas welding
6	Lap joint by metal inert gas welding
CYCLE - II	
7	Facing and Plain (straight) Turning – Video Demonstration using VLAB
8	Step turning, Grooving and Knurling operations and estimation of its machining time - Video Demonstration using VLAB
9	Taper Turning operation and estimation of its machining time
10	Pin and bush assembly
11	Single start external thread cutting operation
12	Drilling, boring and internal Thread cutting
13	Eccentric Turning

* Session Duration: 150 minutes

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - LABORATORY

Sub. Code / Sub. Name: ME18311 / Manufacturing Processes Laboratory

Session No.	**Experiment**	
	(Ist half of Batch)	(IInd half of batch)
1	1	3
2	2	4
3	5	
4	6	
5	Demonstration in Machine shop (Full batch)	
6	Exp. No. 7 & 8 (Full batch)	
7	Exp. No. 9 (Full batch)	
8	Exp. No. 10 (Full batch)	
9	Exp. No. 11 (Full batch)	
10	Exp. No. 12 (Full batch)	
11	Exp. No. 13 (Full batch)	
12	Demonstration on assembly of head stock tail stock	
13	Demonstration on TIG welding	
14	Demonstration on Gas Welding	
15	Model Examination	
Content beyond the Syllabus (if any):		

	Prepared by	**Approved by**
Signature	M.Balakumar V.Senthilvelan	
Name	**Dr.M.Balakumar & V.Senthilvelan**	**Dr.M.Mohandass**
Designation	Assistant Professor	Asst. HoD / MEC
Date	05.09.2022	05.09.2022
Remarks* :		

* If the same lab plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE OUTCOMES - LABORATORY

Department of Mechanical Engineering	
B.E/~~B.Tech/M.E/M.Tech~~ : Mechanical Engineering	LP: ME18311
UG / ~~PG Specialisation~~ : Mechanical Engineering	Rev. No: 01
Regulation : R2018A	Date: 05/09/2022
Sub. Code / Sub. Name : ME 18311 Manufacturing Process Laboratory	

CO	Statements	RBT* Level
CO1	The students can able to identify and perform the operations for a given product diagram for a lathe.	AN
CO2	The students can able to make a green sand mould using different patterns.	AP
CO3	The students can able to select the suitable welding parameters to make a welded component using Arc and MIG welding.	AN

* Revised Bloom's Taxonomy

Mapping CO – PO - PSO*:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	3			2										3	
CO2	3			2	2									3	
CO3	3			2										3	

3 – Strong; 2 – Moderate; 1 – weak

* Add Column if needed

Assessment Methods:

Stream	Internal Assessment Marks			End Semester Examination Marks
	Continuous Assessment (As per AAR)	Model Exam	Total	
Non - Autonomous	-	-	-	-
Autonomous	40	20	60	40

Signature of Faculty / Course Coordinator	**Signature of Module Coordinator**

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - LABORATORY

Department of Mechanical Engineering	LP: ME18313 Rev. No: 0 Date:24/06/2019
B.E/~~B.Tech~~/M.E/M.Tech : Mechanical Engineering Regulation: R2018 PG Specialisation : NA Sub. Code / Sub. Name : ME 18313, Material Testing and Metallurgy Laboratory	

Session No*	List of Experiments
	CYCLE-I
1	Torsion test on mild steel
2	Double shear test on mild steel & aluminum rods
3	Impact test on steel specimens – ~~Izod~~
4	Hardness test on metals – Brinell & Rockwell Hardness Number
5	Deflection test on simply supported & cantilever beam
6	Compression test on Helical Springs
	CYCLE-II
7	Tensile test on mild steel
8	Impact test on steel specimens – Charpy method
9	Strain measurement in Hollow shaft using rosette strain gauge
10	Comparison of Mechanical properties of steel – using impact & hardness tests for Unhardened, Quenched and Quenched & tempered specimens
11	Microscopic Structure of Plain Carbon Steels
12	Microscopic structure of Cast Iron and Non Ferrous alloys

Content beyond syllabus (if any):
1. Heat Treatment of steels-Annealing, Normalizing & Hardening
2. Fatigue Test of steel specimen

* Session Duration: 150 minutes

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - LABORATORY

Sub. Code / Sub. Name: ME 18313, Material Testing and Metallurgy Laboratory

	Prepared by	Approved by
Signature		24/6/19
Name	Dr. M. MOHANDASS	Dr. S. RAMESH BABU
Designation	Associate Professor	Professor & Head
Date	24/06/2019	24/06/2019

Remarks*: The same lesson plan is to be followed for AY 2020-21. (S.MUNIRAJ) [DR.RAMESH] [HOD]

Remarks*: The same lesson plan to be followed for the AY 2021-22. (S.MUNIRAJ)

* If the same lab plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

The same lesson plan to be followed for the Academic year 2022-23.

(Dr. S. MUNIRAJ) 2/8/22

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Mechanical Engineering	
~~B.E/B.Tech/M.E/M.Tech~~ : Mechanical Engineering, Regulation: R2018 PG Specialisation : NA Sub. Code / Sub. Name : **ME18001 / AUTOMOBILE ENGINEERING** Unit : **I**	LP: **ME18001** Rev. No: 01 Date: 31/05/2022

Unit Syllabus: VEHICLE STRUCTURE AND ENGINES **9**

Types of automobiles, vehicle construction and different layouts, chassis, frame and body, Vehicle aerodynamics (various resistances and moments involved), IC Engine components – functions, materials and its applications in land (Off road and On road), water and air vehicles, variable valve timing (VVT) and its necessity

Objective: To impart knowledge on various construction of automobiles, their functions and materials.

Session No *	Topics to be covered	References	Teaching Aids
1	Types of automobiles	1 Pg. No: 12	BB, ICT
2	Different layouts in automobile construction	2 Pg.No:4	BB, ICT
3	Vehicle Chassis – **Laboratory Demonstration**	1 Pg.No:21	BB, ICT
4	Frames and body – **Laboratory Demonstration**	1 Pg.No:21-27	BB, ICT
5	Vehicle aerodynamics (various resistances and moments involved)	4 Pg.No:584	ICT
6	IC engines –Types working – **Laboratory Demonstration**	5 Pg.No:3	BB, ICT
7	IC engines Components, functions and materials	5 Pg.No:3-5	ICT
8	Valve timing diagram for SI and CI engines	5 Pg.No:5-14	ICT
9	Variable valve timing (VVT) and its necessity - **Video demonstration**	3 Pg.No:80-81	ICT
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes
* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: **ME18001 / AUTOMOBILE ENGINEERING**
Unit : **II**

Unit Syllabus : ENGINE AUXILIARY SYSTEMS 9

Electronically controlled gasoline injection system for SI engines (SPI, MPFI, GDI), electronically controlled diesel injection system (Unit injector system, Rotary distributor type and common rail direct injection system CRDI), Electronic ignition system (Transistorized coil ignition system, capacitive discharge ignition system), Supercharger and Turbo chargers (WGT, VGT), Engine emission control by three way catalytic converter system, SCR system and EGR system

Objective: To make the students familiar with the various injection system, ignition system and ways to control emissions.

Session No *	Topics to be covered	References	Teaching Aids
10	Carburetor types application advantages and disadvantages	5 Pg.No:327	BB, ICT
11	Electronically controlled gasoline injection system for SI engines (SPI, MPFI, GDI system) - **Video demonstration**	5 Pg.No:328-331	BB, ICT
12	Electronically controlled diesel injection system –Unit Injector type and Rotary distributor type - **Video demonstration**	5 Pg.No:331-332	BB, ICT
13	Electronically controlled diesel injection system -Common rail direct injection system - **Video demonstration**	5 Pg.No:333	BB, ICT
14	Electronic ignition system -Transistorized coil ignition system	5 Pg.No:356	BB, ICT
15	Electronic ignition system - Capacitive discharge ignition system	5 Pg.No:357	BB, ICT
16	Super charger and Turbo chargers –WGT & VGT	3 Pg.No: 564	BB, ICT
17	Engine emission control by three way catalytic converter system (SCR and EGR) - **Power point presentation by students – Participative learning.**	7 Pg.No:488-493	BB, ICT
18	Engine emission control by three way catalytic converter system (EGR system) - **Power point presentation by students – Participative learning.**	7 Pg.No:488-493	BB, ICT
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes
* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: **ME18001 / AUTOMOBILE ENGINEERING**

Unit : **III**

Unit Syllabus : TRANSMISSION SYSTEMS **9**

Clutch-types and construction, gear boxes-manual and automatic, gear shift mechanisms, Over drive, transfer box, fluid flywheel, torque converter, propeller shaft, slip joints, universal joints Differential and rear axle, Hotchkiss Drive and Torque Tube Drive

Objective: To make the students familiar with the different types of Transmission system (Manual and automatic) and various drives for transmission.

Session No *	Topics to be covered	References	Teaching Aids
19	Clutch - Types and Construction -	1 Pg.No:28-73	BB, ICT
20	Gear boxes- Manual and Automatic	1 Pg.No:77 & 102	BB, ICT
21	Gear shift mechanisms & Over drive	1 Pg.No:116	BB, ICT
22	Transfer box , Fluid flywheel	1 Pg.No:67,94	BB, ICT
23	Torque converter , Propeller shaft	1 Pg.No:109,132	BB, ICT
24	Slip joints, Universal joints - **Video Demonstration**	1 Pg.No:138	BB, ICT
25	Differential and Rear axle - **Laboratory Demonstration**	1 Pg.No:153-159	BB, ICT
26	Hotchkiss Drive - **Power point presentation by students – Participative learning.**	1 Pg.No:160	BB, ICT
27	Torque Tube Drive - **Power point presentation by students – Participative learning.**	1 Pg.No:161	BB, ICT
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes

* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub Code / Sub Name: **ME18001 / AUTOMOBILE ENGINEERING**

Unit : **IV**

Unit Syllabus : STEERING, BRAKES AND SUSPENSION SYSTEM **9**

Steering geometry and types of steering gear box - Power Steering, Types of Front Axle, Types of Suspension Systems, Pneumatic and Hydraulic Braking Systems, Antilock Braking System (ABS), electronic brake force distribution (EBD) and Traction Control

Objective: To make students familiar with steering, brakes and suspension systems.

Session No*	Topics to be covered	References	Teaching Method
28	Steering geometry	1 Pg.No:214	BB, ICT
29	Types of steering gear box	1 Pg.No:235-238	BB, ICT
30	Power Steering	1 Pg.No:244	BB, ICT
31	Types of Front Axle	1 Pg.No:210	BB, ICT
32	Types of Suspension Systems	1 Pg.No:172	BB, ICT
33	Pneumatic and Hydraulic Braking Systems – **Video Demonstration**	1 Pg.No:338 & 365	BB, ICT
34	Antilock Braking System (ABS)	1 Pg.No:391	BB, ICT
35	Electronic brake force distribution (EBD) - **Power point presentation by students – Participative learning.**	1 Pg.No:397	BB, ICT
36	Traction Control	3 Pg.No:879-81	BB, ICT
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes
* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: **ME18001 / AUTOMOBILE ENGINEERING**
Unit : **V**

Unit Syllabus : ALTERNATIVE ENERGY SOURCES **9**

Hybrid Vehicles - Fuel Cell – Electric Battery = Electric vehicle – feasibility study of Electric, Hybrid and fuel cell vehicle, Alternate fuels - Emission norms (Euro and BS) and Driving Cycle

Objective: To make students familiar with alternative energy sources for vehicles.

Session No*	Topics to be covered	References	Teaching Method
37	Hybrid Vehicles	3 Pg.No: 665-668	BB, ICT
38	Fuel Cell Vehicle	3 Pg.No: 665-668	BB, ICT
39	Electric Battery Vehicle	3 Pg.No: 665-668	BB, ICT
40	Feasibility study of Electric Vehicle	3 Pg.No: 658-659	BB, ICT
41	Feasibility study of Hybrid Vehicle	3 Pg.No: 658-659	BB, ICT
42	Feasibility study of fuel cell vehicle	3 Pg.No: 658-659	ICT
43	Alternate fuels - **Power point presentation by students – Participative learning.**	7 Pg.No: 166-186	ICT
44	Emission norms (Euro and BS) and Driving cycle - **Power point presentation by students – Participative learning.**	7 Pg.No:472	BB, ICT
45	Practical Training in dismantling and assembling of Engine parts and Transmission Systems to the students.	NA	LAB
46			
47			
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes
* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

SRI VENKATESWARA COLLEGE OF ENGINEERING

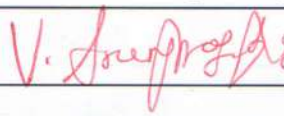
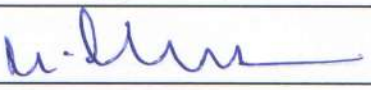
COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: **ME18001 / AUTOMOBILE ENGINEERING**

REFERENCES:

1. Dr. Kirpal Singh, "Automobile Engineering", Vol.1 & 2, Thirteenth Edition, Standard Publishers, New Delhi, 2013.
2. Jain K.K. and Asthana .R.B, "Automobile Engineering", Fifth Reprint, Tata McGraw Hill Publishers, New Delhi, 2002.
3. Newton, Steeds and Garet, "Motor Vehicles", Butterworth Publishers,1989.
4. Joseph Heitner, "Automotive Mechanics," Second Edition, East-West Press, 1999.
5. Martin W, Stockel and Martin T Stockle , "Automotive Mechanics Fundamentals," The Good heart–Will Cox Company Inc, USA ,1978.
6. Heinz Heisler, "Advanced Engine Technology," SAE International Publications USA, 1998.
7. Ganesan V. "Internal Combustion Engines", Third Edition, Tata McGraw-Hill, 2007.
8. William H Crouse & Donald L Anglin, Automotive Mechanics, Tata McGraw-Hill,10th edition, 2010.

WEB RESOURCES: https://nptel.ac.in/courses/107/106/107106088

	Prepared by	Approved by
Signature		
Name	**Dr. V. Arun Prasad Raja**	**Dr. M. Mohandass**
Designation	**Assistant Professor**	**Assistant HOD**
Date	**31-05-2022**	**31-05-2022**
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Mechanical Engineering	LP: ME 18501
	Rev. No: 01
B.E/~~B.Tech/M.E/M.Tech~~ : Mechanical Engineering Regulation: 2018	Date:
Sub. Code / Sub. Name : ME 18501 – Metrology and Quality Control	05.08.2022
Unit : I	

Unit Syllabus: INTRODUCTION

Introduction to Metrology – Basics - Need – Precision and Accuracy, Errors in Measurements, Comparators – Mechanical, Electrical & Optical. Interchangeability - limits, fits and tolerances, Limit gauges, Taylor's principle of gauge design. Calibration, Sensitivity, readability & repeatability. Linear measurement - Vernier calipers – Vernier height gaugeVernier depth gauge - Micrometers – Digital calipers - Slip gauges.

Objective: To make the students to define accuracy, precision, calibration, sensitivity, repeatability and relevant terms in metrology and to make them understand the principles of linear measuring instruments.

Session No *	Topics to be covered	Ref	Teaching Aids
1	Introduction to Metrology	R1.1-80, R2. 1-46	ICT
2	Basics- Calibration, Sensitivity, readability & repeatability	R1.7-8, R3 & R4	ICT
3	Need for measurement and inspection, Precision and accuracy	R1.4-12	ICT
4	Errors in Measurements	R2.13-20	ICT
5	Comparators-Mechanical, Electrical & Optical	R1. 363-417, R2.216-266	ICT
6	Interchangeability – Limits, Fits and Tolerances	R1.267, R2.437-449	ICT
7	Limit Gauges, Taylor's principle of gauge design	R2.483-489	ICT
8	Linear measurement - Vernier calipers – Vernier height gauge - Vernier depth gauge	R1. 135-145	ICT
9	Micrometers – Digital calipers - Slip gauges **(Demonstration on calibration of various precision measuring instruments – Experiential learning)**	R1.156-209	ICT

* Session duration: 50 minutes

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: ME 16018 – ME 18501 – Metrology and Quality Control

Unit: II

Unit Syllabus: ANGULAR AND FORM MEASUREMENTS

Angular Measurement - Angular measuring instruments – Types – Bevel protractor, Spirit levels, Sine bar – Sine center – Sine table – Angle Dekkor - Autocollimator. Form Measurement - Measurement of surface finish – Surf Tester. Screw thread measurement – Minor diameter & Effective diameter – Two wire method. Gear measurement - Gear terminology - Errors in gears – Pitch & Tooth thickness measurement - Parkinson's gear tester.

Objective: To make the students to understand and explore the fundamental working principles of various Angular measuring instruments, Form measuring instruments and gear measuring instruments.

Session No *	Topics to be covered	Ref	Teaching Aids
10	Angular Measurement - Angular measuring instruments, Types – Bevel protractor (Vernier & Optical bevel protractor	R1. 517-520, R2. 271- 341	ICT
11	Spirit levels & Sine bar	R1.520-530	ICT
12	Sine center & Sine table**(Demonstration – Experiential Learning)**	R1.520-530	ICT
13	Angle Dekkor & Autocollimator	R1. 540-543, R1. 533 -535, R1. 472-475	ICT
14	Form Measurement - Measurement of surface finish – Surf Tester. **(Demonstration – Experiential Learning)**	R1. 638-666	ICT
15	Gear measurement - Gear terminology	R1. 730-733,	ICT
16	Errors in gears	R1.735-739, R2. 637	ICT
17	Pitch & Tooth thickness measurement	R1.739-754	ICT
18	Parkinson's gear tester. **(Demonstration – Experiential Learning)**	R1.755-756	ICT
	CAT- I		

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: ME 18501 – Metrology and Quality Control

Unit : III

Unit Syllabus : ADVANCES IN METROLOGY

Interferometry – Types of Interferometers – Michelson interferometer – NPL flatness interferometer. Laser metrology - Basic concept of lasers - Advantages of Laser – Laser Interferometers – Types – DC and AC lasers interferometer – Applications. Coordinate Measuring Machines - Types of construction – Probes. CNC CMM, Machine vision system – Image acquisition & Image processing..

Objective: To make the students to understand the principles of interferometry and familiarize them with the types and working principles of interferometers and CMM.

Session No *	Topics to be covered	Ref	Teaching Aids
19	Interferometry	R1. 418-420, R2. 71-74	ICT
20	Types of Interferometers – Michelson interferometer	R1.426-430	ICT
21	NPL flatness interferometer	R1. 430-432, R2. 80-82	ICT
22	Laser metrology - Basic concept of lasers - Advantages of Laser	R1.1076-1077	ICT
23	Laser Interferometers	R1. 535	ICT
24	DC and AC Interferometer & Application	R1.427-428, R1. 435-436	ICT
25	Coordinate Measuring Machines - Types of construction **(Demonstration on cylindricity measurement – Experiential Learning)**	R1. 792-794	ICT
26	CMM - Probes	R1.800-802, R1.809	ICT
27	Machine vision system – Image acquisition & Image processing.	R1. 818-821, R1.1064-1070	ICT

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: ME 18501 – Metrology and Quality Control

Unit : IV

Unit Syllabus: MEASUREMENT OF PROCESS PARAMETERS

Measurement of Force Load cells Hydraulic & Pneumatic load cells LVDT. Basics of Torque & Power measurement. Flow measurement Differential pressure flow meter, Magnetic flow meter Ultrasonic flow meter. Temperature measurement – Thermocouples Radiation pyrometer Infrared temperature sensor.

Objective: i. To measure the dimensions of the components and process parameters.

Session No *	Topics to be covered	Ref	Teaching Aids
28	Introduction to measurement of process parameters	R3 – Ch.12; Pg . 305	ICT
29	Measurement of Force Load cells	R3 – Ch.15; Pg . 358	ICT
30	Hydraulic & Pneumatic load cells-	R3 – Ch.15; Pg . 359-361	ICT
31	LVDT **(Demonstration – Experiential learning)**	R3 – Ch.14. Pg . 348-350	ICT
32	Basics of Torque & Power measurement	R3 – Ch.16; Pg . 349, 387	ICT
33	Flow measurement, Differential pressure flow meter	R3 – Ch.15; Pg . 364-365	ICT
34	Magnetic flow meter, Ultrasonic flow meter	R3 – Ch.15; Pg . 365-68	ICT
35	Temperature measurement – Thermocouples **(Demonstration – Experiential learning)**	R3 – Ch.15; Pg . 369-372	ICT
36	Radiation pyrometer , Infrared temperature sensor.	R3 – Ch.15; Pg . 379-382	ICT
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name : ME18501- Metrology and Quality Control

Unit : V

Unit Syllabus: QUALITY CONTROL

Quality Definitions - Meaning of quality of product & services - Quality of conformance & Quality of performance. ISO 9000 Series & other standards, necessity of ISO certification. Statistical Quality Control Meaning and importance of SQC, Control charts for variables X & R charts, Acceptance Sampling

Objective: To provide knowledge on quality and control process.

Session No *	Topics to be covered	Ref	Teaching Aids
37	Need for quality	R3 – Ch.11; Pg . 260-262	ICT
38	Quality Definitions - Meaning of quality of product & services	R3 – Ch.11; Pg . 260-264	ICT
39	Quality of conformance & Quality of performance	R3 – Ch.11; Pg . 260-264	ICT
40	ISO - Necessity of ISO Certification	R3 – Ch.11; Pg . 287-289	ICT
41	ISO 9000 Series & other standards **(Participative learning on latest standards through exploration of ISO official website)**	R3 – Ch.11; Pg . 287-289	ICT
42	Statistical Quality Control -Meaning & Importance	R3 – Ch.11; Pg . 267-269	ICT
43	Control charts – Basics, Uses	R3 – Ch.11; Pg . 271-273	ICT
44	Control charts for variables X & R charts	R3 – Ch.11; Pg . 271-273	ICT
45	Acceptance Sampling	R3 – Ch.11; Pg .270	ICT
Content beyond syllabus covered (if any): -			

* Session duration: 50

Sub Code / Sub Name: ME 18501 – Metrology and Quality Control

REFERENCES:

1. Jain R.K "Engineering Metrology", Khanna Publishers, 21 st edition, 2005.
2. Gupta. I.C., "Engineering Metrology", 7th edition, Dhanpatrai Publication, 2012.
3. Raghavendra , Krishnamurthy , '"Engineering Metrology and Measurements", Oxford University Press, 2013
4. https://nptel.ac.in/courses/112/104/112104250/
5. https://nptel.ac.in/courses/112/106/112106179/

	Prepared by	Approved by
Signature		
Name	Dr. S. Ponnuvel/Mr. A. Ranjith Raj	Dr. M. Mohandass
Designation	Associate Professor/Assistant Professor	Asst. HOD/MEC
Date	05.08.2022	05.08.2022
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Mechanical Engineering	LP: ME18502 Rev. No: 01 Date: 01/08/2022
B.E/~~B.Tech/M.E/M.Tech~~ : Mechanical Engineering, Regulation: R2018 PG Specialisation : --- Sub. Code / Sub. Name **: ME18502/DYNAMICS OF MACHINERY** Unit : **I**	

Unit Syllabus: **FORCE ANALYSIS** **12**

Dynamic force analysis – Inertia force and Inertia torque– D Alembert's principle –Dynamic Analysis in Slider Crank Mechanism – Turning moment diagrams –Fluctuation of Energy and Speed, Weight of Flywheel required

Objective: To impart knowledge on the fundamental force-motion relationship in components subjected to external forces and analysis of standard mechanisms

Session No *	Topics to be covered	References	Teaching Aids
1	Introduction to the subject, Dynamic force analysis - Inertia force and Inertia torque	Ref.3-Ch.12-283-326; Ref.3-Ch.15-515	BB
2	D Alembert's principle explanation –Introduction to Dynamic Analysis in reciprocating engines- determining gas forces neglecting the weight of the connecting rod- Bearing loads	Ref.3-Ch.12-283-326;	BB, ICT
3	Explanation of Equivalent Dynamical System	Ref.3-ch.13-543-548	BB, ICT
4	Calculation of correction couple to be applied to equivalent Dynamical System	Ref.3-ch.15-548-550	ICT, BB
5	Derivation of Inertia forces neglecting the weight of the connecting rod and solving problems	Ref.3-ch.15-550-560	ICT
6	Derivation of Crank shaft torque using Analytical method and solving problems	Ref.2- pg.no.437	BB, ICT
7	Introduction to Turning moment diagrams –Explanation of Single and Multi cylinder engines- **Video demonstration**	Ref.2-435-437 Ref.3-ch.16-565-568	ICT
8	Introduction to Turning moment diagrams –Explanation of Single and Multi cylinder engines-Q**uiz – Participative learning.**	Ref.2-431-442	ICT
9	Calculation of Fluctuation of Energy- Introduction to Fly Wheels – Determination of Coefficient of Fluctuation of Speed and Energy store	Ref.3-ch.16-568	ICT
10	Explanation of how Flywheels used in punching presses and derivation of maximum fluctuation of energy	Ref.3-ch.16-568	ICT
11	Continuation of problems based on Flywheels - **Video demonstration**	Ref.2-pg.no.439-446 Ref.3-ch.16-568-607	ICT
12	Continuation of problems based on Flywheels	Ref.2-pg.no.439-446 Ref.3-ch.16-568-607	ICT
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes
* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

Sub. Code / Sub. Name: ME18502/DYNAMICS OF MACHINERY
Unit : **II**

Unit Syllabus : BALANCING OF MASSES 12

Dynamic balancing – Balancing of rotating masses under single and several planes – Balancing of reciprocating masses - Primary and secondary forces and couples– Balancing of linkages.

Objective: To determine the undesirable effects of imbalances resulting from prescribed motions in mechanism.

Session No *	Topics to be covered	References	Teaching Aids
13	Introduction to Static and dynamic balancing – Principal involved in Balancing of rotating masses	Ref.2-ch.14-489-491 Ref.3-ch.21-833-835	ICT
14	Explanation of Balancing of Several masses rotating in same planes – Solving problems	Ref.2-ch.14-491-492 Ref.3-ch.21-837-841	ICT
15	Explanation of Balancing of Several masses rotating in different planes **– Laboratory demonstration - Experiential Learning.**	Ref.2-ch.14-489-491 Ref.3-ch.21-833-835	ICT, LAB
16	Explanation of Balancing of Several masses rotating in different planes – Solving problems	Ref.2-ch.14-489-491 Ref.3-ch.21-833-835	LAB, ICT
17	Calculation of masses for balancing Primary and Secondary unbalanced forces of reciprocating masses and Partial balancing and variation of Tractive force	Ref.2-ch.14-499-504 Ref.3-ch.22-859-873	BB, ICT
18	Calculation of masses for balancing Primary and Secondary unbalanced forces of reciprocating masses and Partial balancing and variation of Tractive force	Ref.2-ch.14-499-504 Ref.3-ch.22-859-873	ICT
19	Introduction to Balancing of coupled locomotives	Ref.2-ch.14-504-505 Ref.3-ch.22-873-878	BB, ICT
20	Calculation of masses for balancing primary forces and Secondary forces of multi cylinder inline engines	Ref.2-ch.14-505-508 Ref.3-ch.22-878-894	ICT
21	Calculation of masses for balancing primary forces and Secondary forces of multi cylinder inline engines- Q**uiz – Participative learning.**	Ref.2-ch.14-505-508 Ref.3-ch.22-878-894	ICT
22	Calculation of masses to balance Radial engines	Ref.3-ch.22-894-898	ICT
23	Calculation of masses to balance V Engines	Ref.2-ch.14-513-520 Ref.3-ch.22-899-904	ICT
24	Principle involved in Balancing of linkages, Balancing machines and Field balancing of discs and rotors.	Ref.2-ch.14-521-525	ICT

Content beyond syllabus covered (if any):

* Session duration: 50 minutes
* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: ME18502/DYNAMICS OF MACHINERY

Unit : **III**

Unit Syllabus FREE VIBRATION 12

Basic features of vibratory systems – Degrees of freedom – single degree of freedom – Free vibration – Equations of motion – Natural frequency – Types of Damping – Damped vibration– Critical speeds of shafts – Dunkerley Method- Torsional vibration of shaft – Torsional vibration – Two rotor Torsional systems

Objective: To inculcate the concepts of vibration and damping principles

Session No *	Topics to be covered	References	Teaching Aids
25	Basic features of vibratory system, Degrees of freedom and terms used in vibratory motion freedom	Ref.2-ch.15-532 Ref.3-ch.23-904-910	ICT
26	Principle of Free vibration– deriving equations of motion based upon following methods: Equilibrium method, Energy method and Rayleigh's method	Ref.2-ch.15-533-536 Ref.3-ch.23-911-915	ICT
27	Principle of Free vibration– deriving equations of motion based upon following methods: Equilibrium method, Energy method and Rayleigh's method	Ref.2-ch.15-533-536 Ref.3-ch.23-911-915	ICT
28	Determination of Natural frequency of transverse vibration with and without including effect of inertia on transverse vibration	Ref.2-ch.15-537-538 Ref.3-ch.23-915-918	ICT,
29	Determination of Natural frequency of transverse vibration with and without including effect of inertia on transverse vibration	Ref.2-ch.15-537-538 Ref.3-ch.23-915-918	BB, ICT
30	Determination of Natural frequency using Dunkerley's method	Ref.2-ch.15-545-546 Ref.3-ch.23-927-930	ICT
31	Determination of Critical speeds of shaft**— Laboratory demonstration - Experiential Learning.**	Ref.2-ch.15-565-567 Ref.3-ch.23-930-937	BB, ICT
32	Determination of Frequency of damped vibrations, Different Types of Damping	Ref.2-ch.15-552-554 Ref.3-ch.23-937	ICT
33	Determination of Frequency of damped vibrations, DifferentTypes of Damping	Ref.2-ch.15-552-554 Ref.3-ch.23-937	ICT
34	Determination of Natural frequency of Torsional vibration of shaft	Ref.2-ch.15-568-583 Ref.3-ch.24-972-975	BB,ICT
35	Determination of Natural frequency of Two and three rotor torsional systems – Solving problems based on Geared Systems	Ref.2-ch.15-568-583 Ref.3-ch.24-977-980	BB,ICT
36	Determination of Torsionally equivalent shaft	Ref.2-ch.15-585 Ref.3-ch.24-982-991	BB,ICT
Content beyond syllabus covered (if any): The refractory metals, super-alloys, noble metals, Lead and Zinc alloys.			

* Session duration: 50 minutes

* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub Code / Sub Name: ME18502/DYNAMICS OF MACHINERY

Unit : **IV**

Unit Syllabus : FORCED VIBRATION AND MESUREMENT 12

Response of one-degree freedom systems to periodic forcing – Harmonic disturbances – Disturbance caused by unbalance – Support motion –transmissibility – Vibration IsolationGeneral considerations in vibration measurement-vibration pickups.

Objective: To identify the undesirable effect of vibrations and its controlling procedures

Session No*	Topics to be covered	References	Teaching Method
37	Derivation of one degree freedom systems Responses to periodic forcing-	Ref.3-ch.23-949-961	ICT
38	Derivation of one degree freedom systems Responses to periodic forcing	Ref.3-ch.23-949-961	ICT
39	Derivation of one degree freedom systems Responses to periodic forcing	Ref.3-ch.23-949-961	ICT
40	Determination of Harmonic disturbances caused by unbalance	Ref.3-ch.23-949-961	ICT
41	Determination of Harmonic disturbances caused by unbalance	Ref.3-ch.23-949-961	ICT
42	Determination of Harmonic disturbances caused by unbalance	Ref.3-ch.23-949-961	ICT
43	Determination of transmissibility for Support motion	Ref.3-ch.23-961-968	ICT
44	Determination of transmissibility for Support motion	Ref.3-ch.23-961-968	ICT
45	Principle involved in Vibration isolation - Q**uiz – Participative learning.**	Ref.3-ch.23-961-968	ICT
46	Principle involved in Vibration isolation	Ref.3-ch.23-961-968	ICT
47	considerations in vibration measurement-vibration pickups	Ref.5.Ch.10-771-799	ICT
48	considerations in vibration measurement-vibration pickups	Ref.5.Ch.10-771-799	ICT
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes
* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

Sub. Code / Sub. Name**:** ME18502/DYNAMICS OF MACHINERY
Unit : **V**

Unit Syllabus : CONTROL MECHANISMS 12

Governors – Types – Centrifugal governors – Gravity controlled and spring controlled Centrifugal governors – Characteristics – Gyroscopes –Gyroscopic forces– Gyroscopic effects in Automobiles, Ships and Airplanes.

Objective: To understand the principles in mechanisms used for speed control and stability control

Session No*	Topics to be covered	References	Teaching Method
49	Principle involved in Governors, Types of Centrifugal governors	Ref.2-ch.13-454 Ref.3-ch.18-653	BB, ICT
50	Explanation of Pendulum type, example Watt governors and solving problems related through Watt Governors	Ref.2-ch.13-455-457 Ref.3-ch.18-654-656	BB, ICT
51	Explanation of Gravity controlled Porter governors and solving problems-– **Laboratory demonstration - Experiential Learning.**	Ref.2-ch.13-457-459 Ref.3-ch.18-657-668	BB, ICT
52	Explanation of Gravity controlled Proell governors and solving problems	Ref.2-ch.13-461-463 Ref.3-ch.18-670-678	BB, ICT, LAB
53	Explanation of Spring controlled centrifugal governors - Hartnell governors and solving problems	Ref.2-ch.13-464-465 Ref.3-ch.18-678-691	BB, ICT
54	Explanation of Pickering in governors	Ref.3-ch.18-698-700	ICT
55	Explanation of Sensitiveness and stability of governors, hunting and Isochronous governors and solving problems	Ref.3-ch.18-700-701	ICT
56	Explanation of Characteristics – Effect of friction -Effort and power of governor and solving problems	Ref.2-ch.13-472-480 Ref.3-ch.18-702-710	BB, ICT
57	Explanation of Controlling force curves	Ref.3-ch.18-711-712	BB, ICT
58	Determination of Gyroscopic effects in Airplanes and solving problems	Ref.1-ch.23-710-712 Ref.3-ch.14-486-488	BB, ICT
59	Determination of Gyroscopic effects in Naval ships and solving problems-– **Laboratory demonstration - Experiential Learning.**	Ref.3-ch.14-488-490	ICT
60	Determination of Gyroscopic effects in Automobiles and solving problems	Ref.1-ch.23-706-707 Ref.3-ch.14-495-506	ICT
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes

* ICT – Laptop, Projector, Pen drive, Google Classroom, Microsoft tools, YouTube Videos

Sub. Code / Sub. Name: ME18502/DYNAMICS OF MACHINERY

TEXT BOOKS:

1. Rao,S.S, "Mechanical Vibrations," Pearson Education, Fifth Edition, 2011.
2. Rattan, S.S, "Theory of Machines", Tata McGraw-Hill, Fourth Edition, 2017.
3. Sadhu Singh, "Theory of Machines: Kinematics and Dynamics", Pearson Education, Third edition, 2011.
4. Uicker, J.J., Pennock G.R and Shigley, J.E., "Theory of Machines and Mechanisms", Oxford University Press, Fifth Edition,2017.

REFERENCES :

1. Ghosh. A and Mallick, A.K., "Theory of Mechanisms and Machines", East-West Pvt. Ltd., New Delhi, 2008.
2. Grover. G.T., "Mechanical Vibrations", Nem Chand and Bros., 2009
3. Khurmi, R.S., "Theory of Machines", S Chand Publications, 2005.
4. Rao J.S. and Dukkipati R.V. "Mechanisms and Machine Theory", Wiley-Eastern Ltd., New Delhi, 1992.
5. Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, 2009.

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Signature	1) 2)	
Name	Dr. V. SRIDHARAN – M. J. SENTHILKUMARAPANDIAN	Dr. M. Mohandas
Designation	Asst. Prof / MECH	Asst. HOD
Date	01/08/2022	01/08/2022
Remarks *:		
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Mechanical Engineering	LP: ME18503 Rev. No: 01 Date: 23/08/2022
B.E/B.Tech/M.E/M.Tech : **Mechanical Engineering** Regulation: **2018** PG Specialisation : NA Sub. Code / Sub. Name : **ME 18503 DESIGN OF MACHINE ELEMENTS** Unit : **I**	

Unit Syllabus: Design Process- types of Stress, Cyclic stresses, Factor of Safety, Stress concentration factor in tension, bending and torsion, Theories of failures. Notch sensitivity, Design for variable and repeated loadings, Fatigue stress concentration factor, Endurance diagrams, Introduction to fracture mechanics

Objective: To know the steps involved in design. Familiarize engineering materials and their selection for a particular application. To know the various standards, tolerances and different types of loading, stresses, factor of safety and design of components subjected to variable loading

Session No *	Topics to be covered	Ref	Teaching Aids
1	Introduction to design process and factors influencing machine design	TB.1; Ch-01; - Pg.01-17, Ch-02-05; Pg.16-180)	BBD/ICT
2	Types of Stress, Cyclic stresses, Factor of Safety examples		
3	Stress concentration factor in tension, bending and torsion		
4	Direct stresses- factor of safety, problems		
5	Problems		
6	Eccentric loading , Bending and torsion stress equations.		
7	Problems on the above topic **Group : To solve the problem**		
8	Theories of failures		
9	Principal stresses, theories of failure, problems		
10	Stress concentration, problems. Methods to avoid stress concentration		
11	Design for variable loading, Soderberg's and Goodman's equations, problems		
12	Problems: **Problem solving Methodology: real time component stress analysis**		
13	Tutorial on theories of failure		
14	introduction to fracture mechanics-theory **QUIZ/ Group : To solve the problem**		
Content beyond syllabus covered (if any): material selection and stresses in curved beam introduction			

* Session duration: 50 minutes

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: **ME 18503 DESIGN OF MACHINE ELEMENTS**

Unit : **II**

Unit Syllabus : Preferred Numbers- Standardization Design of shafts under static and fatigue loadings, Keys – types of keys , design of keys. Design of Rigid coupling, and Flexible coupling. Fits- types of Fits and Tolerance- hole basis system , Shaft basis problems

Objective: To know the design of shafts subjected to bending and torsional loads based on strength and rigidity. To select keys and found out the stresses acting on it and to design different types rigid and flexible couplings. Also familiarizing with standardization , fits and tolerances.

Session No *	Topics to be covered	Ref	Teaching Aids
15	Preferred Numbers , standardization Design of shafts based on strength- subjected to twisting and bending only	TB. 1 Ch. 09, Pg. 330-385	BBD/ICT BBD/ICT
16	Problems		
17	Design of shafts based on combined bending and torsion		
18	Problems ***Problem solving Methodology***: **M/c tools spindle design(lathe M/c)**		
19	Design of shafts subjected to combined bending and torsion		
20	Problems on shafts carrying pulleys and gears ***Problem solving Methodology***: : **M/c tools spindle design(planner M/ctool**		
21	Design of shafts subjected to bending torsion and axial loads		
22	Problems in the above topic Selection of keys and their applications – stresses on the keys		
23	Design of rigid couplings – muff, flange and marine type couplings		
24	Design of flexible couplings – pushed pin type couplings **Grouping / Solving Method** : ***Problem solving methodology***		
25	Fits and tolerance- hole basis system and shaft basis system ***Quiz& Seminar presentations***		
26	problems on the above topic		
	CAT I		

Content beyond syllabus covered (if any):

* Session duration: 50 mins

Sub. Code / Sub. Name: **ME 18503 DESIGN OF MACHINE ELEMENTS**

Unit : **III**

Unit Syllabus: Design of Close coil helical springs under varying load condition. Design of Leaf spring, Disc Spring and Torsion spring.

Objective: To design the close coli helical spring, leaf spring, torsion and disc springs subjected to direct and eccentric loading.

Session No *	Topics to be covered	Ref	Teaching Aids
27	Springs introduction types stresses, terminologies in springs	TB. 1, Ch. No.07, 219-269, Ch. No. 08, 272-325	BBD/ICT
28	Close coil helical spring design under static load- design		
29	problem in the above topic ***Problem solving Methodology***: **Two wheeler spring design**		
30	Close coil helical spring design under static load- eccentric load design		
31	Close coil spring in varying load – Soderberg equation application ***Problem solving Methodology***: **Two wheeler spring design**		
32	Leaf spring design		
33	Problem ***Problem solving Methodology***: LMV /HV **spring design**		
34	Disc spring design ***Group Discussion/ Seminar Presentation***		
35	Problems		
36	Torsion spring design		
37	Problems		
38	Tutorial on helical valve springs		
	CATII		
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: **ME 18503 DESIGN OF MACHINE ELEMENTS**

Unit : **IV**

Unit Syllabus : Rivet – Types of rivet joints, Caulking and fuluring, Design of riveted joints for structural and pressure vessels. Eccentrically loaded rivet joint, Welding – Welding symbols, Design of welded joints under eccentrically load. Geometry of thread forms, Terminology of screw threads.Design of screws and bolts**.**

Objective: To study the design of rivet joints for structural and vessels and to design weld structure subjected to direct, eccentric load and cyclic loadings.

Session No *	Topics to be covered	Ref	Teaching Aids
39	**Rivet – Types of rivet joints, Caulking and fuluring**	TB. No. 1 Ch. No. 10, 392-443, Ch. No. 21, 749-767	BBD/ICT
40	**Design of riveted joints for structural**		
41	Problems ***Problem solving Methodology***: riveted Truss design		
42	**Rivet design for pressure vessels**		
43	Problems ***Problem solving Methodology: Thermal lab Bolie's Rivet design***		
44	**Eccentrically loaded rivet joint –design**		
45	Problems		
46	**Welding – Welding symbols Types -Terminologies - stresses**		
47	Welding design – simple cases- **problems** **Problem solving Methodology: Welded Truss design**		
48	**Design of welded joints under eccentrically load- problems**		
49	. Geometry of thread forms, Terminology of screw threads		
50	Design of screws and bolts**-Problems** ***QUIZ/Group discussion***		
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: **ME 18503 DESIGN OF MACHINE ELEMENTS**

Unit : **V**

Unit Syllabus : Design and selection of rolling contact bearings – Design of sliding contact bearings. Introduction of EHD Journal Bearings.

Objective: The students are able to design hydrodynamic journal bearings. The students are able to study and derive the properties of the lubricants and bearings. The students are to select rolling contact bearings and compute the mean life of the bearings for its survival.

Session No *	Topics to be covered	Ref	Teaching Aids
51	Theory of Lubrication, Bearings, types, hydrodynamic lubrication	TB. No. 1 Ch. No. 16, Pg. No. 601-644, Ch. No 15. Pg. No. 564-599	BBD/ICT
52	Design of hydrodynamic bearings - procedure		
53	Somerfield numbers,		
54	Problems on design of journal bearings ***Problem solving Methodology: Lathe spindle bearing design/Planar M/c tool s over head shaft design***		
55	Rolling contact bearings – types selection and their applications		
56	Selection of rolling contact bearings – problems ***Problem solving Methodology: Wheel axel support bearing in Two wheeler or Machine tool's ball bearing design***		
57	**P**roblems		
58	90% survival of the bearings, mean life of the bearings, problems		
59	Problems ***Problem solving Methodology: Life estimation of Wheel axel support bearing in Two wheeler or Machine tool's ball bearing design***		
60	Introduction of EHD Journal Bearings ***Seminar/ Group discussion***		
	CAT III		
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

Sub Code / Sub Name: **ME 16503 DESIGN OF MACHINE ELEMENTS**

TEXT BOOKS:

1. Bhandari V, "Design of Machine Elements", 3rd Edition, Tata McGraw-Hill Book Co, 2010.
2. Joseph Shigley, Charles Mischke, Richard Budynas and Keith Nisbett "Mechanical Engineering Design", 8th Edition, Tata McGraw-Hill, 2008.
3.Khurmi R.S., and Gupta J.K., "*Machine Design",* 14 th Edition,S Chand&Co NewDelhi,2005.
4.Sundararajamoorthy, T.V. and Shanmugam, N., "*Machine Design",* Anuradha Agencies, Chennai,2003.

REFERENCES:

1. Sundararajamoorthy T. V. Shanmugam .N, "Machine Design", Anuradha Publications, Chennai, 2003.
2. Robert C. Juvinall and Kurt M. Marshek, "Fundamentals of Machine Design", 4th Edition, Wiley, 2005
3. Alfred Hall, Halowenko, A and Laughlin, H., "Machine Design", Tata McGraw-Hill BookCo.(Schaum"s Outline), 2010
4. Bernard Hamrock, Steven Schmid,Bo Jacobson, "Fundamentals of Machine Elements",2nd Edition, Tata McGraw-Hill Book Co., 2006.
5. Orthwein W, "Machine Component Design", Jaico Publishing Co, 2003.
6. Ansel Ugural, "Mechanical Design – An Integral Approach", 1st Edition, Tata McGraw-Hill Book Co, 2003.
7. Merhyle F. Spotts, Terry E. Shoup and Lee E. Hornberger, "Design of Machine Elements" 8th Edition, Printice Hall, 2000.
8.Lingaiah K., "*Machine Design Data Book"*, 2 nd Edition Tata McGraw – Hill.New delhi,2010.
9.Robort.L.Norton," Machine Design", 5 th Edition, Pearson Publisher, New delhi,2018.
10.Sharma,P.C and Agarwal,D.K,"MachineDesign",Agrawal-Kataria and Sons Publication, NewDelhi,2014.
11.Shigley, J.E., Charles, R.M. and Richard, G.B., "*Mechanical Engineering Design", 10 th* ed., McGraw-Hill, New Delhi,2014.
12.Spotts M.F., "*Design of Machine Elements*", 8 th Edition,Pearson Education,NewDelhi, 2019.

	Prepared by	Approved by
Signature		
Name		
Designation		
Date		
Remarks *:		
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

REFERENCES:

1. Mikell.P.Groover"Automation,ProductionSystemsandComputerIntegratedManufacturing",PrenticeHallofIndia,2008.
2. RadhakrishnanP,SubramanyanS.andRajuV.,"CAD/CAM/CIM",2ndEdition,NewAgeInternational(P) Ltd, NewDelhi,2000.
3. KantVajpayeeS,"PrinciplesofComputerIntegratedManufacturing",PrenticeHallIndia,2003.
4. Rao.P,N T i w a r i & T.K.Kundra,"ComputerAidedManufacturing",TataMcGrawHillPublishingCompany ,2000
5. GrooverM.P.,"IndustrialRobotics-TechnologyProgrammingandApplications",McGrawHill,2001
6. Computer-Integrated Design and Manufacturingby David D. Bedworth, M.R. Henderson, Published December 1st 1991 by McGraw-Hill Companies
7. **Li-Hong Juang "Intelligent Robots" , Nova Science Publishers,** Inc.2019

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Name	Dr.S. MUNIRAJ	Dr M. Mohandas
Designation	Assistant Professor	AHoD/ME
Date	30.07.2021	30/7/2021
Remarks *:	The same lesson plan is to be followed for AY 2022-23. 5/8/2022 (S.MUNIRAJ)	
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Mechanical Engineering	LP: Sub Code ME18504 Rev. No: 01 Date: 08/08/2022
B.E/B.Tech/M.E/M.Tech : V/ Mechanical Regulation:2018 PG Specialisation : _____ Sub. Code / Sub. Name : ME18504/Heat and Mass Transfer Unit : I	

Syllabus: 12

General Differential equation of Heat Conduction–Cartesian and Polar Coordinates–One Dimensional Steady State Heat Conduction —Plane and Composite Systems –Conduction with Internal Heat Generation –Extended Surfaces –Unsteady Heat Conduction –Lumped Analysis – Infinite Solids –Use of Heisler"s charts

Objective:

- To understand the mechanisms of heat transfer under steady and transient conditions.

Session No *	Topics to be covered	Ref	Teaching Aids
1	Basic Concepts – Mechanism of Heat Transfer – Conduction, Convection and Radiation- **https://www.youtube.com/watch?v=HpCvWuvCUoA**	5,7	ICT
2	Fourier Law of Conduction; General Differential equation of Heat Conduction in Cartesian coordinates	5,7	ICT
3	Fourier Law of Conduction; General Differential equation of Heat Conduction in Cylindrical coordinates	5,7	ICT
4	One Dimensional Steady State Heat Conduction – Conduction through Plane Wall,	5,7	ICT
5	**Method of Weighted Residuals (Tutorial-1 Steady state conduction) - Descriptive Assignments**	5,7	ICT
6	Composite Systems both plane wall and cylindrical systems - - **Experimental Steady-. Laboratory demonstration of composite wall**	5,7	ICT
7	**Method of Weighted Residuals (Tutorial-2 Composite system) - Descriptive Assignments.**	5,7	ICT
8	Conduction with Internal Heat Generation	5,7	ICT
9	Solution to Conduction equation with Internal Heat Generation	5,7	ICT
10	Extended Surfaces – fins- **Experimental Steady-. Laboratory demonstration of fins**	5,7	ICT
11	Unsteady Heat Conduction – Lumped Analysis – Use of Heislers Chart.	5,7	ICT
12	Semi-infinite , Infinite solids	7	ICT
Content beyond syllabus covered (if any):			

*** Session duration: 50 mins**

ICT – PowerPoint presentation, YouTube videos, Google classroom, Assessment tools.

Sub. Code / Sub. Name: ME18504: Heat and Mass transfer

Unit : II

Syllabus: **12**

Free and Forced Convection -Hydrodynamic and Thermal Boundary Layer. Free and Forced Convection during external flow over Plates and Cylinders, non circular cross section and Internal flow through tubes flow, across banks of tubes, non-circular cross section.

Objective:

- To study the heat transfer rate for laminar and turbulent flows

Session No *	Topics to be covered	Ref	Teaching Aids
13	Basic Concepts: Convective Heat Transfer Coefficients – Boundary Layer Concept and similarity between momentum and heat transfer- **https://www.youtube.com/watch?v=B8H06ZA2xmo**	5,7	ICT
14	Types of Convection – Forced Convection – Dimensional Analysis- **- Experimental Steady-. Laboratory demonstration of Forced Convection**	5,7	ICT
15	External Flow – Flow over Plates, Cylinders	5	ICT
16	External Flow – Flow over Cylinders	7	ICT
17	**Flow over plate Problems (Tutorial 3) - Quiz and Descriptive Assignments**	7	ICT
18	**Flow over cylinder Problems (Tutorial 4) - Quiz and Descriptive Assignments**	7	ICT
19	Internal Flow – Laminar and Turbulent Flow – Combined Laminar and Turbulent	5,7	ICT
20	Flow over Bank of tubes, and its importance in heat exchanger	5,7	ICT
21	Tutorial 6 on Internal flow and flow over bank of tubes	5,7	ICT
22	Free convection: Flow over Vertical Plate, Horizontal Plate, **Experimental Steady-. Laboratory demonstration of Free Convection**	7	ICT
23	Tutorial 5on free convection, problems	5,7	ICT
24	Tutorial 6 on free convection, problems	5,7	ICT
Content beyond syllabus covered (if any):			

*** Session duration: 50 mins**

ICT – PowerPoint presentation, YouTube videos, Google classroom, Assessment tools.

Sub. Code / Sub. Name: ME18504: Heat and Mass transfer

Unit : III

Syllabus: **12**

Nusselt"s theory of condensation-Regimes of Pool boiling and Flow boiling. Correlations in boiling and condensation. Heat Exchanger Types -Overall Heat Transfer Coefficient –Fouling Factors - Analysis –LMTD method -NTU method.

Objective:

To understand the phenomenon of boiling and condensation heat transfer

To learn the thermal analysis of heat exchanger

Session No *	Topics to be covered	Ref	Teaching Aids
25	Nusselt theory of condensation	7	ICT
26	Correlations in condensation	7	ICT
27	Boiling; Pool boiling, flow boiling, correlations in boiling- https://www.youtube.com/watch?v=BAlwZYKwQTU	7	ICT
28	**Boiling and condensation Problems (Tutorial 7) - Quiz and Descriptive Assignments**	7	ICT
29	Types of Heat Exchangers - **Experimental Steady-. Laboratory demonstration of Counter flow and Parallel flow heat exchangers-**	5,7	ICT
30	Analysis of heat exchanger LMTD method	5,7	ICT
31	**Heat exchanger Problems using LMTD method (Tutorial 8) - Quiz and Descriptive Assignments-** https://www.youtube.com/watch?v=mK2QDYjCjzQ	5	ICT
32	Analysis of heat exchanger using Effectiveness – NTU method- https://www.youtube.com/watch?v=vXrnPD1NyUg	5	ICT
33	Overall Heat Transfer Coefficient with and without Fouling Factors	7	ICT
34	Fouling Factors in heat exchangers	7	ICT
35	Tutorial 9 in heat exchanger-	5,7	ICT
36	Tutorial 9 in heat exchanger continued	5,7	ICT
Content beyond syllabus covered (if any):			

*** Session duration: 50 mins**

ICT – PowerPoint presentation, YouTube videos, Google classroom, Assessment tools.

Sub. Code / Sub. Name: ME18504: Heat and Mass transfer

Unit : IV

Syllabus: **12**

Black Body Radiation –Gray body radiation - Shape Factor algebra –Electrical Analogy – Radiation Shields. Radiation through gases

Objective:

To understand the concepts of radiation in black and gray body, and in gases.
To learn the concepts of electrical analogy and shape factor algebra in radiation

Session No	Topics to be covered	Ref	Teaching Aids
37	Basic Concepts, Laws of Radiation – Stefan Boltzmann Law, Kirchhoff's Law- https://www.youtube.com/watch?v=B8H06ZA2xmo	7	ICT
38	Black Body Radiation	7	ICT
39	Grey body radiation	7	ICT
40	Shape Factor Algebra	7	ICT
41	Tutorial 11 in Black Body Radiation and Grey body radiation	7	ICT
42	Tutorial 11 in shape factor algebra	7	ICT
43	Tutorial 11 in Black Body Radiation and Grey body radiation	7	ICT
44	**Tutorial 11 - shape factor algebra Problems - Quiz and Descriptive Assignments**	5,7	ICT
45	Electrical Analogy, Radiation Shields	5,7	ICT
46	Tutorial 12 Radiation problems using Electrical Analogy	5,7	ICT
47	Introduction to Gas Radiation.	5,7	ICT
48	**Tutorial 13 - Gas Radiation Problems - Quiz and Descriptive Assignments**	5	ICT

*** Session duration: 50 mins**

ICT – PowerPoint presentation, YouTube videos, Google classroom, Assessment tools.

Sub. Code / Sub. Name: ME18504: Heat and Mass transfer

Unit : V

Syllabus: 12

Concept – Diffusion Mass Transfer – Fick's Law of Diffusion – Steady state Molecular Diffusion - Convective Mass Transfer – Momentum, Heat and Mass transfer Analogy- Convective Mass Transfer Correlations

Objective:

To understand the basic concepts of diffusion mass transfer Convection mass transfer

Session No	Topics to be covered	Ref	Teaching Aids
49	Basic Concepts – Diffusion Mass Transfer- **https://www.youtube.com/watch?v=Yc2eSffzhBI&list=PLwdnzlV3ogoVX_S_8DyKa7RudEazDL0o**	5,7	ICT
50	Fick's Law of Diffusion – Steady state Molecular Diffusion	5,7	ICT
51	Convective Mass Transfer-correlations - https://www.youtube.com/watch?v=CMlv2KqkW80	5,7	ICT
52	Convective Mass Transfer-Problems	5,7	ICT
53	Momentum, and Mass Transfer Analogy	5,7	ICT
54	Equimolar counter diffusion-problems	5,7	ICT
55	Steady state diffusion-problems	5,7	ICT
56	Convective Mass Transfer Correlations continued	5,7	ICT
57	Tutorial 14 using Fick's Law	5,7	ICT
58	Tutorial 15 Using the Convective Mass Transfer Correlations- https://www.youtube.com/watch?v=M2i3HSw4Ays	5,7	ICT
59	Tutorial 14 using Fick's Law	5,7	ICT
60	Tutorial 15 Using the Convective Mass Transfer Correlations	5,7	ICT
Content beyond syllabus covered (if any):---			

*** Session duration: 50 mins**

ICT – PowerPoint presentation, YouTube videos, Google classroom, Assessment tools.

Sub Code / Sub Name: ME18504: Heat and Mass transfer

TEXT BOOKS:

1. Yunus A. Cengel, "Heat Transfer A Practical Approach", Tata McGraw Hill, 5th Edition, 2015
2. Frank P. Incropera and David P. Dewitt, "Fundamentals of Heat and Mass Transfer", John Wiley & Sons, 2011,

REFERENCES:

1.Ghoshdastidar,P.S, "Heat Transfer", Oxford University Press , 2012

2.Holman, J.P., "Heat and Mass Transfer", Tata McGraw Hill, 7th edition,2010

3.Kothandaraman, C.P., "Fundamentals of Heat and Mass Transfer", New Age International, New Delhi, 1998.

4.Nag, P.K., "Heat Transfer", Tata McGraw Hill, New Delhi,3rd edition 2011

5.Ozisik, M.N., "Heat Transfer", McGraw Hill Book Company., 1994.

6.Sachdeva, R.C.Fundamentals Of Engineering HeatTransfer, New Age Science Ltd., New Delhi; 4th edition, 2009.

7.Thirumaleshwar.M: Fundamentals of Heat and Mass Transfer, "Heat and Mass Transfer", First Edition, Dorling Kindersley,2009.

8.Venkateshan. S.P., „Heat Transfer", Ane Books, New Delhi, 2004.

9.Yadav, R., "Heat and Mass Transfer", Central Publishing House, 1995.

WEBSITE:

https://nptel.ac.in/courses/112101097

	Prepared by	Approved by
Signature		
Name	Dr.K.Pitchandi / Mr.R.Kaliyanasunder	Dr. M. Mohandass
Designation	Prof/Assis. Prof /Mechanical	AHoD - Mechanical
Date	08/08/2022	08/08/22
Remarks *:		
Remarks *:		

- If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - LABORATORY

Department of Mechanical Engineering	LP: 18511 Rev. No: 01 Date: 25/07/2022
B.E/B.Tech/M.E/M.Tech : MEC Regulation: 2018 PG Specialisation : --- Sub. Code / Sub. Name : ME18511 DYNAMICS AND VIBRATION LABORATORY	

Session No*	List of Experiments
	CYCLE-I
1	Single degree of freedom Spring Mass System – Determination of natural Frequency Virtual Lab (VLAB) demonstration
2	Porter Governor - Determination of range sensitivity and effort Video Demonstration using ICT
3	Determination of natural Frequency by Dunkerley method.
4	Determination of Mass moment of inertia and Radius of Gyration of Fly wheel and Axle system
5	Determination of Mass Moment of Inertia and Radius of Gyration using Bifilar Suspension
6	Motorized gyroscope – Study of gyroscopic couple effect Video Demonstration using ICT
	Cycle 2
7	Determination of Mass Moment of Inertia and Radius of Gyration using Compound Pendulum
8	Verification of Torsion equilibrium using Epicyclic Gear Train
9	Whirling of shafts – Determination of critical speeds of shafts Video Demonstration using ICT
10	Cams – Cam profile drawing and study of jump phenomenon
11	Determination of torsional natural frequency of single Rotor systems under Undamped condition
12	Hartnell Governor - Determination of range sensitivity and effort Virtual Lab (VLAB) demonstration
Content beyond syllabus (if any): --	

* Session Duration: 150 minutes

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - LABORATORY

Sub. Code / Sub. Name: ME18511 DYNAMICS AND VIBRATION LABORATORY

	Prepared by	Approved by
Signature	C. Senthamaraikannan	M. Mohandass
Name	**Dr.C.Senthamaraikannan**	**Dr. M.Mohandass**
Designation	Associate Professor	Asst HoD & Asso. Prof
Date	**25/07/2022**	25/07/2022
Remarks* :		
Remarks* :		

* If the same lab plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE OUTCOMES - LABORATORY

Department of Mechanical Engineering	CO: ME18511
B.E/~~B.Tech/M.E/M.Tech~~ : Mechanical Engineering UG / ~~PG Specialisation~~ : Mechanical Engineering Regulation : R2018 Sub. Code / Sub. Name : ME18511 DYNAMICS AND VIBRATION LABORATORY	Rev. No: 01 Date: 25/07/2022

CO	Statements	RBT* Level
CO1	Students will calculate the Moment of Inertia and radius of gyration for the mechanical members.	L2, L3
CO2	Students will determine the natural frequency of free and forced vibration systems	L3
CO3	Students will analyse the motion transmission in cam and gears	L4
CO4	Students will analyse the performance characteristics of governors and gyroscope	L4

* Revised Bloom's Taxonomy

Mapping CO – PO - PSO*:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	2	3			3	2		2	3				3		
CO2	2	3			2	2		2	3				3		
CO3	3	2			3	2		2	2				2		
CO4	2	3			3	2		2	3				1		

3 – Strong; 2 – Moderate; 1 – weak

* Add Column if needed

Assessment Methods:

Stream	Internal Assessment Marks			End Semester Examination Marks
	Continuous Assessment (As per AAR)	Model Exam	Total	
Non - Autonomous	12	8	20	80
Autonomous	50	25	75	25

C. Sudhakar	R. Ramesh [Dr R. RAMESH]
Signature of Faculty / Course Coordinator	**Signature of Module Coordinator**

SRI VENKATESWARA COLLEGE OF ENGINEERING
(Autonomous)
Department of Mechanical Engineering

DEPARTMENT: Mechanical Engineering (UG) Regulation: 2018

Subject Code & Name: ME 18512- Metrology and Instrumentation Laboratory

Session No*	List of Experiments
	CYCLE-I
1	Calibration and Use of precision instruments-Vernier/Micrometer/Dial gauge.
2	Measurement of Taper angle using: Sine Bar
3	Measurement of Tool nomenclature using: Tool Maker's Microscope
4	Checking the limits of Dimensional tolerances using Pneumatic Comparator. **(Video Demonstration using ICT)**
5	Bore Measurement using bore dial gauge/Micrometer/Telescopic gauge
6	Straightness measurement using Autocollimator
	CYCLE-II
7	Measurements of Thread Parameters using Floating Carriage Micrometer
8	Measurement of Gear Tooth Dimensions using Gear tooth Vernier
9	Measurement of Force using Proving ring Measurement of Torque using Torque Measuring setup
10	Measurement of nomenclature of spur gear using Tool Maker's Microscope.**(Video Demonstration using ICT)**
11	Measurement of Temperature using Thermocouple/RTD/Thermistor
12	Displacement measurement - LVDT
	CYCLE-III
13	Measurement of Surface roughness using surf tester.
14	Linear, Angular, Cylindricity and circularity Measurement using CMM.
15	Measurement of geometric dimensions of industrial components using CMM.**(Experiential learning at Industry)**
16	Measurement of Geometric dimensions of Industrial components using Vision Measuring Machine.**(Experiential learning at Industry)**

Content beyond syllabus (if any):

1. Flatness measurement using optical interferometer
2. Error measurement of gears using gear tester
3. Angle measurement using Bevel protector

*Session Duration: 150 minutes

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - LABORATORY

Sub. Code / Sub. Name: ME18512- Metrology and Instrumentation Laboratory

	Prepared by	Approved by
Signature		
Name	**Dr. S. Ilaiyavel**	**Dr. M. Mohandass**
Designation	Associate Professor	Assistant HOD
Date	2/8/2022	2/8/2022
Remarks* :		
Remarks* :		

* If the same lab plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - LABORATORY

Department of Mechanical Engineering	LP: SUB CODE ME18513
B.E/B.Tech/M.E/M.Tech : Mechanical Engineering Regulation: 2018 PG Specialisation : Nil Sub. Code / Sub. Name : ME18513 Heat Transfer, Refrigeration and air conditioning lab	Rev. No: Date:

Session No*	List of Experiments
	CYCLE-I
1	PERFORMANCE TEST ON REFRIGERATION TEST RIG
2	HEAT TRANSFER COEFFICIENT – NATURAL CONVECTION (PIN-FIN APPARATUS)
3	PERFORMANCE TEST ON HEAT EXCHANGERS **Video Demonstration using ICT**
4	PERFORMANCE TEST ON MULTISTAGE RECIPROCATING AIR COMPRESSOR
5	
6	HEAT TRANSFER IN NATURAL CONVECTION (VERTICAL TUBE)
7	DETERMINATION OF EMISSIVITY OF A GREY SURFACE
8(a)	EVAPORATOR CAPACITY TEST ON AIR CONDITIONING TEST RIG
8(b)	CONDENSER CAPACITY TEST ON AIR CONDITIONING TEST RIG
	CYCLE-II
9	THERMAL CONDUCTIVITY OF METALS (COMPOSITE WALL) **Video Demonstration using ICT**
10	HEAT TRANSFER COEFFICIENT – FORCED CONVECTION (PIN-FIN APPARATUS)
11	HEAT TRANSFER IN FORCED CONVECTION (INSIDE TUBE APPARATUS)
12	HEAT TRANSFER THROUGH LAGGED PIPE APPARATUS
13	VAPOUR COMPRESSION REFRIGERATION TEST RIG USING HYDROCARBON
14	STEFAN BOLTSMAN APPARATUS
Content beyond syllabus (if any):	

* Session Duration: 150 minutes

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - LABORATORY

	Prepared by	Approved by
Signature		
Name	**Mr.R.Kalyana sundaran/ Dr.P.Raghu**	**Dr.S.Rameshbabu**
Designation	**Assistant Professor**	**Professor&HOD**
Date	**05.08.2022**	**05.08.2022**
Remarks* :		
Remarks* :		

* If the same lab plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Mechanical Engineering	LP: OE18005 Rev. No: 01 Date: 28.07.22
B.E/B.Tech/M.E/M.Tech : B.E & B.Tech Regulation: R2018 PG Specialisation : NA Sub. Code / Sub. Name : OE 18005 / Industrial Engineering and Manegement Unit : 1	

Unit Syllabus: Meaning, Definition, Objective, Need, Scope, Evolution and developments. Definition of productivity, individual enterprises, management productivity of materials, land, building, machine and power. Measurement of productivity, factors affecting the productivity, productivity improvement programs, wages and incentives (simple numerical problems)

Objective: To know the basics Concepts of Industrial Engineering

Session No *	Topics to be covered	Ref	Teaching Aids
1	Meaning, Definition, Objective of Industrial Engineering	R1, pg 2-3	BB/PPT
2	Need, Scope for Industrial Engineers	R1, pg 5-10	BB/PPT
3	Evolution and developments. **Presentation by students about various application of industrial engineering- Participative learning**	R1, pg 15-24	BB/PPT
4	Definition of productivity, individual enterprises	R1, pg 26-32	BB/PPT
5	Management productivity of materials, land	R1, pg 33-42	BB/PPT
6	Management productivity of building, machine and power	R1, pg 45-58	BB/PPT
7	Factors affecting the productivity,	R1, pg 62-66	BB/PPT
8	Productivity improvement programs,	R1, pg 92-95	BB/PPT
9	Numerical problems in wages and incentives **Problem solving – Different industrial cases and solutions**	R1, pg 115-117	BB/PPT
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: OE 18005 / Industrial Engineering and Manegement
Unit : II

Unit Syllabus: Definition, objective and scope of work study. Human factors in work study. Work study and management, work study and supervision, work study and worker. Method study Definition, objective & scope, activity recording and exam aids. Charts to record moments in shop operation process charts, flow process charts, travel chart and multiple activity charts. (With simple problems). Charts to record moment at work place principles of motion economy, classification of moments two handed process chart, SIMO chart, and micro motion study. Development, definition and installation of the improved method, brief concept about synthetic motion studies.

Objective: To understand about Work Study, Method Study and Time Study.

Session No *	Topics to be covered	Ref	Teaching Aids
10	Definition, objective and scope of work study, human factors in work study.	R2, pg 112-113	BB/PPT
11	Work study and management, work study and supervision, work study and worker **Demonstration with YouTube videos about method of performing work study**	R2, pg 128-132	BB/PPT
12	Method study Definition, objective & scope, activity recording and exam aids	R2, pg 134-141	BB/PPT
13	Charts to record moments in shop operation process charts, flow process charts, travel chart and multiple activity charts	R2, pg 142-145	BB/PPT
14	Simple problems in activity chart **Industrial cases – Problem solving**	R2, pg 162-167	BB/PPT
15	Charts to record moment at work place principles of motion economy,	R2, pg 172-183	BB/PPT
16	Classification of moments two handed process chart **Case study discussion with live example of handed process chart – Experiential learning**	R2, pg 184-187	BB/PPT
17	SIMO chart, and micro motion study	R2, pg 192-198	BB/PPT
18	Development, definition and installation of the improved method	R2, pg 211-213	BB/PPT
19	Brief concept about synthetic motion studies.	R1, pg 182-188	BB/PPT
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: OE 18005 / Industrial Engineering and Manegement

Unit : III

Unit Syllabus : Definition, objective and benefit of work measurement. Work measurement techniques. Work sampling: need, confidence levels, sample size determinations, random observation, conducting study with the simple problems. Time Study, Definition, time study equipment, selection of job, steps in time study. Breaking jobs into elements, recording information. Rating & standard Rating, standard performance, scale of rating, factors of affecting rate of working, allowances and standard time determination. Predetermined motion time study Method time measurement (MTM)

Objective: To understand the concept of Motion Study.

Session No *	Topics to be covered	Ref	Teaching Aids
20	Definition, objective, techniques and benefit of work measurement	R3, pg 52 - 66	BB/PPT
21	Work sampling: need, confidence levels, sample size determinations	R3, pg 173-186	BB/PPT
22	Random observation, conducting study with the simple problems	R4, pg 10-20	BB/PPT
23	Time Study, Definition, time study equipment, selection of job, steps in time study **Presentation by students about application of time study in day to day example – participative learning**	R3, pg 201-203	BB/PPT
24	Breaking jobs into elements, recording information.	R3, pg 201-203	BB/PPT
25	Rating & standard Rating, standard performance, scale of rating, determination	R3, pg 201-203	BB/PPT
26	Factors of affecting rate of working allowances and standard time	R3, pg 201-203	BB/PPT
27	Predetermined motion time study Method time measurement (MTM)	R3, pg 201-203	BB/PPT
28	Industrial cases discussion in Method study and work measurement **Brainstorming session about possible solutions for industrial problems- Participative learning**	R3, pg 201-203	BB/PPT
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: OE 18005 / Industrial Engineering and Manegement

Unit : IV

Unit Syllabus: Introduction, areas of study under ergonomics, system approach to ergonomics model, man-machine system. Components of man-machine system and their functions work capabilities of industrial worker, study of development of stress in human body and their consequences. Fatigue in industrial workers, Quantitative qualitative representation and alphanumeric displays, Controls and their design criteria, control types, relation between controls and displays, layouts of panels and machines. Design of work places, influence of climate on human efficiency. Influence of noise, vibration and light

Objective: To recognize the need for Ergonomics and Ergonomics Model.

Session No *	Topics to be covered	Ref	Teaching Aids
29	Introduction to ergonomics, why study ergonomics?	R3, pg 91 – 94	BB/PPT
30	Areas of study under ergonomics	R3, pg 95 – 109	BB/PPT
31	System approach to ergonomics model, man-machine system **Demonstration with YouTube videos about how man machine system works**	R3, pg 110 – 114	BB/PPT
32	Components of man-machine system and their functions work capabilities of industrial worker,	R3, pg 115 –121	BB/PPT
33	Study of development of stress in human body and consequences	R3, pg 121 –129	BB/PPT
34	Fatigue in industrial workers, Quantitative qualitative representation and alphanumeric displays	R3, pg 136 –138	BB/PPT
35	Controls and their design criteria, control types, relation between controls and displays, layouts of panels and machines.	R3, pg 142 –143	BB/PPT
36	Design of work places - Influence of climate on human efficiency	R3, pg 146-155	BB/PPT
37	Design of work places -Influence of noise, vibration and light **Case study discussion and brainstorming for ergonomically designed workplace – particiative learning**	R3, pg 91 – 94	BB/PPT
38	Discussion on cases of how ergonomically designed workplace influences productivity	R3, pg 95 – 109	BB/PPT
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: OE 18005 / Industrial Engineering and Manegement

Unit : V

Unit Syllabus: Introduction to Agile manufacturing, Lean and Six Sigma, Value Engineering, Just in time, Total quality management, Enterprise resource planning, Supply chain and logistics management.

Objective: To know the current trends in Industrial Engineering

Session No *	Topics to be covered	Ref	Teaching Aids
37	Introduction to Agile manufacturing	R3, pg 22-27	BB/PPT
38	Lean and Six Sigma,	R3, pg 367-379	BB/PPT
39	Just in time, Total quality management	R3, pg 380-391	BB/PPT
40	Value stream Engineering **Case study discussion of industrial problem using VSM – Participative learning**	R3, pg 392-395	BB/PPT
41	Enterprise resource planning	R3, pg 341-350	BB/PPT
42	Supply chain and logistics management. **Role play related to logistics and SCM – Experiential learning**	R3, pg 310-313	BB/PPT
43	Case study discussion	R3, pg 54-65	BB/PPT
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

TEXT BOOK:

1.George Kanawaty, "Introduction to Work study", IV Revised Edition,1992.
2.Khanna O.P, Industrial Engineering and Management", Dhanpat Rai Publications Pvt Ltd, 2010
3. Marvin E. Mundel and David L. Danner, Motion and Time study Improving Productivity, Prentice Hall India, 7th edition,1994.
4. Ralph M.Barnes , "Motion and time study design and Measurement of work", Paperback,2009.
5. "Engineered work Measurement" - Weldon, ELBS,1991

REFERENCES:

1.Bridger RS. Introduction to Ergonomics. 3 rd CRC Press, Boca Raton, Fl, USA,2009.
2.Khan M.I , Industrial Engineering, New Age International,2nd edition ,2009
3. Sanders. S and E J McCormick, Human Factors in Engineering Design, Mcgraw Hill,New york ,7 th Edition,1993.

WEB RESOURCE:

1. https://nptel.ac.in/courses/112/107/112107292/

	Prepared by	Approved by
Signature		
Name	K. Ram Prasad	Dr.M.Mohandass
Designation	Assistant Professor	Asst HOD & Associate Professor
Date	25/7/22	28/07/22
Remarks *:		
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

DEPARTMENT OF MECHANICAL ENGINEERING	LP: ME18015 Rev. No: 01 Date:25.07.22
B.E/B.Tech/M.E/M.Tech : B.E Regulation: R2018 PG Specialisation : NA Sub. Code / Sub. Name : ME18015 / Lean Six Sigma Unit : 1	

Unit Syllabus: LEAN MANUFACTURING 9

Evolution of lean; traditional versus lean manufacturing; ford production system concept of lean; Toyota's foray in lean, Customer Need; lean tools- Process mapping value stream management3 M; 7 types of Muda; 7 major losses reduction. cell layout; line balancing; concept of kaizen; steps involved in kaizen deployment; kanban concepts; types of Kanban; and practical application; push vs pull; changeover time reduction - single minute exchange of die; concept of TPM; poka-yoke; 5S; maintenance - preventive, time based and condition based; autonomous maintenance, JIT, Autonomation, DFMA.

Objective: To impart knowledge on the Lean manufacturing concepts

Session No *	Topics to be covered	Ref	Teaching Aids
1	Evolution of lean; traditional versus lean manufacturing	R1, pg 2-3	BB //PPT
2	Ford production system concept of lean; Toyota's foray in lean	R1, pg 5-10	BB/PPT
3	Customer Need; lean tools- Process mapping value stream management3 M; 7 types of Muda; 7 major losses reduction	R1, pg 15-24	BB/PPT
4	cell layout; line balancing; concept of kaizen; steps involved in kaizen deployment; kanban concepts;	R1, pg 26-32	BB/PPT
5	Types of Kanban; and practical application; **Presentation by students about Kanban application in manufacturing and service industries- Participative learning**	R1, pg 33-42	BB/PPT
6	Push vs Pull; changeover time reduction - single minute exchange of die;	R1, pg 45-58	BB/PPT
7	Concept of TPM; poka-yoke; 5S; maintenance - preventive, time based and condition based	R1, pg 62-66	BB/PPT
8	Autonomous maintenance, JIT, Autonomation **Presentation by students about various lean tools and its application in daily life- Participative learning**	R1, pg 92-95	BB/PPT
9	DFMA	R1, pg 115-117	BB/PPT
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes

Sub. Code / Sub. Name: ME18015 / Lean Six Sigma

Unit : II

Unit Syllabus: LEAN METRICS 9

Identify lean metrics; kaizen cloud identification in VSM; lean assessment. improving targets and benchmarks.

Objective: To expertise in the implementation of lean metrics, VSM and all lean assessments.

Session No *	Topics to be covered	Ref	Teaching Aids
10	What is Lean Metrics	R1, pg 112-113	BB /PPT
11	Identify Lean Metrics	R1, pg 118-122	BB/PPT
12	Value Stream Mapping and its benefits	R1, pg 124-131	BB/PPT
13	Case study in VSM **Brainstorming session with industrial case of how VSM is done for industrial problem – Experiential learning**	R1, pg 132-135	BB/PPT
14	Kaizen and its impact **Demonstration with YouTube videos about kaizen innovation and application**	R1, pg 152-157	BB/PPT
15	Kaizen cloud identification in VSM	R1, pg 162-173	BB/PPT
16	Case study	R1, pg 174-177	BB/PPT
17	Lean assessment	R1, pg 182-188	BB/PPT
18	Improving targets and benchmarks.	R1, pg 201-203	BB/PPT
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: ME18015 / Lean Six Sigma

Unit : III

Unit Syllabus : SIX SIGMA , TOOLS AND TECHNIQUES 9

SIPCO,QFD; voice of the customer, kano models, , cost of poor quality (COPQ), statistical process control, DMAIC

Objective: To gain knowledge on the six sigma principles, tools and its techniques.

Session No *	Topics to be covered	Ref	Teaching Aids
19	SIPCO	R3, pg 52 - 66	BB /PPT
20	QFD **Brainstorming discussion with industrial case of how QFD is done for industrial problem – Experiential learning**	R3, pg 173-186	BB/PPT
21	Voice of the customer	R3, pg 10-20	BB/PPT
22	Kano models	R3, pg 201-203	BB/PPT
23	Industrial Kano models	R3, pg 201-203	BB/PPT
24	Cost of poor quality (COPQ)	R3, pg 201-203	BB/PPT
25	Statistical process control	R3, pg 201-203	BB/PPT
26	DMAIC **Case study discussion with example of DMAIC phase for industrial application- Participative learning**	R3, pg 201-203	BB/PPT
27	Case studies of DMAIC	R3, pg 201-203	BB/PPT
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: ME18015 / Lean Six Sigma

Unit : IV

Unit Syllabus: SIX SIGMA DEFINE, MEASURE AND ANALYSE PHASE 9

DMAIC phases, overview, project charter – voice of the customer – high level process map – project team – case study, types of measures – introduction to statistical methods – sampling plan – data collection – choosing statistical software – measure tools – process maps, pareto charts, cause and effect diagrams, histograms, six sigma measurements – measurement system analysis – process capability calculations. Analyze – process analysis – hypothesis testing – statistical tests and tables – tools for analyzing relationships among variables – survival analysis.

Objective: To inculcate the knowledge on the application of Six Sigma principles of three phases to improve the quality of process outputs

Session No *	Topics to be covered	Ref	Teaching Aids
28	DMAIC phases, overview, project charter	R3, pg 91 – 94	BB /PPT
30	Voice of the customer – high level process map – project team – case study	R3, pg 95 – 109	BB/PPT
31	Types of measures – introduction to statistical methods — process maps	R3, pg 110 – 114	BB/PPT
32	Sampling plan – data collection – choosing statistical software – measure tools **Industrial cases – Problem solving**	R3, pg 115 – 121	BB/PPT
33	Pareto charts, cause and effect diagrams, histograms, calculations	R3, pg 121 – 129	BB/PPT
34	Six sigma measurements – measurement system analysis – process capability **Presentation by students about quality tools and its application – Participative learning**	R3, pg 136 – 138	BB/PPT
35	Analyze – process analysis – hypothesis testing – statistical tests and tables	R3, pg 142 –143	BB/PPT
36	Tools for analyzing relationships among variables – survival analysis.	R3, pg 146-155	BB/PPT
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

Sub. Code / Sub. Name: ME18015 / Lean Six Sigma

Unit : V

Unit Syllabus: IMPROVE AND CONTROL PHASE 9

Process redesign – generating improvement alternatives – design of experiments – pilot experiments – cost/benefit analysis – implementation plan. Control phase control plan – process scorecard – failure mode and effects analysis – final project report and documentation. DMADV, DFSS–six sigma in manufacturing and services case studies & Sustainability of Lean Six Sigma.

Objective: To induce a knowledge on the analyze and control the processes using six sigma concept.

Session No *	Topics to be covered	Ref	Teaching Aids
37	Process redesign – generating improvement alternatives	R3, pg 22-27	BB /PPT
38	Design of experiments – pilot experiments	R3, pg 367-379	BB/PPT
39	Cost/benefit analysis & implementation plan	R3, pg 380-391	BB/PPT
40	Control phase control plan – process scorecard	R3, pg 392-395	BB/PPT
41	Failure mode and effects analysis – final project report and documentation **Student's presentation about FMEA for an industrial problem – Experiential learning**	R3, pg 341-350	BB/PPT
42	DMADV	R3, pg 310-313	BB/PPT
43	DFSS–six sigma **Case study analysis of DFSS using Industrial example**	R3, pg 54-65	BB/PPT
44	Manufacturing and service case study of DMADV & DFSS	R3, pg 67-73	BB/PPT
45	Sustainability of Lean Six Sigma.	R3, pg 465-480	BB/PPT
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

REFERENCES BOOKS:

1. Gopalakrishnan N, Simplified Lean Manufacture: Elements, rules, tools and implementation, Prentice Hall of India, NewDelhi 2013.
2. James P. Womack , Daniel T. Jones ,Lean Thinking, Free press business,2013.
3. Kai Yang and Basemel-Haik, "Design for Six-Sigma: A Roadmap for Product Development", McGraw Hill, 2009.
4. Michael L. George, David Rowlands, Bill Kastle ,What is Lean Six Sigma, Tata McGrawHill,2003.
5. James P. Womack , Daniel T. Jones ,Lean Thinking, Free press business,2013.

WEB RESOURCES:

1. https://nptel.ac.in/courses/110/105/110105123/

	Prepared by	Approved by
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Date	25/7/22	25/7/2022
Remarks *:		
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Mechanical Engineering	LP: **ME18023**
B.E/B.Tech/M.E/M.Tech : **Mechanical Engineering**	Rev. No: 00
Regulation : 2018	Date: 29.07.2022
PG Specialisation : __Not Applicable__	
Sub. Code / Sub. Name : **ME18023- POWER PLANT ENGINEERING**	
Unit : I	

Unit syllabus: COAL BASED THERMAL POWER PLANTS 12

Rankine cycle -improvisations, Layout of modern coal power plant, Super Critical Boilers, FBC Boilers, Turbines, Condensers, All types of valves, Boiler Safety valves and relief valves, Pipes and tubes for boiler pressure parts, Steam & Heat rate, Subsystems of thermal power plants – Fuel and ash handling, Draught system, Feed water treatment. Binary Cycles and Cogeneration systems

Objective: Understanding engineering principles of operation and carry out thermodynamic cycle analysis for Thermal power generation systems.

Session No *	Topics to be covered	Ref	Teaching Aids
1	Introduction thermodynamic cycles, Rankine cycle	1 -Ch.2; Pg.41- 45	PPT
2	Layout of modern coal power plant, problems solving in Rankine cycle	1- Ch.2; Pg.74-75	PPT, ICT
3	Super Critical Boilers, FBC Boilers Problem solving	1- Ch.5; Pg.274-276	PPT, ICT
4	Turbines, Condensers, Steam & Heat rate	1- Ch.7; Pg.428-508,562-565	PPT
5	Boiler Safety valves and relief valves	1- Ch.6; Pg.356-374,580-586	PPT,
6	Pipes and tubes for boiler pressure parts	1- Ch.6; Pg.356-374,580-586	PPT
7	Subsystems of thermal power plants	1- Ch.6; Pg.356-374,580-586	PPT
8	Fuel handling	1-Ch.5; Pg.241-248	PPT
9	Ash handling	1-Ch 2; Pg. 402	PPT
10	Draught system, Feed water treatment.	1-Ch 4; Pg. 189	PPT, BB
11	Binary Cycles	2-Ch.3;Pg.105	PPT
12	Cogeneration systems	1-Ch 2; Pg 78	PPT
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes

Sub. Code / Sub. Name: ME18023- POWER PLANT ENGINEERING

Unit : II

Unit syllabus: DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS

Components of Diesel and Gas Turbine power plants. Combined Cycle Power Plants. Integrated Gasifier based Combined Cycle systems

Objective: To understand the working principles of Diesel engine and Gas turbine power plant components.

Session No *	Topics to be covered	Ref	Teaching Aids
13	Layout of Diesel engine power plants	1-Ch.11; Pg.765	PPT
14	Components of Diesel engine working principles and its components, Demonstration in thermal laboratory Experimental learning	1-Ch.11; Pg.765	ICT PPT
15	Diesel Engine Sub systems- Electronic fuel injection system	1-Ch.11; Pg.765	PPT
16	Components of Gas Turbine power plants Participate learning Power point presentation by students	1 - Ch.11; Pg.785-793 3 – Ch.3; Pg.76 - 112	PPT, ICT
17	Combined Cycle Power Plants	1 - Ch.3; Pg.109-110	PPT
18	Introduction gasifier	1 - Ch.5; Pg.299	PPT
19	Types of gasifier	1 - Ch.5; Pg.299	PPT,
20	Integrated Gasifier based Combined Cycle systems	1 - Ch.5; Pg.307-310	PPT
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

Sub. Code / Sub. Name: ME18023- POWER PLANT ENGINEERING

Unit : III

Unit syllabus: NUCLEAR POWER PLANTS 7

Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors : Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), Canada Deuterium-

Uranium reactor (CANDU), Breeder, Gas Cooled and Liquid Metal Cooled Reactors. Safety measures for Nuclear Power plants

Objective: To understand the Nuclear power plant, types of reactors, pressurized water reactor, waste disposal.

Session No *	Topics to be covered	Ref	Teaching Aids
21	Basics of Nuclear Engineering	1-Ch 9; Pg. 602-612	PPT
22	Layout of Nuclear Power Plants	1-Ch 9; Pg. 602-612	PPT,
23	Elements of nuclear reactor- core, moderator, control rod, coolant, shield pressure and thermal shield	1-Ch 9; Pg. 602-632	PPT
24	Types of reactors - Boiling Water Reactor, pressurized water reactor	1-Ch 9; Pg. 632-638	PPT
25	Fast breeder reactor and CANDU, Quiz by students Participate learning	1-Ch 9; Pg 641	PPT, ICT
26	Gas cooled Reactors, Liquid Metal Cooled Reactors	1-Ch 9; Pg. 640 - 641	PPT
27	Safety measures for Nuclear Power plants, Power point presentation by students Participate learning	l-Ch 14; Pg 899	PPT, ICT
Content beyond syllabus covered (if any): Basics of nuclear fission, fusion, Radioactive chain reactions explain Clearly.			

Sub. Code / Sub. Name: ME18023- POWER PLANT ENGINEERING

Unit : IV

Unit syllabus: POWER FROM RENEWABLE ENERGY 10

Hydro Electric Power Plants – Classification, Typical Layout and associated components including Turbines. Principle, Construction and working of Wind, Tidal, OTEC, Solar Photo Voltaic (SPV), Solar Thermal, Geo Thermal, Biogas and Fuel Cell power systems.

Objective: To understand the concept of Renewable energy power generation

Session No *	Topics to be covered	Ref	Teaching Aids
28	Introduction hydroelectric power plant	1-Ch 10; Pg 658	PPT
29	Hydroelectric power plant layout	1-Ch 10; Pg 667	PPT
30	Hydroelectric power plant - Classification	l-Ch 10; Pg 676	PPT
31	Hydraulic turbine - Pelton Wheel. Francis and Kaplan working principles Participate learning Power point presentation by students	l-Ch 10; Pg 679-691	PPT, ICT

32	Working of Wind, Tidal power systems, OTEC	l-Ch 14; Pg 912	PPT
33	Working of *Solar* Photo Voltaic (SPV) power system	1-Ch 14; Pg 899	PPT
34	Working of Solar Thermal power system, Participate learning	1-Ch 14; Pg 899	PPT, ICT
35	Working of Geo Thermal power system	1-Ch 13; Pg 888,929	PPT
36	Biogas power system Participate learning Power point presentation by students	1-Ch 14; Pg 935	ICT,PPT,
37	Working of Fuel Cell power system	1-Ch 13; Pg 879	PPT
Content beyond syllabus covered (if any): Explain with neat sketch working principle of Pumped storage power plant.			

Sub. Code / Sub. Name: ME18023- POWER PLANT ENGINEERING

Unit : V

Unit Syllabus: ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS 8

Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria, relative merits & demerits, Capital & Operating Cost of different power plants. Pollution control technologies including Waste Disposal Options for Coal and Nuclear Power Plants - ESP-Electro Static Preceptor - Repair & Maintenance cost and selling cost.

Objective: Understand the current power generation industry economic, political, technical and environmental context and challenges and have an appreciation of how these challenges may change in future.

Session No *	Topics to be covered	Ref	Teaching Aids
38	Introduction economics of power plants - Cost of Electric Energy Fixed and operating Costs	1-Ch 1 Pg; 1-37	PPT
39	Various terms of power plant - Energy Rates - Types of Tariffs	1-Ch 1 Pg; 1-37	PPT
40	Economics of load sharing	1-Ch 1 Pg; 1-37	PPT
41	Comparison of economics of various power plants, Problem solving	1-Ch 1 Pg; 1-37	PPT, ICT
42	Cost of Electric energy and tariff -Numerical problems	1-Ch 1 Pg; 1-37	PPT
43	Tariffs - Numerical problems, problem solving	1-Ch 1 Pg; 1-37	PPT, ICT

44	Pollution control technology, Waste disposal for coal and nuclear, Power point presentation by students Participate learning	1-Ch 1 Pg; 1-37	PPT, ICT
45	ESP-Electro Static Preceptor - Repair & Maintenance cost and selling cost.	1-Ch 1 Pg; 1-37	PPT
Content beyond syllabus covered (if any):			

Sub Code / Sub Name: ME18023- POWER PLANT ENGINEERING

TEXT BOOKS:

1. Nag. P.K., "Power Plant Engineering", Third Edition, Tata McGraw –Hill Publishing Company Ltd., 2014.

REFERENCES

1. El-Wakil. M.M., "Power Plant Technology", Tata McGraw –Hill Publishing Company
2. Ltd., 2010.
3. Black & Veatch, "Power Plant Engineering",, Springer Publications,1996.
4. Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, "Power Plant Engineering", Second Edition, Standard Handbook of McGraw –Hill, 1998.
5. Godfrey Boyle, "Renewable energy, Power for a Sustainable Future", Oxford University Press,2012.
6. N.K. Bansal, Non-Conventional Energy Resources, Vikas Publishing House, 2014.

WEB RESOURCES:

https://nptel.ac.in/courses/112107291,
https://www.youtube.com/watch?v=Int8whA_izQ
https://www.youtube.com/watch?v=mx09jPJb3gY,
https://www.youtube.com/watch?v=HgKS7PqcD6Y,
https://www.youtube.com/watch?v=69q27Q6RSsI

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Date	29.7.2022	29.07.2022
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Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Mechanical Engineeering	LP: ME 18029 Rev. No: 00 Date: 25/07/2022
B.E/~~B.Tech/M.E/M.Tech~~ : Mechanical Engineeering Regulation: R2018 PG Specialisation : -- Sub. Code / Sub. Name : ME18029 Renewable Energy Resources Unit : I	

Unit Syllabus: SOLAR ENERGY **9**

Introduction – Renewable vs non-renewable sources of energy, Solar Radiation; Solar collectors - Flat Plate and Concentrating Collectors; Solar Applications – power generation, green houses, space heating and cooling; Solar Cells - Fundamentals of Solar Photo Voltaic Cells, Power Generation & Applications

Objective: To identify the methods and technologies for effective utilization of solar energy, wind energy and biomass

Session No *	Topics to be covered	Ref	Teaching Aids
1	Introduction – Renewable sources of energy	1 (Chap.-1, page.-2-4)	ICT
2	Renewable vs non-renewable sources of energy	1 (Chap.-1, page.-9-20)	ICT
3	Solar Radiation- **Measurement of Solar Radiation using PYRANOMETER – Experiential Learning.**	1 (Chap.-1, page.-37-56)	ICT
4	Solar collectors - Flat Plate	1 (Chap.-3, page.-57-79)	ICT
5	Solar collectors - Concentrating Collectors	1 (Chap.-3, page.-80-94)	ICT
6	Solar Applications – power generation, green houses	1 (Chap.-5, page.-113-138)	ICT
7	Solar Applications – space heating and cooling;	1 (Chap.-5, page.-138-152)	ICT
8	Solar Cells - Fundamentals of Solar Photo Voltaic Cells- **Video demonstration**	2 (Chap.-7, page.-182-194)	ICT
9	Solar Cells - Power Generation & Applications	2 (Chap.-7, page.-194-224)	ICT
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes

Sub. Code / Sub. Name: **ME18029 Renewable Energy Resources**

Unit : II

Unit Syllabus: **WIND ENERGY** **9**

Wind Energy – Wind data, site selection, power available in wind, Betz criterion; Wind energy conversion – Principle, evolution of wind mills, Vertical and Horizontal axis wind mills, Construction and working, Safety and failure

Objective: To acquire knowledge about wind energy conversion techniques

Session No *	Topics to be covered	Ref	Teaching Aids
10	Wind Energy -Introduction	1 (Chap.-6, page.-175-184)	ICT
11	Wind data, site selection	1 (Chap.-6, page.-190-194)	ICT
12	power available in wind	1 (Chap.-6, page.-196-220)	ICT
13	Betz criterion;	2 (Chap.-9, page.-220-277)	ICT
14	Wind energy conversion – Principle **-Video demonstration**	1 (Chap.-6, page.-201-220)	ICT
15	Wind energy conversion – Evolution of wind mills	1 (Chap.-6, page.-220-228)	ICT
16	Vertical axis wind mills	1 (Chap.-6, page.-201-228)	ICT
17	Horizontal axis wind mills	1 (Chap.-6, page.-201-228)	ICT
18	Construction and working, Safety and failure **- quiz on safety and working– Participative learning**	2 (Chap.-9, page.-305-328)	ICT
	CAT 1		

Content beyond syllabus covered (if any):

* Session duration: 50 mins

Sub. Code / Sub. Name: **ME18029 Renewable Energy Resources**

Unit : III

Unit Syllabus: BIO ENERGY **9**

Bio energy – Introduction, energy crops, Biomass, Municipal & Industrial waste stream, Conversion techniques – Physical means, direct combustion, Thermo chemical and biochemical methods, Biomass gasifiers, Digesters, Ethanol production, Bio diesel.

Objective: To learn how biomass could become an energy source

Session No *	Topics to be covered	Ref	Teaching Aids
19	Bioenergy – Introduction	2 (Chap.-11, page.-351-354)	ICT
20	Bioenergy – Energy crops, Biomass	2 (Chap.-11, page.-357-365)	ICT
21	Municipal & Industrial waste stream **-Power point presentation by students – Participative learning.**	2 (Chap.-11, page.-351-354)	ICT
22	Conversion techniques – Physical means, direct combustion	2 (Chap.-11, page.-354-374)	ICT
23	Conversion techniques –Thermo chemical and biochemical methods	2 (Chap.-11, page.-375-387)	ICT
24	Conversion techniques -Biomass gasifiers	1 (Chap.-7, page.-301-314)	ICT
25	Conversion techniques -Biomass Digesters- **Biogas plant Demonstration -Experiential Learning**	1 (Chap.-7, page.-280-291)	ICT
26	Conversion techniques -Ethanol production	1 (Chap.-7, page.-317-318)	ICT
27	Conversion techniques -Bio diesel production	2 (Chap.-11, page.-388-393)	ICT

Content beyond syllabus covered (if any):

* Session duration: 50 mins

Sub. Code / Sub. Name: **ME18029 Renewable Energy Resources**

Unit : IV

Unit Syllabus: HYDRO ENERGY **9**

Tidal energy, Ocean Thermal energy – Open and Closed OTEC Cycles, Geothermal Energy, Small Hydro energy and conversion techniques.

Objective: To know the energy available in various hydro and geo-based sources in the world and its conversion

Session No *	Topics to be covered	Ref	Teaching Aids
28	Hydro energy- Introduction.	2 (Chap.-8, page.-237-240)	ICT
29	Tidal energy – classification.	1 (Chap.-9, page.-387-391)	ICT
30	Tidal energy- conversion techniques -**Video demonstration**	1 (Chap.-9, page.-392-403)	ICT
31	Ocean Thermal energy – Introduction -**Video demonstration**	1 (Chap.-9, page.-375-378)	ICT
32	Ocean Thermal energy - Open Cycles.	1 (Chap.-9, page.-379-380)	ICT
33	Ocean Thermal energy - Closed Cycles.	1 (Chap.-9, page.-381-386)	ICT
34	Geothermal Energy – classification. **Quiz on geothermal – Participative learning**	2 (Chap.-15, page.-471-475)	ICT
35	Geothermal Energy - conversion techniques -**Video demonstration**	2(Chap.-15, page.-476-487)	ICT
36	Small Hydro Energy - conversion techniques -**Video demonstration**	1 (Chap.-9, page.-411-421)	ICT
	CAT 2		

Content beyond syllabus covered (if any):

* Session duration: 50 mins

Sub. Code / Sub. Name: **ME18029 Renewable Energy Resources**

Unit: V

Unit Syllabus: OTHER NON-CONVENTIONAL ENERGY TECHNOLOGY 9

Hydrogen – Production & Storage; Fuel Cell – principle, construction, working and limitations of Alkali, Molten Carbonate, Solid Oxide, Phosphoric acid, Proton Exchange Membrane fuel cells. Super capacitors.

Objective: To get educated about various new forms of energy and its effective usage

Session No *	Topics to be covered	Ref	Teaching Aids
37	Other non-conventional energy technology- Introduction.	1 (Chap.-12,page.-503-507)	ICT
38	Hydrogen – Production & Storage	1 (Chap.-11, page.-464-477)	ICT
39	Fuel Cell – principle and limitations - **Video demonstration**	2(Chap.-16, page.-506-517)	ICT
40	Construction and working – Alkali fuel cells	2(Chap.-16, page.-495-505)	ICT
41	Construction and working - Molten Carbonate, fuel cells	1(Chap.-10, page.-427-431)	ICT
42	Construction and working - Solid Oxide fuel cells	1(Chap.-10, page.-432-438)	ICT
43	Construction and working - Phosphoric acid fuel cells	1(Chap.-10, page.-439-448)	ICT
44	Construction and working - Proton Exchange Membrane fuel cells – **Quiz on fuel cell – Participative learning**	1(Chap.-10, page.-439-448)	ICT
45	Super capacitors - **Power point presentation by students – Participative learning**	2 (Chap.-16, page.-505-507)	ICT
	CAT 3		

Content beyond syllabus covered (if any):

* Session duration: 50 mins

Sub Code / Sub Name: **ME18029 Renewable Energy Resources**

REFERENCES:

1. Rai. G.D., "Non-Conventional Energy Sources", Khanna Publishers, New Delhi, 2011.
2. Twidell, J.W. & Weir, A., "Renewable Energy Sources", EFN Spon Ltd., UK, 2006.
3. Sukhatme. S.P., Solar Energy", Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.
4. Godfrey Boyle, "Renewable Energy, Power for a Sustainable Future", Oxford University Press, U.K., 1996.
5. Tiwari. G.N., Solar Energy –"Fundamentals Design, Modeling & Applications", Narosa Publishing House, New Delhi, 2002.
6. Freris. L.L., "Wind Energy Conversion Systems", Prentice Hall, UK, 1990.
7. David M. Mousdale – "Introduction to Biofuels", CRC Press, Taylor & Francis Group, USA 2010.
8. Chetan Singh Solanki, "Solar Photovoltaics - Fundamentals, Technologies and Applications", PHI Learning Private Limited, New Delhi, 2015

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Date	25/07/2022	25/07/2022
Remarks *:		
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Mechanical Engineering		LP: ME18701 Rev. No: 01 Date: 20/07/2022
B.E/~~B.Tech/M.E/M.Tech~~ : Mechanical Engineering	Regulation: 2018 (CBCS)	
PG Specialisation : NA		
Sub. Code / Sub. Name : ME18701 Finite Element Analysis		
Unit : 1		

Unit Syllabus:

General description of Finite Element Method - General procedure of FEM - Applications of FEM – FEA softwares. General field problems, Discrete and continuous models, Variational formulation in finite elements – Ritz method - Weighted residual methods – Galerkin – sub domain – Method of least squares and collocation method - numerical problems

Objective:

To introduce basic Modeling concept & classical techniques incorporated into Finite Element Method.
To introduce basic Finite Element Method and its advantage over others

Session No *	Topics to be covered	Ref	Teaching Aids
1	Introduction-Ansys application in FEA -Historical Background	R6 p6	ICT
2	Mathematical Modeling - Discrete & Continuous Models	R7 p78-96	ICT
3	Governing Equations- Boundary, Initial & Eigen Value Problems	R7 p78-96	ICT
4	Discrete & Continuous Models – (Direct) Stiffness Method	R3 p20-24	ICT
5	Method of Weighted Residuals (Theory through Tutorial)	T2 p16-36	ICT
6	***Method of Weighted Residuals (Tutorial) - Descriptive Assignments***	T2 p16-36	-
7	Variational Formulation of Boundary Value Problems	T2 p66-67	ICT
8	Ritz Techniques – Problems and its importance	T2 p68-80	ICT
9	Steps involved in Finite Element Method	R2 p7-14	ICT
10	Galerkin FEM Formulation	T2 p41-47	ICT
11	Variational FEM Formulation & equivalence to Galerkin FEM	T2 p67-73	ICT
12	Shape Function for Linear & Higher Order (1d) Element	R2 p34-35	ICT
Content beyond syllabus covered (if any): Session 4: Direct Stiffness Method			

* Session duration: 50 minutes
ICT – PowerPoint presentation, YouTube videos, Google classroom, Assessment tools.

Sub. Code / Sub. Name: ME18701 Finite Element Analysis
Unit : II

Unit Syllabus:

One dimensional elasticity – Castigliano's first theorem – Principle of minimum potential energy - Linear spring - Elastic bar with constant and varying cross sections using linear and quadratic elements – Truss structures and Beams

Objective:

Steps involved in Finite Element Method. To demonstrate h & p refinement for 1D case. Application to Solid Mechanics & Heat transfer problems

Session No *	Topics to be covered	Ref	Teaching Aids Ref No.
1	Principle of Virtual work - Castigliano's first theorem and its uses in 1D elasticity	T2 p73-74	ICT
2	Principle of Minimum Potential Energy - Problems	T2 p75 - 80	ICT
3	Introduction to 1D element in Linear Spring and its relation with Bar element, Problems	T2 p48-57	ICT
4	Introduction to Bar element - Bar Problems in structural application	T2 p48-57	ICT
5	***Bar Problems - Quiz and Descriptive Assignments***	T2 p48-57	-
6	Derivation of stiffness matrix for Linear and quadratic elements in bar	T2 p101 - 103	ICT
7	Introduction to Truss element – Problems in Truss	R5 p133-155	ICT
8	Truss element Problems	R5 p133-155	ICT
9	***Truss element Problems (contd..) - Quiz and Descriptive Assignments***	R5 p133-155	-
10	Beam Problem	R2 p151-204	ICT
11	***Beam Problem (Contd.) – Activity based Assignment***	R2 p151-204	-
12	Beam Problem (Contd.)	R2 p151-204	ICT

Content beyond syllabus covered (if any):
Nil

* Session duration: 50 mins
ICT – PowerPoint presentation, YouTube videos, Google classroom, Assessment tools.

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: ME18701 Finite Element Analysis

Unit : III

Unit Syllabus:

Introduction to plane elasticity theory – Plane stress, Plane strain and Axisymmetric problems – Finite Element formulations of plane elasticity problems using CST and four noded quadrilateral elements only

Objective:

To demonstrate 2D Elements & their application to scalar variable problems

Session No *	Topics to be covered	Ref	Teaching Aids Ref No.
1	2nd order 2d Equation involving Scalar Variable Functions	R8 p87-97	ICT
2	Triangular Elements – Shape function, Element Matrices & Vectors	T2 p171-178	ICT
3	Application to Field Problems for Plane stress, Plane strain and Axisymmetric	R8 p227-235	ICT
4	Derivation of Stiffness matrix , [B] and [D] matrix for Plane stress problem	T1 p607-609	ICT
5	Problems in Plane Stress condition for CST element	T1 p622-628	ICT
6	***Plane stress Problems (contd.) - Descriptive and Application type Assignments***	T1 p622-628	-
7	Derivation of Stiffness matrix , [B] and [D] matrix for Plane strain problem	T1 p607-609	ICT
8	Problems in Plane Strain condition for CST element	T1 p622-628	ICT
9	Plane Strain problems (Contd.)	T1 p622-628	ICT
10	Derivation of Stiffness matrix , [B] and [D] matrix for Axisymmetric problem	T1 p441	ICT
11	Problems in Axisymmetric condition for CST element	T1 p442-450	ICT
12	***Axisymmetric problems (Contd.) - Descriptive and Application type Assignments***	T1 p442-450	-
13	Formulation of four noded Isoparametric element	T2 p149-151	ICT

Content beyond syllabus covered (if any):

* Session duration: 50 mins

ICT – PowerPoint presentation, YouTube videos, Google classroom, Assessment tools.

Sub. Code / Sub. Name: ME18701 Finite Element Analysis

Unit : IV

Unit Syllabus:

Finite Element formulation of One-dimensional and Two-dimensional steady state heat conduction problems with convection - Simple elements only
Longitudinal vibration frequencies and mode shapes. Fourth Order Beam Equation –Transverse deflections and Natural frequencies of beams

Objective:

To understand the concepts of 1D Elements in Heat transfer and vibration problems

Session No *	Topics to be covered	Ref	Teaching Aids Ref No.
1	Derivation of Stiffness matrix for 1D Heat transfer problems	T2 p48-60	ICT
2	Bar Problem (Heat Transfer)	T2 p48-60	ICT
3	Problems in Fins involving conduction and convection	R5 p361-385	ICT
4	Derivation of Stiffness matrix for 2D CST element for Heat transfer problems	R5 p361-385	ICT
5	***2D Heat transfer problem - Application type Assignments***	R5 p361-385	-
6	Derivation of Mass matrix for 1D vibration	T2 p245	ICT
7	Longitudinal Vibration – Natural Frequencies & Mode Shapes	T2 p235-237	ICT
8	Longitudinal Vibration Problems – Natural Frequencies & Mode Shapes (Contd.)	T2 p235-237	ICT
9	Eigen value and Eigen vector Problems to find mode shapes - Methods	R5 p433-435	ICT
10	***Transverse Vibration Problems – Natural Frequencies – Quiz, Application type Assignments***	T2 p237-240	-
11	Transverse Vibration Problems – Natural Frequencies and Modes shapes (Contd.)	T2 p237-240	ICT
Content beyond syllabus covered (if any):			

* Session duration: 50 mins
ICT – PowerPoint presentation, YouTube videos, Google classroom, Assessment tools.

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: ME18701 Finite Element Analysis

Unit : V

Unit Syllabus:

Iso, Sub & Super parametric element, shape functions for four noded, eight noded and nine noded rectangular elements – Numerical Integration-Gaussian quadrature -Matrix solution techniques - Solutions Techniques to Dynamic problems - Introduction to Analysis Software.

Objective:

To introduce the concepts needed for effective FEM implementation.

Session No *	Topics to be covered	Ref	Teaching Aids Ref No.
1	Classification of Iso parametric, Sub parametric and super parametric elements , Introduction to Natural Co-ordinate Systems	T2 p156-167	ICT
2	Importance of jacobian matrix – Relation with Global and natural coordinates	T2 p156-167	ICT
3	Shape function for Isoparametric Elements for 4, 9 noded elements	R1 p140-143	ICT
4	Shape function for Isoparametric Elements for 8 noded elements - Serendipity Elements	R1 p140-143	ICT
5	Numerical Integration & application to plane stress problems	T1 p537-538	ICT
6	Problems in Numerical Integration – Gaussian quadrature	T1 p540-557	ICT
7	***Problems in Numerical Integration (Contd..) – Descriptive Assignment***	T1 p540-557	-
8	***Matrix Solution Techniques – Problems - Descriptive Assignment***	R8 p413-421	-
9	Solution Techniques to Dynamics Problems to find mode shapes	T2, p232-294	ICT
10	Introduction to Simulation software, its uses	-	ICT
11	Demo in ANSYS software with practical problems	-	ICT
12	Revision	-	ICT

Content beyond syllabus covered (if any):

Demo in ANSYS software

* Session duration: 50 mins

ICT – PowerPoint presentation, YouTube videos, Google classroom, Assessment tools.

Sub Code / Sub Name: ME18701 Finite Element Analysis

TEXT BOOK:

1. Reddy. J.N., "An Introduction to the Finite Element Method", 3rd Edition, Tata McGraw-Hill, 2018
2. Seshu, P, "Text Book of Finite Element Analysis", Prentice-Hall of India Pvt. Ltd., New Delhi, 2007.

REFERENCES:

1. Rao, S.S., "The Finite Element Method in Engineering", 3rd Edition, Butterworth Heinemann, 2004
2. Logan, D.L., "A first course in Finite Element Method", Thomson Asia Pvt. Ltd., 20
3. Robert D. Cook, David S. Malkus, Michael E. Plesha, Robert J. Witt, "Concepts and Applications of Finite Element Analysis", 4th Edition, Wiley Student Edition, 2010.
4. Chandrupatla & Belagundu, "Introduction to Finite Elements in Engineering", 3rd Edition, Prentice Hall College Div, 2012
5. O.C.Zienkiewicz & R L Taylor "The Finite Element Method Volume 1 : The Basis",5th Edition, Butterworth Heinemann,2011

WEBSITES:

1. https://nptel.ac.in/courses/112/104/112104116/
2. https://ocw.mit.edu/courses/mechanical-engineering/2-092-finite-element-analysis-of-solids-and-fluids-i-fall-2009/lecture-notes/

	Prepared by	Approved by
Signature	23/7/22	
Name	Mr. M. Maheswaran	Dr. M. Mohandass
Designation	Assistant Professor	AHoD - Mechanical
Date	23/07/2022	23/07/2022
Remarks *:		
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Mechanical Engineering	LP: ME18702 Rev. No: 01 Date: 22/08/2022
B.E/~~B.Tech/M.E/M.Tech~~ :**Mechanical Engineering**Regulation:2018 PG Specialisation: NA Sub. Code/Sub. Name : **ME18702/COMPUTER INTEGRATED MANUFACTURING** Unit : I - CIM CONCEPTS, AUTOMATION AND COMPUTER AIDED PROCESS PLANNING	

Unit Syllabus:

CIM concepts – Meaning and origin of CIM - Production systems – Automation in production systems – Automation principles and strategies - Basic elements of an automated systems – Advanced automation functions - Levels of automation - Process planning – Computer Aided Process Planning (CAPP) – Logical steps in Variant and Generative approaches of CAPP. Integration of CAD/CAPP/CAM/CNC.

Session No *	Topics to be covered	Ref	Teaching Aids
1	BriefintroductiontoCADandCAM	R1: Chapter:24,P699 -708 R2: P8-11 R5: P 1-4	ICT/BBD/BBD
2	Manufacturing and Production systems, CIM concepts- Computerized elements of CIM system, CIM wheel lI & II	R1:P708 – 710 R1:P710-712 ; 728 – 729 R2: P5-9; 18-20; 25 -26 R2: P4-7, 11-12 R5: P 10;134-145;599-601	ICT/BBD
3	Production systems -Types of production	R1:chapter1,P1-2,7,78	ICT/BBD
4	Automation in production systems ,Automation principles and strategies	R1:chapter3,P61-70,	ICT/BBD
5	Basic elements of an automated systems – Advanced automation functions - Levels of automation	R1:chapter1,P76-78	ICT/BBD
6	BasicElementsofanAutomatedsystem ***Experimental Learning:* CNC center, Half Nut in conventional lathe**	R1:chapter3,P61-64	ICT/BBD
7	Levels of Automation	R1:chapter3,P76-78	ICT/BBD
8	Process planning – Computer Aided Process Planning (CAPP) – Logical steps in Variant and Generative approaches of CAPP ***Participative learining: Route sheet prepaprtion for the given work part.***	R1:chapter25,P782-790	ICT/BBD
9	Logical steps in Variant and Generative approaches of CAPP. Integration of CAD/CAPP/CAM/CNC.	R1:chapter25,P782-790 R2: Chapter17, P608-616	ICT/BBD
	CATI		
Content beyond syllabus covered (if any):			

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

* Session duration: 50 minutes

Sub. Code / Sub. Name:ME18702/COMPUTER INTEGRATED MANUFACTURING
Unit :II - CELLULAR MANUFACTURING

Unit Syllabus:
Group Technology(GT), Part Families – Parts Classification and coding – Simple Problems in Opitz Part Coding system – Production Flow Analysis – Cellular Manufacturing – Composite part concept – Machine cell design and layout – Quantitative analysis in Cellular Manufacturing – Rank Order Clustering Method - Arranging Machines in a GT cell – Hollier Method – Simple Problems

Session No *	Topics to be covered	Ref	Teaching Aids
10	Group Technology(GT), Part Families – Parts Classification and coding	R1: Chapter 15 P 420-442	ICT/BBD
11	Simple Problems in Opitz Part Coding system **Experimental Learning: Creation of Part code from the real work**	R1: Chapter 15 P 420-442	ICT/BBD
12	Production Flow Analysis **Problem solving Methodology: Machine cell design evaluation**	R1: Chapter 15 P 431-438	ICT/BBD
13	Cellular Manufacturing – Composite part concept **Experimental learning: Classify the given component and executing the composite concept.**	R1: Chapter 15 P 422-430	ICT/BBD
14	Machine cell design and layout based on GT and Cellular manufacturing	R1: Chapter 15 P 420-442	ICT/BBD
15	Quantitative analysis in Cellular Manufacturing – Rank Order Clustering Method	R1: Chapter 15 P 439-442	ICT/BBD
16	Sample problems solving in Rank order clustering method and PFA **Problem solving Methodology: Machine cell design evaluation**	R1: Chapter 15 P 439-442	ICT/BBD
17	Arranging Machines in a GT cell – Holier Method – Simple Problems **Problem solving Methodology: Machine cell design evaluation**	R1: Chapter 15 P 439-442	ICT/BBD
18	Simple problems solving in Holier method and Composite part concepts **Problem solving Methodology: Machine cell design evaluation**	R1: Chapter 15 P 439-442	ICT/BBD
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: ME18702/COMPUTER INTEGRATED MANUFACTURING

Unit :III - FLEXIBLE MANUFACTURINGSYSTEM(FMS) AND AUTOMATED GUIDED VEHICLE SYSTEM (AGVS)

Unit Syllabus :.

Types of Flexibility - FMS – FMC/FMS Components – FMS Application, Quantitative analysis in FMS – Simple Problems. Automated Guided Vehicle System (AGVS) – AGVS Application – Vehicle Guidance technology – Vehicle Management & Safety

Session No *	Topics to be covered	Ref	Teaching Aids
19	FMS–Types ofFlexibility	R1 Chapter 16,P480-485	ICT/BBD
20	FMS Components	R1 Chapter 16, P469-479	ICT/BBD
21	FMSApplication & Benefits- FMS Planning and Control	R1 Chapter 16, P476-479	ICT/BBD
22	Quantitative analysis in FMS–Simple Problems **Problem solving Methodology: Giving Part families , forming FMS lay out**	R1 Chapter 16, P476-479	ICT/BBD
23	Automated Guided Vehicle System(AGVS)	R1 Chapter 16, P835-844	ICT/BBD
24	AGVS Application	R1 Chapter 16, P835-844	ICT/BBD
25	Vehicle Guidance technology	R1 Chapter 16, P835-844	ICT/BBD
26	Vehicle Management &Safety	R1 Chapter 16, P835-844	ICT/BBD
27	Solving problems on quantitative analysis Quiz/ Group discussion: AGVS operation and safety, traffic management.	R1 Chapter 16, P835-844	ICT/BBD/BB
	CATII		

Content beyond syllabus covered (if any):

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: ME18702/COMPUTER INTEGRATED MANUFACTURING

Unit :IV - **INDUSTRIAL ROBOTICS**

Unit Syllabus :

Robot Anatomy and Related Attributes – Classification of Robots- Robot Control systems – End Effectors – Sensors in Robotics – Robot Accuracy and Repeatability - Industrial Robot Applications – Intelligent robots

Session No *	Topics to be covered	Ref	Teaching Aids
28	Introduction to robotics,	R1,Chapter7, P212-210	ICT/BBD
29	Robot Anatomy and Related Attributes	R1,Chapter7, P212-210	ICT/BBD
30	Classification of Robots	R1,Chapter7, P212-210	ICT/BBD
31	Robot Control systems	R1,Chapter7, P218-220	ICT/BBD
32	End Effectors	R1,Chapter7, P220	ICT/BBD
33	Sensors in Robotics	R1,Chapter7, P222	ICT/BBD
34	Robot Accuracy and Repeatability **Quizz/ Group Discussion**	R1,Chapter7, P230-240	ICT/BBD
35	Industrial Robot Applications **Experimental learning: Robotics simple program in lab**	R1,Chapter7, P230-240	ICT/BBD
36	Intelligent robots	R1,Chapter7, P230-240	ICT/BBD
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: ME18702/COMPUTER INTEGRATED MANUFACTURING SYSTEMS

Unit : V - **OPEN SYSTEM AND DATABASE FOR CIM**

Unit Syllabus :

Open systems-open system inter connection - manufacturing automations protocol and technical office protocol (MAP /TOP). Development of databases -database terminology- architecture of database systems-data modelling and data associations - relational data bases - database operators - advantages of data base and relational database

Session No *	Topics to be covered	Ref	Teaching Aids
37	Open systems-open system inter connection	R2: chapter 1, P1145-162	ICT/BBD
38	Manufacturing automations protocol and technical office protocol (MAP /TOP).	R2: Chapter 1 ,P94,114,159 28-29 R3: chapter5,171-191	ICT/BBD
39	Manufacturing automations protocol (MAP)	R3:chapter 4 P159-162,	ICT/BBD
40	Technical office protocol (TOP). ***Participative learning: Quizz, Seminar presentation***	R3: chapter5,P223-224 R2: P159-162	ICT/BBD
41	Development of databases -database terminology architecture of database systems	R2: : chapter5, P172-196	ICT/BBD
42	Modeling and data associations	R2: : chapter5, P172-196	ICT/BBD
43	Database operators	R2: P 172-196	ICT/BBD
44	Advantages of data base and relational database	R2: chapter5, P 171-196	ICT/BBD
45	Relational Data base ***Group discussion: OSI model and data base structrue***	R2: chapter5 P 172-196	ICT/BBD
	CAT3		

Content beyond syllabus covered (if any):

* Session duration: 50 mins

Sub Code / Sub Name: **ME 16503 DESIGN OF MACHINE ELEMENTS**

TEXT BOOKS:

1. Bhandari V, "Design of Machine Elements", 3rd Edition, Tata McGraw-Hill Book Co, 2010.
2. Joseph Shigley, Charles Mischke, Richard Budynas and Keith Nisbett "Mechanical Engineering Design", 8th Edition, Tata McGraw-Hill, 2008.
3.Khurmi R.S., and Gupta J.K., "*Machine Design*", 14 th Edition,S Chand&Co NewDelhi,2005.
4.Sundararajamoorthy, T.V. and Shanmugam, N., "*Machine Design*", Anuradha Agencies, Chennai,2003.

REFERENCES:

1. Sundararajamoorthy T. V. Shanmugam .N, "Machine Design", Anuradha Publications, Chennai, 2003.
2. Robert C. Juvinall and Kurt M. Marshek, "Fundamentals of Machine Design", 4th Edition, Wiley, 2005
3. Alfred Hall, Halowenko, A and Laughlin, H., "Machine Design", Tata McGraw-Hill BookCo.(Schaum"s Outline), 2010
4. Bernard Hamrock, Steven Schmid,Bo Jacobson, "Fundamentals of Machine Elements",2nd Edition, Tata McGraw-Hill Book Co., 2006.
5. Orthwein W, "Machine Component Design", Jaico Publishing Co, 2003.
6. Ansel Ugural, "Mechanical Design – An Integral Approach", 1st Edition, Tata McGraw-Hill Book Co, 2003.
7. Merhyle F. Spotts, Terry E. Shoup and Lee E. Hornberger, "Design of Machine Elements" 8th Edition, Printice Hall, 2000.
8.Lingaiah K., "*Machine Design Data Book*", 2 nd Edition Tata McGraw – Hill.New delhi,2010.
9.Robort.L.Norton," Machine Design", 5 th Edition, Pearson Publisher, New delhi,2018.
10.Sharma,P.C and Agarwal,D.K,"MachineDesign",Agrawal-Kataria and Sons Publication, NewDelhi,2014.
11.Shigley, J.E., Charles, R.M. and Richard, G.B., "*Mechanical Engineering Design*", *10 th* ed., McGraw-Hill, New Delhi,2014.
12.Spotts M.F., "*Design of Machine Elements*", 8 th Edition,Pearson Education,NewDelhi, 2019.

	Prepared by	Approved by
Signature		
Name	Dr. S. Muniraj	Dr.M.Mohandas
Designation	Assistant Professor	AHOD/MEC
Date	23/8/2022	
Remarks *:	This LP is used for this AY: 2022-23. (R1)	
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN – THEORY

Department of Mechanical Engineering	LP: ME18703 Rev. No: 00 Date: 24/08/2022
B.E/~~B.Tech/M.E/M.Tech~~ :Mechanical EngineeringRegulation: 2018 PG Specialisation: NA Sub. Code / Sub. Name :ME18703 - Mechatronics Unit :1	

UNIT I SENSORS, TRANSDUCERS ANDACTUATORS 10

Static and dynamic Characteristics of Sensor, Potentiometers–LVDT–Capacitance sensors– Strain gauges–Load cell–Eddy current sensor–Hall effect sensor–Temperature sensors– Light sensors-Types of Stepper and Servomotors –Construction–Working Principle– Advantages and Disadvantages.

Objective: To impart the knowledge about elements and techniques involved in Mechatronics systems which are very much essential to understand the emerging field of automation

Session No *	Topics to be covered	Ref	Teaching Aids
1	Introduction to Mechatronics.	Ref 1 (Chapter 1 pp. 1-3)	ICT
2	Static and dynamic Characteristics of Sensor	Ref 1 (Chapter 1 pp. 4-6)	ICT
3	Potentiometers and LVDT	Ref 1 (Chapter 1 pp. 7-10)	ICT
4	Capacitance sensors and Strain gauges	Ref 1 (Chapter 1 pp. 22-27)	ICT
5	Eddy current sensor and Hall Effect Sensor	Ref 1 (Chapter 2 pp. 22-27)	ICT
6	**Tutorial – 1 (Activity based Assignment -Experiential learning)**	-	-
7	Temperature sensors& Light Sensors	Ref 1 (Chapter 2 pp. 28-29)	ICT
8	Stepper Motor – working principle	Ref 1 (Chapter 2 pp. 30-38	ICT
9	Types of Stepper – working principle	Ref.1 (Chapter 9 pp. 201-209)	ICT
10	Servo motor – working principle	Ref.1 (Chapter 9 pp. 201-209)	ICT
11	**Laboratory demonstration of sensors and actuators – Experiential learning**	-	LAB
12	**Tutorial – 2 (Quiz & Descriptive type – Participative learning)**	-	-
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes

ICT – Laptop, Projectors, Pen drive, Google classroom, Microsoft tools, YouTube videos

Sub. Code / Sub. Name: ME18703- MECHATRONICS

Unit: II

UNIT II MICROPROCESSOR AND MICROCONTROLLER 14

Introduction– Architecture of 8085–Pin Configuration– Addressing Modes–Instruction set, Timing diagram of 8085- Programming– Concepts of 8051 microcontroller–Block diagram. Concepts of 8255 PPI–Block diagram.

Objective: The students will be imparted the basic of microprocessor and microcontroller which are the main components in mechatronics system design.

Session No *	Topics to be covered	Ref	Teaching Aids
12	Introduction to 8085 Microprocessor	Ref 2 (Chapter 1 pp. 1-13)	ICT
13	Architecture of 8085 Microprocessor	Ref 2 (Chapter 3 pp. 57-61)	ICT
14	**Tutorial – 3 (Activity based Assignment on data transfer using registers – Experiential learning)**	-	ICT
15	Pin Configuration of 8085 Microprocessor	Ref 7 (Chapter 3 pp. 84-86)	ICT
16	Addressing Modes	Ref 7 (Chapter 4 pp. 99-101)	ICT
17	Instruction set and formats	Ref 7 (Chapter 4 pp. 99-120)	ICT
18	Timing diagram of 8085	Ref 7 (Chapter 3 pp. 91-94)	ICT
19	Programming of Microprocessors	Ref 7 (Chapter 4 pp. 97-126)	ICT
20	Programming of Microprocessors	Ref 7 (Chapter 4 pp. 97-126)	ICT
21	Programming of Microprocessors	Ref 7 (Chapter 4 pp. 97-126)	ICT
22	**Tutorial – 4 (Activity based Assignment on Microprocessor Simulation App – Experiential learning)**	-	ICT
23	Introduction to 8051 Microcontroller	Ref 7 (Chapter 9 pp. 418-419)	ICT

24	Architecture of 8051 Microcontroller	Ref 7 (Chapter 9 pp. 419-420)	ICT
25	Pin description of 8051 Microcontroller	Ref 7 (Chapter 9 pp. 430-432)	ICT
26	Introduction to Peripheral Interface	Ref 7 (Chapter 7 pp. 245-247)	ICT
27	Architecture of 8255	Ref 7 (Chapter 7 pp. 249-250)	ICT
28	**Laboratory demonstration on traffic light and Stepper motor interfacing – Experiential learning**	-	LAB
29	**Tutorial – 5 (Quiz & Descriptive type – Participative learning)**	-	-
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

Sub. Code / Sub. Name: ME18703 – MECHATRONICS

Unit: III

UNIT III PROGRAMMABLE LOGIC CONTROLLER 14

Introduction–Basic structure–Input and output processing –Programming –Mnemonics–Boolean algebra -Timers, counters and internal relays–Data handling– Selection of PLC Applications of PLC

Objective: To make the student to understand basics of Programmable Logic Controllers and its elements used for making ladder logic programs.

Session No *	Topics to be covered	Ref	Teaching Aids
30	Introduction and Basic structure of PLC	Ref 1 (Chapter 21, pp. 440-443)	ICT
31	Input and output processing	Ref 1 (Chapter 21, pp. 443-444)	ICT
32	Ladder diagram programming	Ref 1 (Chapter 21, pp. 445-450)	ICT
33	**Tutorial – 6 (Activity based Assignment on PLC Simulation App for basic PLC program– Experiential learning)**	-	ICT
34	Structured text programming and other types of programming	Ref 1 (Chapter 21, pp. 445-450)	ICT
35	Boolean algebra Programming	Ref 1 (Chapter 21, pp. 445-450)	ICT
36	Types of Timers and its function	Ref 1 (Chapter 21, pp. 452-457)	ICT
37	**Tutorial – 7 (Activity based Assignment on PLC Simulation App for PLC timer programming – Experiential learning)**	-	ICT
38	Programming using ON & OFF delay timer function	Ref 1 (Chapter 21, pp. 452-457)	ICT
39	Programming using ON & OFF delay timer function	Ref 1 (Chapter 21, pp. 452-457)	ICT
40	Types of counters and its function	Ref 1 (Chapter 21, pp. 458)	ICT
41	Programming using UP/DOWN counter function	Ref 1 (Chapter 21, pp. 458)	ICT

42	**Tutorial – 8 (Activity based Assignment on PLC Simulation App for PLC counter programming – Experiential learning)**	-	ICT
43	Internal relay and its function	Ref 1 (Chapter 21, pp. 459)	ICT
44	Programming on Internal relay function	Ref 1 (Chapter 21, pp. 459)	ICT
45	Data handling and Selection of PLC	Ref 1 (Chapter 21, pp. 460)	ICT
46	Application of PLC	Ref 1 (Chapter 21, pp. 460)	ICT
47	**Laboratory demonstration on PLC programming using Siemens and FANUC PLC Trainer kit– Experiential learning**	-	LAB
48	**Tutorial – 9 (Quiz & Descriptive type – Participative learning)**	-	-
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

Sub. Code / Sub. Name: ME18703 – MECHATRONICS

Unit: IV

Unit – IV MECHATRONICS SYSTEMDESIGN 12

Mechatronics, key elements of mechatronic systems, Stages in design, traditional and mechatronic design approaches, Data acquisition systems, overview of I/O process, virtual instrumentation software. Condition monitoring, adaptive control and SCADA systems. Possible Design Solutions

Objective: To describe the mechatronics design solutions for various industrial applications

Session No *	Topics to be covered	Ref	Teaching Aids
49	Key elements of mechatronic systems	Ref. 1 (Chapter 24, pp. 501-506)	ICT
50	Stages of design process	Ref. 1 (Chapter 24, pp. 501-506)	ICT
51	Traditional and Mechatronics design concepts	Ref. 1 (Chapter 24, pp. 501-506)	ICT
52	Traditional and Mechatronics design: case Study	Ref. 1 (Chapter 24, pp. 501-506)	ICT
53	**Tutorial – 10 (Activity based Assignment – Experiential learning)**	-	-
54	Data acquisition systems	Ref. 1 (Chapter 24, pp. 501-506)	ICT
55	Overview of I/O process,	Ref. 1 (Chapter 24, pp. 501-506)	ICT
56	Virtual instrumentation software	Ref. 1 (Chapter 24, pp. 511-513)	ICT
57	Condition monitoring	Ref. 1 (Chapter 24, pp. 513-520)	ICT
58	Adaptive control	Ref. 1 (Chapter 24, pp. 520-522)	ICT
59	SCADA systems	Ref. 1 (Chapter 24, pp. 522-523)	ICT
60	Possible design solutions	Ref. 1 (Chapter 24, pp. 501-506)	ICT
61	Possible design solutions	Ref. 1 (Chapter 24, pp. 501-506)	ICT
62	**Tutorial – 11 (Quiz & Descriptive type – Participative learning)**	-	-
Content beyond syllabus covered (if any):			

Sub. Code / Sub. Name: ME18703 – MECHATRONICS

Unit : V

UNIT V MECHATRONICS APPLICATIONS 10

Mechatronic control in automated manufacturing, Artificial intelligence in Mechatronics, Fuzzy logic applications in Mechatronics, Microsensors in Mechatronics-Case studies-pick and place robot, engine management system, consumer mechatronic products.

Objective: To study the role of AI, Fuzzy application in automation and the case studies.

Session No *	Topics to be covered	Ref	Teaching Aids
63	Mechatronic control in automated manufacturing	Ref.1 (Chapter 9 pp. 201-209)	ICT
64	Mechatronic control in automated manufacturing	Ref.1 (Chapter 9 pp. 201-209)	ICT
65	Artificial intelligence in Mechatronics	Ref.1 (Chapter 9 pp. 210-215)	ICT
66	Fuzzy logic applications in Mechatronics	Ref.1 (Chapter 9 pp. 210-215)	ICT
67	Fuzzy logic applications in Mechatronics	Ref. 1 (Chapter 24, pp. 501-506)	ICT
68	**Tutorial – 12 (Activity based Assignment – Experiential learning)**	-	-
69	Microsensors in Mechatronics	Ref. 1 (Chapter 24, pp. 501-506)	ICT
70	Case studies of Mechatronics systems: Pick and place Robot	Ref. 1 (Chapter 24, pp. 511-513)	ICT
71	Engine Management system	Ref. 1 (Chapter 24, pp. 513-520)	ICT
72	Consumer mechatronics products	Ref. 1 (Chapter 24, pp. 513-520)	ICT
73	Other case Studies.	Ref. 1 (Chapter 24, pp. 513-520)	ICT
74	**Laboratory demonstration on Pick and Place robot programming using Mitsubishi Robot– Experiential learning**	-	LAB
75	**Tutorial – 11 (Quiz & Descriptive type – Participative learning)**	-	-
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

Sub Code / Sub Name: ME18703 – MECHATRONICS

TEXT BOOKS:

1. Bolton, "Mechatronics",Prentice Hall, 2019
2. RameshSGaonkar,"MicroprocessorArchitecture,ProgrammingandApplicationswith the 8085", 6th Edition, PrenticeHall, 2013.

REFERENCES:

1. Bradley D.A, Dawson D, Buru N. C and Loader A.J, "Mechatronics", Chapman and Hall, 2013.
2. DevadasShettyandRichardA.Kolk,"MechatronicsSystemsDesign",PWSpublishing company, 2013.
3. Krishna Kant, "Microprocessors &Microcontrollers", Prentice Hall of India, 2013. Larence W, de Silva, "Mechatronics" CRC Press, First Indian Re-print, 2014.
4. Michael B. Histand and Davis G. Alciatore, "Introduction to Mechatronics and Measurement systems", McGraw Hill International 4th edition, 2017.
5. Smaili.A and Mrad. F, "Mechatronics Integrated Technologies for Intelligent Machines", Oxford UniversityPress,2012.

WEBRESOURCES:

Sl. No	Topics	Online Resources	Mapping
1.	Sensors and transducers	https://www.youtube.com/watch?v=bfw_So5cCp4	Unit – 01
2.	Stepper motor	https://www.youtube.com/watch?v=eyqwLiowZiU	
3.	Servo motor	https://www.youtube.com/watch?v=ditS0a28Sko	
4.	Microprocessor Programming Simulation	https://youtu.be/RNJjF3xLLzU	Unit – 02
5.	PLC Ladder programming Simulation	https://youtu.be/cUnmMfx84I8	Unit – 03
6.	PLC – Timer programming Simulation	https://youtu.be/P8P5PVsCtE0	
7.	Mechatronics	https://onlinecourses.nptel.ac.in/noc21_me27/preview	Unit – 01 Unit – 02 Unit – 05
8.	Mechatronics	https://nptel.ac.in/courses/112/103/112103174/	Unit – 01 Unit – 03

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN – THEORY

	Prepared by	Approved by
Signature		
Name	Mr.M.Arulkumar	Dr. S. Ramesh Babu
Designation	Assistant Professor	Professor and Head
Date	24/08/2022	24/08/2022

Remarks *:

Remarks *:

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - LABORATORY

Department of Mechanical Engineering	LP: ME18712 Rev. No: 01 Date: 22/08/2022
B.E/~~B.Tech/M.E/M.Tech~~ : **Mechanical Engineering** Regulation: **2018** PG Specialisation : NA Sub. Code / Sub. Name : **ME18712 – FINITE ELEMENT ANALYSIS AND SIMULATION LABORATORY**	

Session No*	List of Experiments
CYCLE-I	
1	(a) Analysis of Trusses with same cross sections - **Demonstration using ICT** (b) Analysis of Trusses with different cross sections - **Demonstration using ICT**
2	Analysis of beams to compute shear force, bending moment and maximum deflection - **Demonstration using ICT**
3	(a) Stress analysis of a plate with a circular hole (Plane stress problem) - **Demonstration using ICT** (b) Stress analysis of pressure vessel (Plane strain problem) - **Demonstration using ICT** (c) Stress analysis of a bicycle spanner (Additional exercise)- **Demonstration using ICT**
4	Stress analysis of an axi-symmetric component - **Demonstration using ICT**
5	(a) Thermal stress analysis of a 2D component - **Demonstration using ICT** (b) Convective heat transfer analysis of a 2D component - **Demonstration using ICT**
6	Analysis of a spring – mass system - **Demonstration using ICT**
7	Mode frequency analysis of beams (Cantilever, Simply supported, Fixed ends) - **Demonstration using ICT**
8	Mode frequency analysis of a 2 D component - **Demonstration using ICT**
9	Harmonic analysis of a 2D component - **Demonstration using ICT**
CYCLE-II	
10	Introduction to MATLAB - Dealing with matrices, simple Simulink components - **Demonstration using ICT**
11	Simulink model for Simulation for work done by a cutting tool
12	Simulink model Simulation of Doorbell Using Solenoid Valve

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - LABORATORY

13	Spring Mass Damper System – Unforced and Forced Response - **Demonstration using ICT**
14	Model Exam

Content beyond syllabus (if any): Demonstration of ANSYS Workbench for

1. Slider crank mechanism
2. Optimization for beam, and
3. Contact Analysis.

* Session Duration: 150 minutes

Sub. Code / Sub. Name: **ME 18712 – FINITE ELEMENT ANALYSIS AND SIMULATION LABORATORY**

Course Outcomes:

Course Outcome 1: Students will **analyse and simulate the structural components** for various mechanical applications using analysis software.

Course Outcome 2: Students will **analyse and simulate the thermal components** for various mechanical applications using analysis software.

Course Outcome 3: Students will predict the performance of **vibration systems using MATLAB** analysis software.

Mapping – CO – PO:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2								2	3		
CO2	3	3	2	2								2	3		
CO3	3	3	2	2								2	3		

3 – Strong; 2 – Moderate; 1 - Weak

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - LABORATORY

Sub. Code / Sub. Name: **ME 18712 – FINITE ELEMENT ANALYSIS AND SIMULATION LABORATORY**

	Prepared by	**Approved by**
Signature		
Name	Mr M Maheswaran, & Mr.G.Kirubakaran	Dr. M. Mohandass
Designation	Assistant Professor	Assistant HoD - Mechanical
Date	22/08/2022	22/08/2022
Remarks* :		
Remarks* :		

* If the same lab plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - LABORATORY

Department of Mechanical Engineering	LP: ME18713 Rev. No: 00 Date: 24/08/2022
B.E/~~B.Tech/M.E/M.Tech~~: Mechanical Regulation: 2018 PG Specialisation : NA Sub. Code / Sub. Name : ME18713/ Mechatronics Laboratory	

Session No*	List of Experiments
	CYCLE-I
1	a. Control of single acting cylinder using AND &OR value – Basic Pneumatic trainer kit – **Virtual lab demonstration** b. Design and operation of cascade circuit using pilot operated DCV-Pneumatic trainer kit - **Virtual lab demonstration**
2	a. Control of single/ double acting cylinders using solenoid operated DCV & electrical timer- Basic Electro Pneumatic trainer kit. - **Virtual lab demonstration** b. Design and operation of cascade circuit using solenoid operated DCV and timers in the sequence $A^+ B^+ B^- A^-$ - Basic Electro Pneumatic trainer kit. - **Virtual lab demonstration**
3	a. Design and operation of pneumatic circuit for shaping operation using PLC- Basic Electro Pneumatic trainer kit & PLC - **Virtual lab demonstration** b. Design and operation of cascade circuit with the sequence $A^+ B^+ B^- A^-$ - Basic Electro Pneumatic trainer kit &PLC -**Virtual lab demonstration**
4	a. Control of single acting cylinder using- Basic hydraulic trainer kit. - **Virtual lab demonstration** b. Design and operation of cascade circuit using - Basic Hydraulic trainer kit. -**Virtual lab demonstration**
5	a. Design and operation of pneumatic circuit for shaping operation using PLC-Basic Electro Hydraulic trainer kit & PLC – **Virtual lab demonstration** b. Design and operation of cascade circuit with the sequence $A^+ B^+ B^- A^-$ (Punching/Pressing operation) - Basic Electro Hydraulic trainer kit & PLC - **Virtual lab demonstration**
6	a. Simulation using FluidSim software. b. Simulation using Automation Studio software.
7	Implementation of Logic gates and Boolean expression using PLC. – **Virtuallab demonstration**

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - LABORATORY

Sub. Code / Sub. Name: ME18713/ Mechatronics Laboratory

	CYCLE-II
8	a. Interfacing A Stepper motor using 8051 Microcontroller. b. Traffic light control using 8051 Microcontroller.
9	Closed loop speed control of PMDC motor using 3 phase fully controlled converter.
10	Characteristics study of various types of transducers. - **Virtual lab demonstration**
11	To Study Assembly language programming of 8085 – Addition – Subtraction – Multiplication – Division – Sorting – Code conversion
12	ImageprocessingtechniqueusingMachine Vision system.
13	Programmingon Pick and Placerobot manipulator.
Content beyond syllabus (if any):	

* Session Duration: 150 minutes

	Prepared by	**Approved by**
Signature		
Name	Mr.M.Arulkumar	Dr.S.Ramesh Babu
Designation	Assistant Professor	Professor & Head
Date	24/08/2022	24/08/2022
Remarks* :		
Remarks* :		

* If the same lab plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE OUTCOMES - LABORATORY

Department of Mechanical Engineering	CO: ME18713 Rev. No: 00 Date:24/08/2022
B.E/~~B.Tech/M.E/M.Tech~~ : Mechanical Engineering UG / PG Specialisation : NA Regulation : 2018 Sub. Code / Sub. Name : ME18713 – Mechatronics Laboratory	

CO	Statements	RBT* Level
CO1	The students can able to work on basic fluid power based automated process.	U
CO2	The students are competent toprogram apick andplacerobotfordifferent operations	AP
CO3	Thestudents willbeabletoidentifythevariousaccessories,tooling's required forautomation.	U
CO4	The studentsare capable todesignandprogramforgivenbasic sequenceof operation using Programmable LogicController(PLC).	AP
CO5	Thestudents can controlaprocessusing microprocessor/ microcontroller.	AP

* Revised Bloom's Taxonomy

Mapping CO – PO - PSO*:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2	PSO-3
CO1	2	0	3	0	3	0	0	0	0	0	0	0	3	0	0
CO2	0	0	3	0	3	0	0	0	0	0	0	0	3	0	0
CO3	2	0	3	0	3	0	0	0	2	0	0	0	3	0	0
CO4	0	0	3	0	3	0	0	0	0	0	0	0	3	0	0
CO5	2	0	3	0	3	0	0	0	0	0	0	0	3	0	0

3– Strong;2 – Moderate; 1– weak

Assessment Methods:

Stream	Internal Assessment Marks			End Semester Examination Marks
	Continuous Assessment (As per AAR)	Model Exam	Total	
Non - Autonomous	12	8	20	80
Autonomous	50	25	75	25

Signature of Faculty / Course Coordinator	**Signature of Module Coordinator**

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Mechanical Engineering	LP: **OE18007** Rev. No: 00 Date:12/09/2022
B.E/B.Tech/M.E/M.Tech : **Civil/Chemical/CSE/ECE/IT/Marine**Regulation: **2018A** PG Specialisation : **N.A** Sub. Code / Sub. Name : **OE 18007 BASICS OF ENERGY RESOURCES** Unit : **I**	

UNIT SYLLABUS:ENERGY RESOURCES 9

Energy generation in coal based, nuclear based, diesel and gas based power plants, world energy flows, energy and economic growth, supply and availability; Electric utilities and regulations, cost structure analysis, economics of energy use in agriculture, transport, building, Industry and energy substitution, cost benefit analysis –carbon credit and footprint.

Objective: To impart knowledge on various sources of energy and associated environmental impact

Session No *	Topics to be covered	Ref	Teaching Aids
1.	Introduction to the subject and Overview of syllabus https://www.youtube.com/watch?v=1TKHlfPrEFQ	8- Ch.2; Pg.74-75	PPT,BB,ICT
2.	Energy generation in coal basedpower plants https://www.youtube.com/watch?v=IdPTuwKEfmA	8- Ch.2; Pg.74-75	PPT,BB,ICT
3.	Energy generation in Nuclear basedpower plants https://www.youtube.com/watch?v=q8HmRLCgDAI	8-Ch 9; Pg. 602-612	PPT,BB,ICT
4.	Energy generation in Gas basedpower plants https://www.youtube.com/watch?v=AMXxXoHtM-o	8 - Ch.11; Pg.785-793	PPT,BB,ICT
5.	World and Indian energy scenario and energy flows, energy and economic growth, supply and availability FM_GOPSONS.qxd (beeindia.gov.in)	8 - Ch.11; Pg.785-793	PPT,BB,ICT
6.	Electric utilities and regulations, cost structure analysis	8 - Ch.11; Pg.785-793	PPT,BB,ICT
7.	Economics of energy use in agriculture, transport and in buildingsAn Analysis of Cost Structures in the Electricity Generation Industry (repec.org)	8 - Ch.11; Pg.785-793	PPT,BB,ICT
8.	Industry and energy substitution, cost benefit analysis	8 - Ch.11; Pg.785-793	PPT,BB,ICT
9.	Carbon credit and footprint and Revision of topics covered	8 - Ch.11; Pg.785-793	PPT,BB,ICT
Content beyond syllabus covered (if any): Indian energy scenario			

* Session duration: 50 minutes

Sub. Code / Sub. Name: **OE18007 – Basics of Energy Resources**
Unit : II

Unit Syllabus: ENVIRONMENTAL IMPACTS OF ENERGY USE 9

Global warming -sources of emissions, CO_2emissions, impacts, mitigation and sustainability. environmental standards, legislation and audits, air pollution -SOx, NOx, CO, particulates, solid and water pollution, formation of pollutants, measurement and controls.

Objective: To impart knowledge on environmental impacts associated with usage of traditional energy sources.

Session No *	Topics to be covered	Ref	Teaching Aids
10.	Environmental impacts of energy use - Overview	8- Ch.2; Pg.74-75	PPT,BB,ICT
11.	Global warming - Contributing factors Global Warming 101 - Definition, Facts, Causes and Effects of Global Warming | NRDC	8- Ch.2; Pg.74-75	PPT,BB,ICT
12.	Sources of emissionsGlobal Greenhouse Gas Emissions Data | US EPA	8- Ch.2; Pg.74-75	PPT,BB,ICT
13.	CO_2emissions, impacts, mitigation and sustainabilitySustainability | Free Full-Text | Issues, Impacts, and Mitigations of Carbon Dioxide Emissions in the Building Sector (mdpi.com)	8- Ch.2; Pg.74-75	PPT,BB,ICT
14.	Environmental standards, legislation and auditshttps://en.wikipedia.org/wiki/Environmental_audit	8- Ch.2; Pg.74-75	PPT,BB,ICT
15.	Air pollution -SOx, NOx, CO, particulate emissionhttps://aeronsystems.com/iot/smart-air-quality-monitoring/	8- Ch.2; Pg.74-75	PPT,BB,ICT
16.	Solid (Land) and water pollution	8- Ch.2; Pg.74-75	PPT,BB,ICT
17.	Formationof pollutants, measurement and controls	8- Ch.2; Pg.74-75	PPT,BB,ICT
18.	Revision of topics covered	8- Ch.2; Pg.74-75	PPT,BB,ICT

Content beyond syllabus covered (if any): Methods of reducing emissions

* Session duration: 50 mins

Sub. Code / Sub. Name: **OE18007 – Basics of Energy Resources**
Unit : **III**

Unit Syllabus:RENEWABLE ENERGY **9**

Solar PV cell; Wind energy - HAWT; Biomass energy - Bio digesters, Bio-diesel; OTEC

Objective: To impart knowledge on various techniques used in effective conversion of renewable sources of energy.

Session No *	Topics to be covered	Ref	Teaching Aids
19.	Renewable energy resources overview	8-Ch 14; Pg 899	PPT,BB,ICT
20.	Solar PV cell, principle of energy conversion & methods of conversion of Solar energy **https://www.sciencedirect.com/topics/earth-and-planetary-sciences/photovoltaic-conversion** **https://www.sciencedirect.com/topics/earth-and-planetary-sciences/solar-energy-conversion**	8-Ch 14; Pg 899	PPT,BB,ICT
21.	Potential, advantages & limitations of Solar energy	8-Ch 14; Pg 899	PPT,BB,ICT
22.	Wind energy - Potential, advantages & limitations **https://www.energy.gov/eere/wind/advantages-and-challenges-wind-energy**	8-Ch 14; Pg 912	PPT,BB,ICT
23.	Horizontal Axis Wind Turbine (HAWT) - construction and working principle	8-Ch 14; Pg 912	PPT,BB,ICT
24.	Types of refrigerated Cargos, Importance of maintaining temperature, humidity, oxygen content in container	8-Ch 14; Pg 912	PPT,BB,ICT
25.	Biomass energy - Potential, advantages & limitationshttps://nam04.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.glbrc.org%2Foutreach%2Feducational-materials%2Ffermentation-	8-Ch 14; Pg 912	PPT,BB,ICT
26.	Bio digesters, Biodiesel - Potential, advantages & limitationshttps://nam04.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.eia.gov%2Fenergyexplained%2F&data=02%7C01%7CShelby.Strudler%40constellation.com%7Cfafa4fdaed8448850f4508d82390853e%7C600d01fc055f49c6868f3ecfcc791773%7C0%7C0%7C637298451979511143&sdata=OQe1pxMTjzXkotSzCyKfW4oD%2BHrWtmYV6mPHLrRahSA%3D&reserved=0	8-Ch 14; Pg 912	PPT,BB,ICT
27.	Ocean Thermal Energy Conversion (OTEC), Revision of topics covered	8-Ch 14; Pg 912	PPT,BB,ICT

Content beyond syllabus covered (if any): Global renewable energy utilization scenario

* Session duration: 50 mins

Sub. Code / Sub. Name: **OE18007 – Basics of Energy Resources**
Unit : **IV**

Unit Syllabus:ENERGY STORAGE **9**

Potential energy, Pumped hydro storage; KE and Compressed gas system: Flywheel storage, compressed air energy storage; Electrical and magnetic energy storage: Capacitors, electromagnets; Chemical Energy storage: Thermo-chemical, photo-chemical, bio-chemical, Superconducting Magnet Energy Storage (SMES) systems.

Objective: To impart knowledge on storage of energy in different forms.

Session No *	Topics to be covered	Ref	Teaching Aids
28.	Energy storage - overview	8- Ch.12; Pg.778-817	PPT,BB,ICT
29.	Potential energy, Pumped hydro storage https://www.energy.gov/eere/water/pumped-storage-hydropower	8- Ch.12; Pg.778-817	PPT,BB,ICT
30.	Kinetic Energy and Compressed gas system https://www.atlascopco.com/en-in/compressors/wiki/compressed-air-articles/what-is-compressed-air	8- Ch.12; Pg.778-817	PPT,BB,ICT
31.	Flywheel storage, compressed air energy storage **https://www.youtube.com/watch?v=ay_NiGu7mis**	8- Ch.12; Pg.778-817	PPT,BB,ICT
32.	Electrical and magnetic energy storage, Capacitors, electromagnets	8- Ch.12; Pg.778-817	PPT,BB,ICT
33.	Chemical Energy storage: Thermo – chemical https://www.etipbioenergy.eu/everyone/fuels-and-conversion/thermochemical-conversion	8- Ch.12; Pg.778-817	PPT,BB,ICT
34.	Photo-chemical, Bio-chemical energy storage	8- Ch.12; Pg.778-817	PPT,BB,ICT
35.	Superconducting Magnet Energy Storage (SMES) systems	8- Ch.12; Pg.778-817	PPT,BB,ICT
36.	Revision of topics covered	8- Ch.12; Pg.778-817	PPT,BB,ICT
Content beyond syllabus covered (if any): Advantages of decentralization of energy production			

* Session duration: 50 mins

Sub. Code / Sub. Name: **OE18007 – Basics of Energy Resources**
Unit : **V**

Unit Syllabus: ENERGY ECONOMICS9

Simple payback period, time value of money, IRR, NPV, life cycle costing, cost of saved energy, and cost of energy generated, examples from energy generation and conservation, energy chain, primary energy analysis, life cycle assessment, net energy analysis, case studies on life cycle costing

Objective: To impart knowledge to assess the life cycle and cost analysis.

Session No *	Topics to be covered	Ref	Teaching Aids
37.	Introduction to Energy economics	8-Ch 1; Pg. 1-37	PPT,BB,ICT
38.	Timevalue of money, Internal Rate of Return (IRR), Net Present Value (NPV)	8-Ch 1; Pg. 1-37	PPT,BB,ICT
39.	Life cycle costing, cost of saved energy and cost of energy generated	8-Ch 1; Pg. 1-37	PPT,BB,ICT
40.	Examples from energy generation and conservation	8-Ch 1; Pg. 1-37	PPT,BB,ICT
41.	Energy chain, primary energy analysis	8-Ch 1; Pg. 1-37	PPT,BB,ICT
42.	Life cycle assessment, net energy analysis	8-Ch 1; Pg. 1-37	PPT,BB,ICT
43.	Expansion valves – types, construction and maintenance	8-Ch 1; Pg. 1-37	PPT,BB,ICT
44.	Casestudies on life cycle costing	8-Ch 1; Pg. 1-37	PPT,BB,ICT
45.	Revision of all the 5 units	8-Ch 1; Pg. 1-37	PPT,BB,ICT
Content beyond syllabus covered (if any): Energy economics scenario			

* Session duration: 50 mins

Sub Code / Sub Name: **OE18007 – Basics of Energy Resources**

TEXT BOOKS:

1. Energy and the Challenge of Sustainability, World energy assessment, UNDP New York, 2004.
2. AKN Reddy, RH Williams, TB Johansson, Energy after Rio, Prospects and challenges, UNDP, United Nations Publications, New York, 1997

REFERENCES :

3. Nebojsa Nakicenovic, Arnulf Grubler and Alan McDonald "Global energy perspectives", Cambridge University Press, 1999.
4. Fowler, J.M ., "Energy and the environment", McGraw Hill,1984.5.Robert Ristirer, and Jack P. Kraushaar., "Energy and the environment",Willey,2005
5. Yves Brunet., "Energy storage", Wiley publications, 2013.
6. Rai, G.D., "Non-conventional Energy Sources", Khanna Publishers, 2002.
7. S.K.Garg, Dr.Ranjini Garg, "Environmental Studies and Green Technologies", Khanna Publishers, 2008
8. Nag P.K, "Power Plant Engineering", Tata McGraw Hill Publishing Co., New Delhi, 2014.

WEB RESOURCES:

8. https://nptel.ac.in/courses/108105058/
9. https://nptel.ac.in/courses/121106014/
10. https://www.iea.org and other related websites

	Prepared by	Approved by
Signature		
Name	Dr. S.Arumugam	Dr. S. Ramesh Babu
Designation	Assistant Professor	Professor & HoD
Date	12.09.2022	12.09.2022
Remarks *:		
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD