CURRICULUM

(REGULATIONS 2023)

FOR

B.E. MECHANICAL ENGINEERING

CHOICE BASED CREDIT SYSTEM

(Applicable to the students admitted from the Academic Year 2023-24 onwards)

III & IV SEMESTER

AUTONOMOUS

EASWARI ENGINEERING COLLEGE

(Autonomous Institution)
Bharathi Salai, Ramapuram, Chennai - 600 089

[A Unit of SRM Group of Educational Institutions, Approved by AICTE | Affiliated to Anna University, Chennai | NAAC Accredited 'A' Grade | 2(f) & 12(B) Status (UGC) | ISO 9001:2015 Certified | NBA Accredited Programmes | FIST Funded (DST) | SIRO Certified (DSIR)]

SEMESTER III									
S.No	**Course Code**	**Course Title**	**Category**	**Hours / Week**				**CREDITS**	**Internal / External %**
				L	**T**	**P**	**R**		
THEORY									
1	231MAB301T	Transforms and partial differential equations	BS	3	2	0	0	4	40 / 60
2	231MEC301T	Manufacturing Processes - I	PC	3	0	0	0	3	40 / 60
3	231MEC302T	Measurements and Metrology	PC	3	0	0	0	3	40 / 60
4	231MEC303T	Fluid Mechanics and Machinery	PC	3	0	0	0	3	40 / 60
5	231MEC304T	Engineering Thermodynamics	PC	3	2	0	0	4	40 / 60
PRACTICALS									
6	231MEC311L	Manufacturing Processes Laboratory –I	PC	0	0	4	0	2	60 / 40
7	231MEC312L	Measurements and Metrology Laboratory	PC	0	0	4	0	2	60 / 40
8	231MEC313L	Computer Aided Design laboratory	PC	0	0	3	1	2	60 / 40
9	231SDA001	Comprehensive Programming – Foundations	EEC	0	0	2	0	0	100 / 0
TOTAL CREDITS								**23**	**-**

SYLLABUS OF

SEMESTER – III

COURSES

231MAB301T	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS (Common to AUTO, CIVIL, EEE, BME & MECH)	Periods per week				Credits
		L	T	P	R	
Regulation - R23 V 1.0		**3**	2	**0**	**0**	**4**

SCHEME OF EXAMINATION					
Duration of End Semester Examination inHours	Marks Weightage			Minimum marks for Pass	
	Continuous assessment Examination	End Semester Examination	Maximum marks	End Semester Examination	Total
3	40 %	60 %	100	45 %	50 %

PREREQUISITES:
Nil

COURSE OBJECTIVES:	
1.	To introduce the basic concepts of PDE for solving standard partial differential equations.
2.	To introduce Fourier series analysis which is central to many applications in engineering apart from its usein solving boundary value problems.
3.	To acquaint the student with Fourier series techniques in solving heat flow problems used in varioussituations.
4.	To acquaint the student with Fourier, transform techniques used in wide variety of situations.
5.	To introduce the effective mathematical tools for the solutions of partial differential equations that modelseveral physical processes and to develop Z transform techniques for discrete time systems.

COURSE OUTCOMES (COs):		
Upon completion of this course, student will be able to:		Bloom's level
CO1:	Solve linear, first and higher order, homogeneous and non-homogeneous partialdifferential equations.	K4
CO2:	Use Fourier series expansion of a complicated periodic function, in terms of simpleperiodic functions to know its basic nature better.	K6
CO3:	Solve one dimensional wave and two-dimensional steady state heat flow PDEs withinitial and boundary conditions.	K5
CO4:	Evaluate definite integrals by using Fourier transform techniques.	K6
CO5:	Solve difference equations by using Z- transform techniques.	K5

MAPPING OF COURSE OUTCOMES (CO) WITH PROGRAMME OUTCOME (PO)												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	-	-	-	-	-	1	-	-	1
CO2	3	2	1	-	2	-	-	-	2	-	-	2
CO3	3	2	3	2	2	-	-	-	2	-	-	-
CO4	3	2	1	2	2	-	-	-	2	-	-	-
CO5	3	2	1	2	2	-	-	-	2	-	-	-
3 – High : 2 - Medium : 1 – Low: '-' - No correlation												

UNIT	UNIT	PERIODS
I	**PARTIAL DIFFERENTIAL EQUATIONS**	**12**
Formation of partial differential equations – Singular integrals - Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types. (Exponential, sin(ax+by) and cos (ax+by))		
UNIT	**UNIT**	**PERIODS**
II	**FOURIER SERIES**	**12**
Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half rangecosine series – Complex form of Fourier series – Parseval's identity – Harmonic analysis.		
UNIT	**UNIT**	**PERIODS**
III	**APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**	**12**
Classification of PDE – Method of separation of variables - Fourier Series Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction.		
UNIT	**UNIT**	**PERIODS**
IV	**FOURIER TRANSFORMS**	**12**
Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties –Transforms of simple functions – Convolution theorem – Parseval's identity.		
UNIT	**UNIT**	**PERIODS**
V	**TRANSFORMS AND DIFFERENCE EQUATIONS**	**12**
Z-transforms - Elementary properties – Inverse Z-transform (using partial fraction and residues) – Initial and final value theorems - Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.		

TOTAL PERIODS:	60

TEXT BOOKS:	
1.	Grewal B.S., “Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, New Delhi, 2014.
2.	Narayanan S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for EngineeringStudents", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.
3.	Work-Book on‟ Tranforms and Partial Differential Equations”, Chess Educational Publishers, prepared by Department ofMathematics

REFERENCE BOOKS:	
1.	B.V Ramana.., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
2.	Erwin Kreyszig, "Advanced Engineering Mathematics ", 10th Edition, John Wiley, India, 2016.
3.	G. James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.
4.	L.C Andrews, L.C and Shivamoggi, B, "Integral Transforms for Engineers" SPIE Press, 1999.
5.	N.P. Bali. and Manish Goyal, "A Textbook of Engineering Mathematics", 9th Edition, Laxmi PublicationsPvt. Ltd, 2014.
6.	R.C. Wylie, and Barrett, L.C., “Advanced Engineering Mathematics “Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

WEBSITES:	
1.	https://archive.nptel.ac.in/courses/111/107/111107105

COURSE DESIGNERS			
1.	Dr.S.Muthukumar	Professor	Department of Mathematics
2.	Dr.S.R.Ananthalakshmi	Associate Professor & HOD	Department of Mathematics
3.	Dr.N.Nagamani	Assistant Professor	Department of Mathematics

Recommended by Board of Studies	Date:12.10.23	Syllabus version	V.1
Approved by the Academic Council	Date:	Meeting No.	

231MEC301T	MANUFACTURING PROCESSES- I	Periods per Week				Credits
		L	T	P	R	
Regulation - R23 V 1.0		**3**	**0**	**0**	**0**	**3**

SCHEME OF EXAMINATION						
Duration of End Semester Examination in Hours	Maximum Marks -100			Minimum Marks for Pass- 50		
	Weightage			Weightage		Overall
	Continuous assessment Examination	End Semester Examination		Continuous assessment Examination	End Semester Examination	
3	40%	60%		-	45%	50%

PREREQUISITES:
Nil

COURSE OBJECTIVES:	
1.	To illustrate the working principles of various metal casting processes.
2.	To learn and apply the working principles of various metal joining processes.
3.	To analyze the working principles of bulk deformation of metals.
4.	To learn the working principles of sheet metal forming process.
5.	To study and apply the working principles of plastics molding.

COURSEOUTCOMES(COs):		
Upon completion of this course ,student will be able to:		Bloom’ slevel
CO1:	Select an appropriate casting process for a given simple industrial component.	K3
CO2:	Choose suitable welding processes for industrial applications.	K5
CO3:	Select the different methods of bulk deformation processes for a given product.	K5
CO4:	Choose a suitable sheet metal forming technique for a given component.	K5
CO5:	Apply suitable molding Technique for manufacturing of plastic components.	K3

MAPPINGOF COURSEOUTCOMES(CO)WITHPROGRAMMEOUTCOME(PO)												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2	0	2	1	1	1	0	0	0	1
CO2	3	2	2	0	2	1	1	1	0	0	0	1
CO3	3	2	2	0	2	1	1	1	0	0	0	1
CO4	3	2	2	0	0	1	1	1	0	0	0	1
CO5	3	1	2	0	0	1	1	1	0	0	0	1
3–High :2-Medium : 1–Low :‘-‘-No correlation												

MAPPING OF COURSE OUTCOME (CO) WITH PROGRAMME SPECIFIC OUTCOME (PSO):

COPSO	PSO1	PSO2	PSO3	PSO4
CO1	-	-	3	-
CO2	-	-	3	-
CO3	-	-	3	-
CO4	-	-	3	-
CO5	-	-	3	-
CO	-	-	3	-

UNIT	TITLE	PERIODS
I	**METAL CASTING PROCESSES**	**9**
Sand Casting – Sand Mould – Type of patterns - Pattern Materials – Pattern allowances – Molding sand– Cores –Types and applications- design of patterns, moulds and cores-– Melting furnaces –Defects in Sand casting process-remedies -Principle of special casting processes-Shell, investment — Pressure die casting -Centrifugal Casting		
UNIT	**TITLE**	**PERIODS**
II	**METAL JOINING PROCESSES**	**9**
Fusion welding processes – Oxy fuel welding – Filler and Flux materials-–Arc welding, Electrodes, Coating and specifications – Gas Tungsten arc welding –Gas metal arc welding - Submerged arc welding – Electro slag welding–– Resistance welding Processes -Electron beam welding –Laser beam Welding Friction welding – Friction stir welding — Thermit Welding, Weld defects – inspection &remedies.		
UNIT	**TITLE**	**PERIODS**
III	**BULK DEFORMATION PROCESSES**	**9**

Hot working and cold working of metals – Forging processes – Open, impression and closed die forging – cold forging-– Typical forging operations, load estimation for forging– rolling of metals – Types of Rolling – Flat strip rolling – shape rolling operations – Defects in rolled parts load estimation for rolling– Principle of rod and wire drawing – Tube drawing – Principles of Extrusion – Types – Hot and Cold extrusion.		
UNIT	**TITLE**	**PERIODS**
IV	**SHEET METAL PROCESSES**	**9**
Sheet metal characteristics – Typical shearing, bending and drawing operations – Stretch forming operations – Formability of sheet metal – Test methods, load estimation for shearing and bending –special forming processes - Working principle and applications – Hydro forming – Rubber pad forming – Metal spinning – Introduction to Explosive forming- Super plastic forming.		
UNIT	**TITLE**	**PERIODS**
V	**PLASTIC MANUFACTURINGPROCESSES**	**9**
Types and characteristics of plastics – Molding of thermoplastics & Thermosetting polymers– working principles and typical applications – injection molding – Plunger and screw machines – Compression molding, Transfer Molding – Typical industrial applications – introduction to blow molding – Rotational molding – Film blowing – Extrusion –Introduction to additive manufacturing.		

TOTALPERIODS:	**45**

TEXTBOOKS:	
1.	Gowri P. Hariharan, A. Suresh Babu, “Manufacturing Technology”, Pearson Education, 2013.
2.	P.N.Rao “Manufacturing Technology”Tata McGraw Hill Publishing Co. Ltd., Volume 1,5th edition,2018
3.	Kalpakjian. S, “Manufacturing Engineering and Technology”, Pearson Education India,4th Edition, 2013

REFERENCEBOOKS:	
1.	Mikell P. Groover,” Principles of Modern Manufacturing”, SI Version, Wiley & sons Pvt. Ltd, 2013.
2.	Ro y. A. Lindberg, Processes and materials of manufacture, PHI / Pearsoneducation, 2006.
3.	Rajput,R.K.”A textbook of manufacturing technology (manufacturing processes)”,Laxmi publications (p) ltd,2015.
4.	Hajra Chouldhary S.K and Hajra Choudhury. AK., Elements of workshop Technology, volume I and II, Media promoters and Publishers Private Limited, Mumbai, 1997
5.	Sharma, P.C., A Text book of production Technology, S.Chand and Co. Ltd., 2004

WEBSITES:	
1.	https://www.unleashedsoftware.com/blog/manufacturing-processes
2.	https://archive.nptel.ac.in/courses/112/107/112107219/
3.	https://archive.nptel.ac.in/courses/112/107/112107144/

JOURNALS(Publication of Bureau of Indian Standards):	
1.	https://www.sciencedirect.com/journal/journal-of-manufacturing-processes
2.	https://www.tandfonline.com/journals/lmmp20
3.	https://link.springer.com/journal/170

COURSE DESIGNERS			
1.	Dr. R. Ramadoss	Professor	Mechanical Engineering
2.	Dr. K. G. Ashok	Assistant Professor	Mechanical Engineering

Recommended by Board of Studies	Date:24.05.2024	Syllabus version	V1
Approved by the Academic Council	Date:	Meeting No.	

<table>
<tr><td rowspan="2">231MEC302T</td><td rowspan="3">MEASUREMENTS AND METROLOGY</td><td colspan="4">Periods per week</td><td rowspan="2">Credits</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>R</td></tr>
<tr><td>Regulation - R23 V 1.0</td><td>3</td><td>0</td><td>0</td><td>0</td><td>3</td></tr>
</table>

<table>
<tr><td colspan="7">SCHEME OF EXAMINATION</td></tr>
<tr><td rowspan="3">Duration of End Semester Examination in Hours</td><td colspan="2">Maximum Marks - 100</td><td rowspan="4"></td><td colspan="3">Minimum Marks for Pass - 50</td></tr>
<tr><td colspan="2">Weightage</td><td colspan="2">Weightage</td><td rowspan="2">Overall</td></tr>
<tr><td>Continuous assessment Examination</td><td>End Semester Examination</td><td>Continuous assessment Examination</td><td>End Semester Examination</td></tr>
<tr><td>3</td><td>40 %</td><td>60 %</td><td>-</td><td>45%</td><td>50%</td></tr>
</table>

PREREQUISITES:
Nil

COURSE OBJECTIVES:	
1.	Describe the evolution of quality standards and measuring instruments for temperature, pressure and flow.
2.	Operate various instruments to measure the force, torque and power
3.	Explain the various methods for linear and angular measurement.
4.	Classify the methods used for form measurement.
5.	Apply the working principle of various comparators and summarize the advanced metrology concepts.

<table>
<tr><td colspan="3">COURSE OUTCOMES (COs):</td></tr>
<tr><td colspan="2">Upon completion of this course, student will be able to:</td><td>Bloom' slevel</td></tr>
<tr><td>CO1:</td><td>Examine different measurement techniques and selecting the suitable measuring instrument for temperature, pressure and flow.</td><td>K3</td></tr>
<tr><td>CO2:</td><td>Selecting the suitable measuring instrument for force, torque and power</td><td>K5</td></tr>
<tr><td>CO3:</td><td>Apply the principle and applications of linear and angular measuring instruments.</td><td>K3</td></tr>
<tr><td>CO4:</td><td>Apply the principles and methods of form and surface metrology.</td><td>K3</td></tr>
<tr><td>CO5:</td><td>Choose appropriate advanced measuring instruments and comparators for quality control in manufacturing Industries.</td><td>K5</td></tr>
</table>

MAPPING OF COURSE OUTCOMES (CO) WITH PROGRAMME OUTCOME (PO)												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	2	-	-	2	-	-	1
CO2	3	2	2	2	-	2	-	-	2	-	-	1
CO3	3	2	2	2	3	2	-	-	2	-	-	1
CO4	3	2	2	2	-	2	-	-	2	-	-	1
CO5	3	2	2	2	-	2	-	-	2	-	-	1
3 – High : 2 - Medium : 1 – Low : '-' - No correlation												

Mapping of Course Outcome (CO) with Programme Specific Outcome (PSO)

CO PSO	PSO1	PSO2	PSO3	PSO4
CO1	-	-	3	-
CO2	-	-	3	-
CO3	-	-	3	-
CO4	-	-	3	-
CO5	-	-	3	-

UNIT	**TITLE**	**PERIODS**
I	**FUNDAMENTALS OF MEASUREMENTS**	**9**
Fundamental principles and definitions, measurement standards / primary and tertiary standards, distinction between precision and accuracy, sensors, static characteristics, dynamic characteristics, calibration, temperature, pressure and flow measurement.		
UNIT	**TITLE**	**PERIODS**
II	**MEASUREMENT OF FORCE, TORQUE AND POWER**	**9**
Measurement of Force and Torque- Strain gauge factor, mechanical strain gauge, electrical strain gauge, platform balance, load cell, cantilever beams, torsion bar dynamometer, servo controller dynamometer, absorption dynamometer- Power measurement- Eddy current dynamometer, hydraulic dynamometer.		
UNIT	**TITLE**	**PERIODS**
III	**LINEAR AND ANGULAR MEASUREMENTS**	**9**
Linear Measuring Instruments – Vernier caliper, Micrometer, Vernier height gauge, Depth Micrometer, Bore gauge, Telescoping gauge; Gauge blocks – Use and precautions, Angular measuring instruments – Bevel protractor, Clinometer, Angle gauges, Sine bar, Autocollimator, Angle dekkor, Alignment telescope.		

UNIT	TITLE	PERIODS
IV	**FORM MEASUREMENT**	9

Principles and Methods of straightness – Flatness measurement – Thread measurement, gear measurement, surface finish measurement, Roundness measurement – Applications.

UNIT	TITLE	PERIODS
V	**COMPARATORS AND ADVANCES IN METROLOGY**	9

Comparators- Mechanical, Electrical, Optical, Pneumatic comparators- Basic concept of lasers -DC and AC Lasers interferometer, Applications- Basic concept of CMM, Types and Constructional features, Applications – Basic concepts of Machine Vision System – Element – Applications.

TOTAL PERIODS:	**45**

TEXT BOOKS:	
1.	Jain R.K. “Engineering Metrology”, Khanna Publishers, 22nd edition 2022.
2.	Raghavendra N.V. and Krishnamurthy. L., Engineering Metrology and Measurements, Oxford University Press, 2013.

REFERENCE BOOKS:	
1.	Ammar Grous, J “Applied Metrology for Manufacturing Engineering”, Wiley-ISTE, First edition, 2013.
2.	Dotson Connie, “Fundamentals of Dimensional Metrology”, Cengage Learning,Sixth edition, 2016.
3.	Mark Curtis, Francis T. Farago, “Handbook of Dimensional Measurement”,Industrial Press, Fifth edition, 2013
4.	Mechanical Measurements, Beckwith Marangoni and Lienhard, PearsonEducation, 6th Ed., 2006.
5.	Venkateshan, S. P., “Mechanical Measurements”, Second edition, John Wiley&Sons, 2015.

WEBSITES:	
1.	https://emtoolbox.nist.gov/Main/Main.asp
2.	https://www.zeiss.co.in/metrology/industries/machinery.html

JOURNALS (Publication of Bureau of Indian Standards):	
1.	Metrology- MDPI publishers
2.	International Journal of Metrology and Quality Engineering (IJMQE)

COURSE DESIGNERS			
1.	Dr.M.Naresh Babu	Associate Professor	Mechanical Engineering
2.	Dr. K. Thavasilingam	Assistant Professor	Mechanical Engineering

Recommended by Board of Studies	Date:24.05.2024	Syllabus version	1
Approved by the Academic Council	Date:	Meeting No.	1

231MEC303T	FLUID MECHANICS AND MACHINERY	Periods per week				Credits
		L	T	P	R	
Regulation - R23 V 1.0		**3**	**0**	**0**	**0**	**3**

SCHEME OF EXAMINATION

Duration of End Semester Examination in Hours	Maximum Marks -100			Minimum Marks for Pass- 50		
	Weightage			Weightage		Overall
	Continuous assessment Examination	End Semester Examination		Continuous assessment Examination	End Semester Examination	
3	40 %	60 %		-	45%	50 %

PREREQUISITES:
Nil

COURSE OBJECTIVES:

1.	To introduce the fundamental properties of fluids.
2.	To impart the boundary layer concepts and losses in pipes.
3.	To emphasize the importance of dimensional analysis in modeling and prototyping.
4.	To interpret the performance characteristics in types of pumps.
5.	To comprehend the importance, types and governing of turbines.

COURSE OUTCOMES (COs):

Upon completion of this course, student will be able to:		Bloom's level
CO1:	Apply the basic equations of fluid statics to predict the properties of fluids.	K3
CO2:	Examine the flow characteristics and the losses associated in piping networks.	K3
CO3:	Execute the performance characteristics of pumps and turbines.	K3
CO4:	Analyze the concepts of Dimensional analysis.	K4
CO5:	Apply the principles of compressible flow for engineering applications.	K3

MAPPING OF COURSE OUTCOMES (CO) WITH PROGRAMME OUTCOMES (PO)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	0	0	0	1	1	0	1
CO2	3	3	3	2	0	0	0	0	1	1	0	0
CO3	3	3	3	2	2	0	0	0	1	1	0	1
CO4	3	3	3	2	0	2	2	1	1	1	0	0
CO5	3	3	3	2	0	2	2	1	1	1	1	0
3–High :2-Medium: 1–Low: ‘-‘-No correlation												

Mapping of Course Outcome (CO) with Programme Specific Outcome (PSO)

CO / PSO	PSO1	PSO2	PSO 3	PSO4
CO1	3	0	0	1
CO2	3	0	0	0
CO3	3	0	0	0
CO4	3	0	0	0
CO5	3	0	0	0

UNIT	TITLE	PERIODS
I	FLUID PROPERTIES	9
Units and dimensions- Properties of fluids- viscosity, compressibility, vapor pressure, surface tension and capillarity, Buoyancy forces. Manometer and its Applications. Flow characteristics – application of continuity equation, energy equation and momentum equation.		
UNIT	TITLE	PERIODS
II	FLOW THROUGH PIPES AND CHARACTERISTICS	9
Laminar flow through circular conduits and circular annuli-Boundary layer concepts – types of boundary layer thickness – Darcy Weisbach equation – minor losses – Flow through pipes in series and parallel. Fluid Kinematics - Velocity and Acceleration of a fluid particle-Stream line, stream tubes and path line- Vorticity and irrotationality.		
UNIT	TITLE	PERIODS
III	PUMPS AND TURBINES	11
Pumps: Impact of jets - Theory of roto-dynamic machines – various efficiencies– velocity components at entry and exit of the rotor- velocity triangles - Centrifugal pumps– performance curves - Reciprocating pump. Turbines: Classification of turbines – heads and efficiencies – velocity triangles. Axial, radial and mixed flow turbines- Pelton wheel, Francis turbine and Kaplan turbines- working principles - work done by water on the runner – performance curves for turbines.		
UNIT	TITLE	PERIODS
IV	DIMENSIONAL ANALYSIS	7
Need for dimensional analysis – methods of dimensional analysis – Similitude –types of similitude - Dimensionless parameters.		

UNIT	TITLE	PERIODS
V	COMPRESSIBLE FLOW	9
Stagnation properties, subsonic, sonic and supersonic flow through ideal nozzles and diffusers- Definition of transonic, hypersonic flow and shock waves-Difference between jet and a rocket.		

TOTALPERIODS:	45

TEXTBOOKS:	
1.	Bansal. R.K , “A Textbook Of Fluid Mechanics And Hydraulic Machines”, Laxmi publications, Twelth Edition 2022
2.	Modi P.N. and Seth, S.M. "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi 2019.

REFERENCEBOOKS:	
1	Graebel. W.P, "Engineering Fluid Mechanics", Taylor & Francis, Indian Reprint, 2015
2	Kumar K. L., "Engineering Fluid Mechanics", Eurasia Publishing House(p) Ltd., New Delhi 2016
3	Robert W.Fox, Alan T. McDonald, Philip J.Pritchard, “Fluid Mechanics and Machinery”, 2011.
4	Streeter, V. L. and Wylie E. B., "Fluid Mechanics", McGraw Hill Publishing Co.2015

WEBSITES:	
1.	https://law.resource.org/
2.	https://fluidmechanics.com/

COURSE DESIGNERS			
1.	Dr. K. Thavasilingam	Assistant Professor	Mechanical Engineering
2.	Dr. K. Giridharan	Assistant Professor	Mechanical Engineering

Recommended by Board of Studies	Date:24.05.2024	Syllabus version	1
Approved by the Academic Council	Date:	Meeting No.	1

231MEC304T	ENGINEERING THERMODYNAMICS	Periods per week				Credits
		L	T	P	R	
Regulation - R23 V 1.0		**3**	**2**	**0**	**0**	**4**

SCHEME OF EXAMINATION						
Duration of End Semester Examination inHours	Maximum Marks - 100			Minimum Marks for Pass - 50		
	Weightage			Weightage		Overall
	Continuous assessment Examination	End Semester Examination		Continuous assessment Examination	End Semester Examination	
3	40 %	60 %		-	45%	50%

PREREQUISITES:
Nil

COURSE OBJECTIVES:	
1.	To enable the students to understand the fundamentals and first law of thermodynamics
2.	To make the students to understand second law of thermodynamics and apply it to open and closed systems, and to analyze the availability and entropy of a system.
3.	To help the students to understand and apply the properties of pure substances to analyze steam power cycles.
4.	To enable the students to understand and apply the concepts of real and ideal gases, equations of state and thermodynamic relations.
5.	To enable
6.	To enable the students to understand the fundamentals and first law of thermodynamics

COURSE OUTCOMES (COs):		
Upon completion of this course, student will be able to:		Bloom' slevel
CO1:	Determine the thermal parameters of open and closed systems using first law of thermodynamics.	K3
CO2:	Calculate the thermal parameters of open and closed systems using second law of thermodynamics for energy grading.	K4
CO3:	Determine the performance parameters of steam power cycles	K5
CO4:	Calculate the thermodynamic properties of ideal and real gases.	K5
CO5:	Estimate the thermodynamic properties of gas mixtures, moist air for psychrometric processes.	K3

MAPPING OF COURSE OUTCOMES (CO) WITH PROGRAMME OUTCOME (PO)												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	2	-	1	1	-	-	1	-	3
CO2	3	2	1	2	-	1	1	-	-	1	-	3
CO3	3	2	1	2	-	1	1	-	-	1	-	3
CO4	3	2	1	2	-	1	1	-	-	1	-	3
CO5	3	2	1	2	-	1	1	-	-	1	-	3
3 – High : 2 - Medium : 1 – Low : '-' - No correlation												

MAPPING OF COURSE OUTCOME (CO) WITH PROGRAMME SPECIFIC OUTCOME (PSO):

COPSO	PSO1	PSO2	PSO3	PSO4
CO1	**3**	**-**	**-**	**-**
CO2	**3**	**-**	**-**	**-**
CO3	**3**	**-**	**-**	**-**
CO4	**3**	**-**	**-**	**-**
CO5	**3**	**-**	**-**	**-**
CO	**3**	**-**	**-**	**-**

UNIT	TITLE	PERIODS
I	BASIC CONCEPTS AND FIRST LAW	12
Fundamental concepts and definitions- continuum, Microscopic and Macroscopic approaches. Path and point functions. Intensive and extensive properties, total and specific quantities. System, surrounding, boundary 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, P-V diagram and other modes of work. Zeroth law - concept of temperature and thermal equilibrium. First law - application to closed and open systems - steady and unsteady flow processes.		
UNIT	TITLE	PERIODS
II	SECOND LAW AND AVAILABILITY ANALYSIS	12
Heat Reservoir - source and sink. Heat Engine, Refrigerator, Heat pump. Statements of second law and its corollaries. Carnot cycle, Reversed Carnot cycle, Performance. Clausius inequality. Concept of entropy, T-s diagram, Tds Equations - entropy change for a pure substance, ideal gases undergoing different processes, principle of increase in entropy. Applications of II Law. High- and low-grade energy. Availability and Irreversibility analysis for open and closed systems, I and II law Efficiency.		
UNIT	TITLE	PERIODS
III	PROPERTIES OF PURE SUBSTANCE AND STEAM POWER CYCLE	12
Properties of pure substances – formation of Steam and its thermodynamic properties p-v, p-T, T-v, T-s, h-s diagrams. p-v-T surface. Determination of dryness fraction. Calculation of work done and heat transfer in non-flow and flow processes using Steam Table and Mollier Chart. Rankine cycle- cycle efficiency-reheat cycle-regenerative cycle (concept only)		
UNIT	TITLE	PERIODS
IV	IDEAL AND REAL GASES, THERMODYNAMIC RELATIONS	12
Properties of Ideal gas, real gas, and their comparison. Equations of state for ideal and real gases. Van der Waal's relation, Reduced properties, Compressibility factor, Principle of Corresponding states. Generalized Compressibility Chart and its use. Maxwell relations, Tds Equations, heat capacities relations, Energy equation, Joule-Thomson experiment, Phase Change Processes, Clausius-Clapeyron equation. Simple Calculations.		
UNIT	TITLE	PERIODS
V	GAS MIXTURES AND PSYCHROMETRY	12
Gas and gas-vapour mixtures - Dalton's and Amagat's laws, properties of ideal gas mixtures. Psychrometric properties - Property calculations using Psychrometric chart and expressions. Psychrometric processes - adiabatic saturation, sensible heating and cooling, humidification, dehumidification, evaporative cooling and adiabatic mixing.		

TOTAL PERIODS:	**60**

TEXT BOOKS:	
1	Nag.P.K., “Engineering Thermodynamics”, 6th Edition, Tata McGraw Hill (2017), New Delhi
2	Rajput R.K. “A Text Book of Engineering Thermodynamics “, Fifth Edition, 2016.

REFERENCE BOOKS:	
1.	Yunus A. Cengel & Michael A. Boles, “Thermodynamics, An Engineering Approach”, Ninth Edition 2019.
2.	Borgnakke & Sonnatag, “Fundamental of Thermodynamics”, Eighth Edition, 2016.
3.	Chattopadhyay,P,”Engineering Thermodynamics”, Oxford University Press, 2016.
4.	Holman J P, “Thermodynamics”, Third Edition, McGraw-Hill, 2000.
5.	Arora C P, “Thermodynamics”, Tata McGraw-Hill, New Delhi, 2008

WEBSITES:	
1.	https://nptel.ac.in/courses/101104063
2.	https://nptel.ac.in/courses/112102255

COURSE DESIGNERS			
1.	Dr.K.R.Suresh Kumar	Assistant Professor	Mechanical Engineering
2.	Dr.S.Sathya Narayanan	Assistant Professor	Mechanical Engineering

Recommended by Board of Studies	Date:24.05.2024	Syllabus version	1
Approved by the Academic Council		Meeting No.	

231MEC311L	MANUFACTURING PROCESS LABORATORY-I	Periods per week				Credits
		L	T	P	R	
Regulation - R23 V 1.0		**0**	**0**	**4**	**0**	**2**

SCHEME OF EXAMINATION

Duration of End Semester Examination inHours	Maximum Marks - 100			Minimum Marks for Pass - 50		
	Weightage			Weightage		Overall
	Continuous assessment Examination	End Semester Examination		Continuous assessment Examination	End Semester Examination	
3	40 %	60 %		-	45%	50%

PREREQUISITES:
Nil

COURSE OBJECTIVES:

1.	To select appropriate tools, equipment's and machines to complete a given job
2.	To perform various machining operations using shaper and drilling machines.
3.	To acquire knowledge on sand casting processes, and equipped with practical skills to manufacture components.

COURSE OUTCOMES (COs):

Upon completion of this course, student will be able to:		Bloom' slevel
CO1:	Perform turning operations on cylindrical components for the given specifications.	K4
CO2:	Execute thread cutting operations on cylindrical components for given specification.	K4
CO3:	Perform shaping and drilling operations on components for the given dimensions.	K4
CO4:	Create sand casting mould and produce components for the given dimensions	K6
CO5:	Fabricate components by using the process of injection moulding, casting.	K6

MAPPING OF COURSE OUTCOMES (CO) WITH PROGRAMME OUTCOME (PO)												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	-	-	-	1	1	-	1	2	2	-	1
CO2	3	1	-	-	1	1	-	1	2	2	-	1
CO3	3	-	-	-	1	1	-	1	2	2	-	1
CO4	3	1	-	-	1	1	-	1	2	2	-	1
CO5	3	2	1	-	1	1	-	1	2	2	-	1
3 – High : 2 - Medium : 1 – Low : '-' - No correlation												

MAPPING OF COURSE OUTCOME (CO) WITH PROGRAMME SPECIFIC OUTCOME (PSO):

COPSO	PSO1	PSO2	PSO3	PSO4
CO1	**-**	**-**	**3**	**-**
CO2	**-**	**-**	**3**	**-**
CO3	**-**	**-**	**3**	**-**
CO4	**-**	**-**	**3**	**-**
CO5	**-**	**-**	**3**	**-**
CO	**-**	**-**	**3**	**-**

LIST OF EXPERIMENTS	
1	Facing, Step turning, chamfering and knurling on the circular parts using lathe machine
2	Taper turning on the circular parts using lathe machine (Compound rest Method)
3	Eccentric turning on the circular parts using lathe machine
4	Square head shaping on the circular parts using shaper machine
5	Hexagonal head shaping on the circular parts using shaper machine
6	Drilling and Reaming using vertical drilling machine.
7	External thread cutting on the circular parts using lathe machine
8	Boring and Internal thread cutting on the circular parts using lathe machine
9	Turning Drilling & Parting on the circular parts using Capstan/ Turret Lathe machine
10	Preparation of Green Sand Mould using Solid piece pattern

11	Preparation of Green Sand Mould using Split piece pattern
12	Injection Moulding Process (Demo)

TOTAL PERIODS:	**60**

TEXT BOOKS:	
1.	Kalpakjian. S, “Manufacturing Engineering and Technology”, Pearson Education India,4th Edition, 2013
2.	P.N. Rao Manufacturing Technology Volume 1 Mc Graw hill Education 5th edition,2018.

COURSE DESIGNERS			
1.	Dr. R. Ramadoss	Professor	Mechanical Engineering
2.	Dr. K G Ashok	Assistant Professor	Mechanical Engineering

Recommended by Board of Studies	Date:24.05.2024	Syllabus version	1
Approved by the Academic Council		Meeting No.	1

231MEC312L	MEASUREMENTS AND METROLOGY LABORATORY	Periods per week				Credits
		L	T	P	R	
Regulation - R23 V 1.0		**0**	**0**	**4**	**0**	**2**

SCHEME OF EXAMINATION						
Duration of End Semester Examination in Hours	Maximum Marks - 100			Minimum Marks for Pass - 50		
	Weightage			Weightage		Overall
	Continuous Assessment Examination	End Semester Examination		Continuous Assessment Examination	End Semester Examination	
3	60 %	40 %		-	45%	50%

PREREQUISITES:
Nil

COURSE OBJECTIVES:	
1.	Define the measurement standards; describe the fundamentals of dimensional and geometrical tolerances
2.	Demonstrating the measurement of linear and angular measurements carried out in manufacturing industries.
3.	Demonstrating the measurement of prismatic components using contact and non-contact methods and surface metrology.
4.	Demonstrating the measurement of gear tooth instruments, straightness, Flatness and thread measurement devices used in engineering industries
5.	Demonstrating the measurement of temperature, force, displacement, torque measuring devices.

COURSE OUTCOMES:	
Upon completion of this course, student will be able to:	
CO1:	Illustrate on different metrological tools and perform measurements in quality impulsion
CO2:	Describe and explain the working of precision instruments
CO3:	Outline of optical comparator, surface roughness, gear thickness measuring instruments
CO4:	Distinguish with the different instruments that are available for linear, angular, roundness and roughness measurements.
CO5:	Locate appropriate measuring instrument according to a specific requirement

MAPPING OF COURSE OUTCOMES (CO) WITH PROGRAMME OUTCOME (PO)												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	3	2	2	-	3	2	1	-	1
CO2	3	3	3	3	2	2	-	3	2	1	-	1
CO3	3	3	3	3	3	2	-	3	2	1	-	1
CO4	3	3	3	3	2	2	-	3	2	1	-	1
CO5	3	3	3	3	2	2	-	3	2	1	-	1
CO6	3	3	3	3	2	2	-	3	2	1	-	1
3 – High : 2 - Medium : 1 – Low : '-' - No correlation												

MAPPING OF COURSE OUTCOME (CO) WITH PROGRAMME SPECIFIC OUTCOME (PSO):

COPSO	PSO1	PSO2	PSO3	PSO4
CO1	-	-	3	-
CO2	-	-	3	-
CO3	-	-	3	-
CO4	-	-	3	-
CO5	-	-	3	-
CO	-	-	3	-

LIST OF EXPERIMENTS	
1.	Calibration and use of measuring instruments – Vernier caliper, micrometer, Vernier height gauge – using gauge blocks.
2.	Calibration and use of measuring instruments – Depth micrometer, Bore gauge, Telescopic gauge.
3.	Measurement of angles using bevel protractor and sine bar.
4.	Measurement of Tolerance Limit using Comparator.
5.	Measurement of screw thread parameters – using Floating carriage micrometer.
6.	Measurement of Screw Thread Parameters by Profile projector
7.	Measurement of Cutting Tool Angles by Tool Maker's Micro Scope.
8.	Measurement of Straightness /Flatness using Auto-collimator.
9.	Measurement of Force, Torque and Temperature.
10.	Measurement of Surface Roughness using portable surface roughness tester.
11.	Measurement of the geometry of object in Coordinate Measurement Machine (CMM)
TOTAL PERIODS:	**60**

CONTENT BEYOND SYLLABUS	
1.	Measurement using Optical Flats.
2.	Measurement of cutting tool forces using Lathe tool Dynamometer

COURSE DESIGNERS			
1.	Dr M Nareshbabu	Associate Professor	Mechanical Engineering

Recommended by Board of Studies	Date:24.05.2024	Syllabus version	1
Approved by the Academic Council	Date:	Meeting No.	1

231MEC313L	COMPUTER AIDED DESIGN LABORATORY	Periods Per week				Credits
		L	T	P	R	
Regulation - R23 V 1.0		**0**	**0**	**3**	**1**	**2**

SCHEME OF EXAMINATION						
Duration of End Semester Examination in Hours	MaximumMarks -100			Minimum Marks for Pass- 50		
	Weightage			Weightage		Overall
	Continuous assessment Examination	End Semester Examination		Continuous assessm ent Examination	End Sem ester Examination	
3	60 %	40 %		-	45%	50%

PREREQUISITES:
Nil

COURSEOBJECTIVES:	
1.	To gain practical experience in handling 2D drafting and 3D modeling software.
2.	To provide skills to create drafting from part and assembly models.
3.	To impart the skill to create surface models of automotive/ machine components
4.	To provide knowledge on generating models of sheet metal components.
5.	To provide knowledge to create simulation of assembly models/mechanisms

COURSEOUTCOMES(COs):		
Upon completion of this course, student will be able to:		Bloom' slevel
CO1:	Create assembly drawings using standard 2D & 3D modeling software	K6
CO2:	Apply the knowledge to re-create part drawings,sectional views and assembly drawings as per standards.	K3
CO3:	Construct three-dimensional surface models ofautomotive/ machine components.	K3
CO4:	Construct the three-dimensional sheet metal models ofautomotive /machine elements	K3
CO5:	Create the simulation of mechanisms and analyze itscollisions	K6

MAPPINGOF COURSEOUTCOMES(CO)WITHPROGRAMMEOUTCOME(PO)												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	2	2	-	1	1	2	2	-	1
CO2	3	3	3	2	2	-	1	1	2	2	-	1
CO3	3	3	3	2	2	-	1	1	2	2	-	1
CO4	3	3	3	2	2	-	1	1	2	2	-	1
CO5	3	3	3	2	2	-	1	1	2	2	-	1
3–High :2-Medium : 1–Low :‘-‘-Nocorrelation												

MAPPING OF COURSE OUTCOME (CO) WITH PROGRAMME SPECIFIC OUTCOME (PSO):

COPSO	PSO1	PSO2	PSO3	PSO4
CO1	3	-	-	3
CO2	3	-	-	3
CO3	3	-	-	3
CO4	3	-	-	3
CO5	3	-	-	3
CO	3	-	-	3

LIST OF EXPERIMENTS

Introduction of 3D Modeling software

1. Creation of 3D model of a machine elements using 3D Modeling software
2. Design and Assembly of a Flange Coupling
3. Design and Assembly of a Plummer Block
4. Design and Assembly of a Screw Jack
5. Design and Assembly of a Planetary Gear Mechanism
6. Design of a Turbofan Engine
7. Build sheet metal models of automotive components
8. Create simulation of slider crank mechanisms
9. Create a three-dimensional surface models of pet bottles for specific capacities.
10. Prepare technical documents for an I.C. Engine Assembly with PLM.
11. Design of Piping and Instrumentation using PLM.

TOTAL PERIODS: 60

TEXTBOOKS:	
1.	Geometric Modelling: Theoretical and Computational Basis towards Advanced CAD Applications, Fumihiko Kimura
2.	Ibrahim Zeid, "Mastering CAD/CAM", 2013, McGraw Hill Education (India) P Ltd., SIE.

REFERENCEBOOKS:	
1.	RK. Dhawan, "A Text book of Machine Drawing", First Edition, Sultan Chand and Sons, NewDelhi, 2015.

WEBSITES:	
1.	https://archive.nptel.ac.in/courses/112/104/112104228/

JOURNALS(Publication of Bureau ofIndian Standards):	
1.	BIS recommendation for school practices: SP46:2003

COURSEDESIGNERS			
1.	Dr.M.S.Jagatheeshwaran	Assistant Professor	Mechanical Engineering
2.	Dr.B.Elumalai	Assistant Professor	Mechanical Engineering
3.	Mr.K.Karthieyan	Assistant Professor	MechanicalEngineering

Recommended by Board of Studies	Date:24.05.2024	Syllabus version	1
Approved by the Academic Council	Date:	Meeting No.	1

SEMESTER IV									
S.No	Course Code	Course Title	Category	Hours / Week				CREDITS	Internal / External %
				L	T	P	R		
THEORY									
1	231MAB401T	Numerical Method Tests and Design in Statistics	BS	3	2	0	0	4	40 / 60
2	231MEC401T	Manufacturing Processes - II	PC	3	0	0	0	3	40 / 60
3	231MEC402T	Engineering Materials and Metallurgy	PC	3	0	0	0	3	40 / 60
4	231MEC403T	Thermal Engineering	PC	3	0	0	0	3	40 / 60
5	231MEC404T	Strength of Materials	PC	3	0	0	0	3	40 / 60
PRACTICALS									
6	231MEC411L	Manufacturing Processes Laboratory -II	PC	0	0	3	1	2	60 / 40
7	231MEC412L	Thermal Engineering Laboratory-I	PC	0	0	4	0	2	60 / 40
8	231CES411L	Strength of Materials & Fluid Mechanics Laboratory	PC	0	0	4	0	2	60 / 40
9	231SDA002	Competitive Coding Skills	MC	0	0	2	0	0	Completed / Not completed
TOTAL CREDITS								**22**	

SYLLABUS OF

SEMESTER – IV

COURSES

231MAB401T	NUMERICAL METHODS, TESTS AND DESIGNS IN STATISTICS	Periods per week				Credits
		L	T	P	R	
Regulation - R23	(Common to AUTO, CIVIL & MECH)	**3**	**1**	**0**	**0**	**4**

SCHEME OF EXAMINATION

Duration of End Semester Examination in Hours	Marks			Minimum marks for Pass	
	Continuous assessment Examination	End Semester Examination	Maximum marks	End Semester Examination	Total
3	40 %	60 %	100	45 %	50 %

PREREQUISITES:

Nil

COURSE OBJECTIVES:

1.	This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
2.	To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
3.	To introduce the basic concepts of solving algebraic and transcendental equations.
4.	To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
5.	To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

COURSE OUTCOMES (COs):

Upon completion of this course, student will be able to:		Bloom's level
CO1:	Find the acceptability of null hypothesis by applying testing of hypothesis for small and large samples.	K5
CO2:	Use the design of experiments in the field of engineering and technology.	K3
CO3:	Solve algebraic, transcendental and simultaneous equations numerically.	K5
CO4:	Use various numerical techniques to differentiate and integrate discrete functions.	K6
CO5:	Find the numerical solutions of ordinary differential equations by using single step and multi step methods.	K3

CO	POs												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	3	3	-	-	-	-	-	-	-	-	2				
CO2	3	3	3	-	-	-	-	-	-	-	-	2				
CO3	3	3	3	-	-	-	-	-	-	-	-	2				
CO4	3	3	3	-	-	-	-	-	-	-	-	2				
CO5	3	3	3	-	-	-	-	-	-	-	-	2				

3 – High : 2 - Medium : 1 – Low : '-' - No correlation

UNIT I	TESTING OF HYPOTHESIS AND DESIGN OF EXPERIMENTS	PERIODS 9+3

Statistical hypothesis - large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F distributions for mean, variance - Contingency table (test for independent) - Goodness of fit.

UNIT II	DESIGN OF EXPERIMENTS	PERIODS 9+3

One way and Two-way classifications - Completely randomized design – Randomized block design – Latin squaredesign.

UNIT III	SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS	PERIODS 9+3

Solution of algebraic and transcendental equations –Fixed point iteration method-Newton Raphson method – Gauss elimination method – Gauss Jordan methods – Iterative methods of Gauss Jacobi and Gauss Seidel – Eigenvalues of a matrix by power method and Jacobi's method for symmetric matrices.

UNIT IV	INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION	PERIODS 9+3

Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivates using interpolation polynomials –Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules.

UNIT V	NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS	PERIODS 9+3

Single step methods: Taylor's series method – Euler's method – Modified Euler's method – Fourth order Runge- Kutta method for solving first order equations – Multi step methods: Milne's and Adams-Bash forth predictor corrector methods for solving first order equations.

TOTAL PERIODS:	60

TEXT BOOKS:	
1.	Grewal. B.S., and Grewal. J.S., "Numerical Methods in Engineering and Science",10th Edition,,KhannaPublishers, New Delhi, 2015.
2.	D.C. Montgomery, " Applied Statistics and Probability for Engineers", 6th Edition, 2016, ISV paper pack,Wiley publishers

REFERENCE BOOKS:	
1.	Burden, R.L and faires , J.D, "Numerical Analysis", 9th Edition, Cengage Learning,2016.
2.	Devore.J.L , "Probability and Statistics for Engineering and the Sciences",Cengage Learning,New Delhi,8th Edition,2014.
3.	Gerald. C.F., and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 2006.
4.	Spiegel. M.R., Schiller. J., and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics", TataMcGraw Hill Edition, 2004.
5.	Walpole. R.E., Myers. R.H., Myers. S.L., and Ye. K., "Probability and Statistics for Engineers and Scientists", 8th Edition, Pearson Education, Asia, 2007.

WEBSITES:	
1.	https://onlinecourses.nptel.ac.in/noc21_ma74/preview
2.	https://archive.nptel.ac.in/courses/127/106/127106019/

EXTENSIVE READER:	
1.	Understanding Statistics and Experimental Design: - Michael H. Herzog, Gregory Francis, Aaron Clarke2019 Edition, Springer Publications.
2.	Numerical Methods for Engineers, -Steven C Chapra, Raymond P canale, Seventh Edition, McGraw HillEducation Limited.

COURSE DESIGNERS			
1.	Dr.S.Muthukumar	Professor	Department of Mathematics
2.	Dr.S.R.Ananthalakshmi	Associate Professor & HOD	Department of Mathematics
3.	Mr. E.Paramanathan	Assistant Professor	Department of Mathematics

Recommended by Board of Studies	Date: 12.10.23	Syllabus version	V.1
Approved by the Academic Council	Date:	Meeting No.	

191MEC401T	MANUFACTURING PROCESSESS - II	Periods per week				Credits
		L	T	P	R	
Regulation - R23		**3**	**0**	**0**	**0**	**3**

SCHEME OF EXAMINATION						
Duration of End Semester Examination in Hours	Maximum Marks - 100			Minimum Marks for Pass - 50		
	Weightage			Weightage		
	Continuous assessment Examination	End Semester Examination		Continuous assessment Examination	End Semester Examination	Overall
3	40 %	60 %		-	45%	50%

PREREQUISITES:
Nil

COURSE OBJECTIVES:	
1.	To give an exposure on the theory of metal cutting.
2.	To explain applications of lathe machines.
3.	To explain working of reciprocating and milling machines.
4.	To enable the students to understand working of abrasive and super finishing processes.
5.	To introduce CNC machine tools and Nontraditional Machining processes.

COURSE OUTCOMES (COs):		
Upon completion of this course, student will be able to:		Bloom's level
CO1:	Select the appropriate cutting tool for machining the various material.	**K3**
CO2:	Manufacture of various mechanical components using turning machines.	**K4**
CO3:	Create a transmission component such as gears used in automobiles.	**K5**
CO4:	Choose abrasive machining and super finishing processes.	**K5**
CO5:	Create CNC part programs and choose appropriate Nontraditional Machining process	**K6**

CO	POs												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	3	3	3	3	3	3	2	2	3	-	1				
CO2	3	3	3	0	2	1	-	2	2	-	-	1				
CO3	3	3	3	0	2	1	-	2	2	-	-	1				
CO4	3	3	2	0	2	1	-	2	2	-	-	1				
CO5	3	3	1	0	3	1	-	2	2	3	2	1				
3 – High : 2 - Medium : 1 – Low : ‘-‘ - No correlation																

UNIT	TITLE	PERIODS
I	FUNDAMENTALS OF METAL CUTTING & CUTTING TOOLS	9

Introduction - Material removal processes, Types of machine tools – Theory of metal cutting - chip formation, heat generation, Orthogonal and Oblique cutting, Tool geometry and materials, Tool wear, Cutting forces, Tool Dynamometers, Merchant’s Circle diagram, Cutting fluids, Tool life, Taylor’s Tool life equation, Machinability, Economics of metal cutting

UNIT	TITLE	PERIODS
II	CENTRE LATHE AND SPECIAL PURPOSE LATHES	9

Centre lathe – Constructional features — Various operations – Taper turning methods – Thread cutting methods – Special attachments – Machining time and power estimation – Special Purpose lathes-Capstan and turret lathes, Automatic Lathe.

UNIT	TITLE	PERIODS
III	DRILLING, MILLING AND SHAPING MACHINES	9

Drilling Machine: Types and operations - Drilling, reaming, boring, tapping; Milling Machine: Introduction, Column and Knee type milling machine, specifications, description, attachments, milling cutters, operations performed - Gear cutting, etc.; Gear Hobbing and Gear Shaping; Shaper: Introduction, types, specifications, description, quick return mechanism, Process parameters - cutting speed, feed, DOC & machining time of Drilling, Milling and Shaping Machines.

UNIT	TITLE	PERIODS
IV	ABRASIVE AND SUPER FINISHING PROCESSES	9

Grinding Machines: Introduction, Classification, working of grinding machines, grinding wheel (Abrasives & Bond), Selection of Grinding wheel, mounting, glazing & loading, dressing, balancing, Work & tool holding methods/devices, Process parameters - Definition of process parameters - cutting speed, feed, DOC & machining time. Super finishing processes: Lapping, Honing, Super finishing, Burnishing, Polishing & Buffing.

UNIT	TITLE	PERIODS
V	CNC MACHINE TOOLS AND NONTRADITIONAL MACHINING	9

Computer Numerical control: Basic principles, classification and description of CNC application to M/c tools and adaptive control. CNC Programming, Nontraditional Machining: Classification, working principle and process capability of WJM, USM, ECM, CHM, LBM, EBM, EDM, PAM.

TOTAL PERIODS:	45

TEXT BOOKS:	
1.	Hajra Choudhury, S. K., Nirjhar Roy, "Elements of Workshop Technology, Vol – II Machine Tools",15th Edition, Media Promoters and Publishers Pvt. Ltd, 2015.
2.	Rao .P.N., "Manufacturing Technology", Volume-2, Tata McGraw Hill, New Delhi, Fourth Edition, 2018

REFERENCE BOOKS:	
1.	Richerd R Kibbe, John E. Neely, Roland O. Merges and Warren J.White "Machine Tool Practices", Prentice Hall of India, 1998
2.	HMT, "Production Technology", Tata McGraw Hill, 1998.
3.	Geofrey Boothroyd, "Fundamentals of Metal Machining and Machine Tools", Mc Graw Hill, 1984
4.	Roy. A.Lindberg, "Process and Materials of Manufacture," Fourth Edition, PHI/Pearson Education 2006.
5.	Dr. P.C.Sharma, "A Textbook of Manufacturing Technology II", S.Chand Publishing, New Delhi, 2013.

WEBSITES:	
1.	http://www-old.me.gatech.edu/jonathan.colton/me4210/micromachining.pdf
2.	https://archive.nptel.ac.in/courses/112/105/112105126/

JOURNALS (Publication of Bureau of Indian Standards):	
1.	Sergey N. Grigoriev, Sergey V. Fedorov and Khaled Hamdy, Materials, properties, manufacturing methods and cutting performance of innovative ceramic cutting tools − a review, Manufacturing Review, 2019, Vol 6(19), pp 1-27.
2.	Peter Scallan, 6 - Process parameters, Process Planning, Butterworth-Heinemann, 2003, pp 219-250, doi.org/10.1016/B978-075065129-5/50007-6
3.	Adam Khan M and Kapil Gupta, Machinability Studies on Abrasive Water Jet Machining of Low Alloy Steel for Different Thickness, ICMTMTE IOP Conf. Series: Materials Science and Engineering, 2020.

COURSE DESIGNERS			
1.	**Dr. M. Vetrivel Sezhian**	**Professor**	**Mechanical Engineering**
2.	**Mr. V. M Jothi Prakash**	**Assistant Professor**	**Mechanical Engineering**

Recommended by Board of Studies	Date:24.05.2024	Syllabus version	1
Approved by the Academic Council	Date:	Meeting No.	1

231MEC402T	ENGINEERING MATERIALS AND METALLURGY	Periods per week				Credits
		L	T	P	R	
Regulation - R23		**3**	**0**	**0**	**0**	**3**

SCHEME OF EXAMINATION						
Duration of End Semester Examination in Hours	Maximum Marks - 100			Minimum Marks for Pass - 50		
	Weightage			Weightage		Overall
	Continuous assessment Examination	End Semester Examination		Continuous assessment Examination	End Semester Examination	
3	40 %	60 %		-	45%	50%

PREREQUISITES:
Nil

COURSE OBJECTIVES:	
1.	To learn the constructing the phase diagram and using of iron-iron carbide phase diagram for microstructure formation.
2.	To learn selecting and applying various heat treatment processes and its microstructure formation.
3.	To illustrate the different types of ferrous and non-ferrous alloys and their uses in engineering field.
4.	To illustrate the different polymer, ceramics and composites and their uses in engineering field.
5.	To learn the various testing procedures and failure mechanism in engineering field

COURSE OUTCOMES (COs):		
Upon completion of this course, student will be able to:		Bloom' slevel
CO1:	Examine the crystal structures and metallographic studies under micro and macro inspection.	K3
CO2:	Explain isothermal transformation, continuous cooling diagrams and different heat treatment processes	K2
CO3:	Use the appropriate materials for high temperature applications.	K3
CO4:	Evaluate the failure mechanism of materials under various types of deformation.	K4
CO5:	Analyze the mechanical and tribological properties of material under different testing conditions.	K4

CO	POs												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	1	3	2	-	-	-	-	-	-	-	2	-	-	1	-
CO2	3	1	3	1	-	2	-	1	-	-	-	2	-	-	-	-
CO3	3	1	3	-	-	-	-	-	-	-	-	2	-	-	1	-
CO4	3	1	3	-	-	-	2	-	-	-	-	2	-	-	-	-
CO5	3	1	3	2	2	-	-	-	-	-	-	2	-	-	-	-
3 – High : 2 - Medium : 1 – Low : '-' - No correlation																

UNIT	**TITLE**	**PERIODS**
I	**CRYSTAL STRUCTURES**	**9**
Unit cells, Crystal systems, Crystallographic planes and directions, BCC, FCC and HCP structures, miller indices, crystal imperfections, point, line, surface and volume defects, Metallography – metallurgical microscope – preparation of specimen, micro & macro examination. Grain size ASTM grain size number, grain size measurement.		
UNIT	**TITLE**	**PERIODS**
II	**HEAT TREATMENT**	**9**
Iron – Carbon equilibrium diagram, reactions, phase and microstructure changes – Isothermal transformation diagrams- CCT and TTT diagrams , Heat treatment of steels, Annealing, Normalizing, hardening, Tempering, Austempering, Martempering, hardenability, Jominy end quench test. Surface hardening/Case hardening: Carburizing, Cyaniding, Nitriding, Flame hardening, Induction hardening. Strengthening mechanisms.		
UNIT	**TITLE**	**PERIODS**
III	**ENGINEERING MATERIALS AND APPLICATIONS**	**9**
Steels : Effect of alloying elements on steels- classification of steels – Stainless steels-Tool steels-HSLA Maraging steels; Cast Iron : Grey, White, Malleable, Spheroidal and Alloy cast irons- Properties, Applications, microstructures; Magnesium Alloys, Ni- based super alloys Bearing alloys, Engineering Ceramics- Properties and applications of Al2O3, SiC, Si3N4, PSZ and SAILON. Aerogel, Graphene, Metamaterial , Carbon Nano tubes- Smart materials.		
UNIT	**TITLE**	**PERIODS**
IV	**BEHAVIOR OF ENGINEERING MATERIALS**	**9**
Dislocations and plastic deformation, Griffiths theory-slip systems-slip in single crystals-plastic deformation of poly crystalline materials-Deformation by twinning, Fatigue-Fatigue curves-Fatigue tests-Multi axial fatigue Stress life curve I strain life curve-Strain flow cycle counting-Stress concentration factors-microstructure and surface finish impact on metal fatigue, Creep, Creep curve, Creep tests, Fracture, Ductile fracture, Brittle fracture.		
UNIT	**TITLE**	**PERIODS**
V	**TESTING OF MATERIALS**	**9**

Hardness, Brinell hardness test, Rockwell hardness test, Vickers hardness test, Tensile properties of ductile, brittle and polymer materials, Tensile test, Toughness, Impact tests, Wear types of wear- testing, Corrosion- types of corrosion-testing, SEM,TEM,XRD.

TOTAL PERIODS:	**45**

TEXT BOOKS:	
1.	Kenneth G.Budinski and Michael K. Budinski, “Engineering Materials”, Prentice Hall of India Private Limited, 9th edition ,2018.
2.	Sydney H.Avner, “Introduction to Physical Metallurgy”, McGraw Hill Book Company, 1994

REFERENCE BOOKS:	
1.	A. Alavudeen, N. Venkateshwaran, and J. T.WinowlinJappes, A Textbook of Engineering Materials and Metallurgy, Laxmi Publications, 2006.
2.	Amandeep Singh Wadhwa, and Harvinder Singh Dhaliwal, A Textbook of Engineering Material and Metallurgy, University Sciences Press, 2008.
3.	G.S. Upadhyay and Anish Upadhyay, “Materials Science and Engineering”, Viva Books Pvt.Ltd, New Delhi, 2020.
4.	Raghavan.V, “Materials Science and Engineering”, Prentice Hall of India Pvt.Ltd. 6th edition, 2019.
5.	Williams D Callister, “Material Science and Engineering” Wiley India Pvt Ltd, 2nd edition Re print 2019.

WEBSITES:	
1.	

JOURNALS (Publication of Bureau of Indian Standards):	
1.	

COURSE DESIGNERS			
1.	Dr.M.Naresh Babu	Associate Professor	Mechanical Engineering
2.	Mr.G.Chakaravarthi	Assistant Professor	Mechanical Engineering

Recommended by Board of Studies	Date:24.05.2024	Syllabus version	1
Approved by the Academic Council	Date:	Meeting No.	1

231MEC403T	THERMAL ENGINEERING	Periods per week				Credits
		L	T	P	R	
Regulation-R23		**3**	**0**	**0**	**0**	**3**

SCHEME OF EXAMINATION						
Duration of End Semester Examination in Hours	Maximum Marks -100			Minimum Marks for Pass- 50		
	Weightage			Weightage		Overall
	Continuous assessment Examination	End Semester Examination		Continuous assessment Examination	End Semester Examination	
3	40%	60%		-	45%	50%

PREREQUISITES:
Thermodynamics

COURSE OBJECTIVES:	
1.	Demonstrate the working of IC engines and its auxiliary systems.
2.	Evaluate the engine performance using thermodynamics laws.
3.	Evaluate the performance of single and multistage compressor using thermodynamic laws
4.	Evaluate the thermal performance parameters for nozzles and gas turbines
5.	Calculate thermal performance parameters for a refrigerator and air conditioner.

COURSE OUTCOMES (COs):		
Upon completion of this course, student will be able to:		Bloom's level
CO1:	Classify engine types, explain their working principles, and describe combustion processes and their effects on engine performance.	K2
CO2:	Analyze air standard cycles and IC engine performance using calculations for pressure, efficiency, and power.	K4
CO3:	Analyze the types, working principles, and performance of compressors based on efficiency metrics.	K4
CO4:	Analyze the flow of steam through nozzle and performance of gas turbine with reheating and regenerating.	K4
CO5:	Apply the principles of refrigeration and air conditioning to analyze performance parameters and evaluate system operations	K3

CO	POs												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	-	2	-	-	1	1	-	1	1	1	2	1	2	-	-
CO2	3	3	2	2	-	1	1	-	1	1	1	2	-	1	-	-
CO3	3	3	2	2	-	1	1	-	1	1	1	2	1	2	-	-
CO4	3	3	2	2	-	1	1	-	1	1	1	2	1	2	-	-
CO5	3	3	2	2	-	1	1	-	1	1	1	2	1	2	-	-

3 – High : 2 - Medium : 1 – Low : ‘-‘ - No correlation

UNIT	TITLE	PERIODS
I	INTRODUCTION TO IC ENGINES AND COMBUSTION	9

Introduction to Engines, Classification - Components and their function. Valve and port timing diagram – actual and theoretical P-V diagram of four stroke and two stroke engines. Introduction to injection system – MPFI and CRDI. Introduction to ignition systems – Battery and Magneto. Principles of Combustion and knocking in SI and CI Engines.

UNIT	TITLE	PERIODS
II	AIR STANDARD CYCLES AND ENGINE PERFORMANCE	9

Air standard cycles - Otto, Diesel, and Dual. Calculation of mean effective pressure, and air standard efficiency - Comparison of cycles. Performance calculation in IC engines – simple problems using Indicated power, brake power, and thermal efficiency.

UNIT	TITLE	PERIODS
III	AIR COMPRESSOR	9

Classification and working principles of various compressors, including reciprocating and rotary types, with and without clearance volume - Volumetric, isothermal, and isentropic efficiency.

UNIT	TITLE	PERIODS
IV	STEAM NOZZLES AND GAS TURBINE	9

Flow of steam through nozzles, shapes of nozzles, effect of friction, critical pressure ratio, supersaturated flow.

Introduction to gas turbine – classification, Brayton cycle - reheating and regeneration.

UNIT	TITLE	PERIODS
V	REFRIGERATION AND AIR CONDITIONING	9

Refrigerants - Vapour compression refrigeration cycle- super heat, sub cooling — Performance calculations. Working principle of vapour absorption system, Ammonia – Water, Lithium bromide – water systems.
Air conditioning system - Processes, Types and Working Principles - Concept of RSHF, GSHF, ESHF (Description only).

TOTALPERIODS:	45

TEXT BOOKS:	
1.	Mahesh M Rathore, McGraW Hill Publicaitons,
2.	R.K. Rajput, Laxmi Publicaitons.
3.	Arora.C.P, ”Refrigeration and Air Conditioning”, Third Edition, Tata McGraw-Hill Publishers 2011

REFERENCEBOOKS:	
1.	Ganesan.V, “Internal Combustion Engines” , Third Edition, Tata McGraw-HillPublishers2013
2.	Kothandaraman.C.P.,Domkundwar. S,Domkundwar. A.V., “A course in thermal Engineering", Fifth Edition, DhanpatRai & sons, 2018
3.	Rudramoorthy.R, “Thermal Engineering “,Tata McGraw-Hill, New Delhi,2017

Tables	
1.	Khurmi, R.S, “Steam Tables with Mollier Diagram”, S.Chand Publishers, 2008
2.	Kothandaraman, C.P, “Refrigeration tables and charts including air conditioning data”, New Age International Publishers, 2014

COURSE DESIGNERS			
1.	Dr. S. Sathyanarayanan	A.P.	Mechanical Engineering
2.	Dr. K.R. Suresh Kumar	A.P.	Mechanical Engineering

Recommended by Board of Studies	Date:24.05.2024	Syllabus version	
Approved by the Academic Council	Date:	Meeting No.	

231MEC404T	STRENGTH OF MATERIALS	Periods per week				Credits
		L	T	P	R	
R23		**3**	**0**	**0**	**0**	**3**

SCHEME OF EXAMINATION						
Duration of End Semester Examination in Hours	Maximum Marks - 100			Minimum Marks for Pass - 50		
	Weightage			Weightage		Overall
	Continuous assessment Examination	End Semester Examination		Continuous assessment Examination	End Semester Examination	
3	40 %	60 %		-	45%	50%

PREREQUISITES:
Nil

COURSE OBJECTIVES:	
1.	To determine the stresses and strains using the concepts of stress and strain.
2.	To construct shear force and bending moment diagram and determine the stresses in beams.
3.	To design circular shafts based on strength and rigidity.
4.	To determine the slope and deflection in beams and columns for various loading conditions.
5.	To predict the failure conditions in various cylinders.

COURSE OUTCOMES (COs):		
Upon completion of this course, the student will be able to:		Bloom's level
CO1:	Apply the concepts of the theory of linear elasticity.	K3
CO2:	Analyze the forces, bending moments, and stresses in beams.	K4
CO3:	Apply the concepts of torsion in shafts and springs.	K4
CO4:	Analyze slope and deflection in beams and columns.	K3
CO5:	Analyze the stresses in pressure vessels.	K4

CO	POs												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	3	3	2	-	-	-	-	-	-	-	-	-	1	-	-
CO2	3	3	3	2	-	-	-	-	-	-	-	-	-	2	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-	-	-	1	-	-
CO4	3	3	3	2	-	-	-	-	-	-	-	-	-	1	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-	-	-	1	-	-

3 – High : 2 - Medium : 1 – Low : '-' - No correlation

UNIT	TITLE	PERIODS
I	CONCEPTS OF STRESS AND STRAIN	9

Rigid bodies and deformable solids – Tension, Compression and Shear Stresses - Deformation of simple and compound bars – Thermal stresses – Elastic constants - Volumetric strains – Stresses on inclined planes – Principal stresses and principal planes – Mohr's circle of stress.

UNIT	TITLE	PERIODS
II	THEORY OF BEAMS	9

Beams – Types - Transverse loading on beams – Shear force and Bending moment in beams – Cantilever, Simply supported and over hanging beams. Theory of simple bending – Bending stress distribution – Shear stress distribution.

UNIT	TITLE	PERIODS
III	TORSION OF SHAFTS AND SPRINGS	9

Theory of Torsion – Stresses and Deformations in Solid and Hollow Circular Shafts – Combined bending moment and torsion of shafts - Power transmitted to shaft – Shaft in series and parallel – Closed and Open Coiled helical springs – springs in series and parallel.

UNIT	TITLE	PERIODS
IV	COLUMNS AND DEFLECTION OF BEAMS	9

Crippling load - Euler's theory and Rankine's theory, - Double integration method - Macaulay's method – Area moment method of slope and deflection of determinant beams.

UNIT	TITLE	PERIODS
V	PRESSURE VESSELS	9

Stresses in thin cylindrical shell due to internal pressure - circumferential and longitudinal stresses - Deformation in thin cylinders – Spherical shells subjected to internal pressure – Deformation in spherical shells – Thick cylinders - Lame's theory.

TOTAL PERIODS:	45

TEXT BOOKS:	
1.	Bansal, R. K. (2020). A textbook of strength of materials:(in SI units). Laxmi Publications.
2.	Rajput R.K. “Strength of Materials (Mechanics of Solids)", S.Chand & company Ltd., New Delhi, 7th edition, 2018.
3.	Rattan S.S., “Strength of Materials", Tata McGraw Hill Education Pvt .Ltd., New Delhi, 2017

REFERENCE BOOKS:	
1.	Ferdinand P. Beer, E. Russell Johnson, John T. DeWolf, David F. Mazurek, Sanjeev Sanghi, "Mechanics of Materials: 8th Edition" McGraw Hill, 2020
2.	Egor P. Popov, Engineering Mechanics of Solid, 2nd ed., Prentice Hall of India Pvt. Ltd., 2009
3.	Hibbeler, R. C. (2017). Mechanics of materials. MacMillan Publishing Company.
WEBSITES:	
1.	https://mechanicalc.com/reference/strength-of-materials
2.	https://onlinecourses.nptel.ac.in/noc19_ce18/preview
3.	https://priodeep.weebly.com/uploads/6/5/4/9/65495087/strength_of_materials-lecture_star_marked.pdf

JOURNALS:	
1.	https://www.sciencedirect.com/journal/mechanics-of-materials
2.	https://www.sciencedirect.com/journal/engineering-structures
3.	https://ascelibrary.org/journal/jenmdt

COURSE DESIGNERS			
1.	Dr.K.Thavasilingam	Assistant Professor	Mechanical Engineering
2.	Dr. A. Praveen Kumar	Assistant Professor	Mechanical Engineering

Recommended by Board of Studies	Date:24.05.2024	Syllabus version	V 1.1
Approved by the Academic Council		Meeting No.	

231MEC411L	MANUFACTURING PROCESSES LABORATORY II	Periods per week				Credits
		L	T	P	R	
Regulation - R23		0	0	3	1	2

SCHEME OF EXAMINATION					
Duration of End Semester Examination in Hours	Maximum Marks - 100		Minimum marks for Pass - 50		
	Continuous assessment Examination	End Semester Examination	Continuous assessment Examination	End Semester Examination	Overall
3	60 %	40 %	-	45%	50%

PREREQUISITES:
Nil

COURSE OBJECTIVES:	
1.	To Study and practice the various operations that can be performed in milling, gear hobbing, gear shaper, grinding machines, and to equip with practical knowledge required in core industries.

COURSE OUTCOMES (COs):		
Upon completion of this course, student will be able to:		Bloom's level
CO1:	Use different machine tools to manufacture gears	K3
CO2:	Use different machine tools for finishing operations	K3
CO3:	Manufacture cutting tool using tool and cutter grinder	K3
CO4:	Measure cutting forces acting on cutting tools	K5
CO5:	Create CNC part programming for a given component	K6

CO	POs												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	-	-	-	1	1	-	1	2	2	-	1	-	2	-	2
CO2	3	1	-	-	1	1	-	1	2	2	-	1	-	2	-	2
CO3	3	-	-	-	1	1	-	1	2	2	-	1	-	2	-	2
CO4	3	1	1	-	1	1	-	1	2	2	-	1	-	2	-	2
CO5	3	2	1	-	1	1	-	1	2	2	-	1	-	2	-	2

LIST OF EXPERIMENTS	
1.	Milling contours on plates using vertical milling machine
2.	Cutting spur gear using milling machine.
3.	Cutting helical gear using milling machine
4.	Generating gears using gear hobbing machine.
5.	Generating gears using gear shaping machine.
6.	Grinding components using cylindrical grinding machine.
7.	Grinding components using surface grinding machine.
8.	Grinding components using centre less grinding machine.

9.	Measurement of cutting forces in Milling Process
10.	Measurement of cutting forces in Turning Process
11.	Tool angle grinding with tool and Cutter Grinder
12.	CNC Part Programming
13.	Additive manufacturing of components using FDM Process
	TOTAL PERIODS: 60

REFERENCE BOOKS:	
1.	Heinrich Gerling, “All about Machine Tools”, Wiley Publishers, 1979.
2.	Hajra Choudhary, “Workshop Technology” Vol. 1 & Vol. 2 15th Edition, Media Promoters Publication-2008
3.	Prashant P. Date, "Introduction to Manufacturing Technologies: Principles & Practice", Jaico Publishing House, 2010.
4.	Rao P. N, "Manufacturing Technology", Vol.1 & Vol. 2, 4th Edition, Tata McGraw-Hill, 2013.
5.	Serope Kalpakjian, and Steven R. Schmid, "Manufacturing Engineering and Technology", 5th Edition, Pearson Education, 2015.

COURSE DESIGNERS			
1.	Dr.M.Vetrivel Sezhian	Professor	Mechanical Engineering
2.	Dr.K.G.Ashok	Assistant Professor	Mechanical Engineering

Recommended by Board of Studies	Date: 24.05.2024	Syllabus version	V1.1
Approved by the Academic Council	Date:	Meeting No.	

231MEC412L	THERMAL ENGINEERING LABORATORY-I	Periods per week				Credits
		L	T	P	R	
Regulation - R23		0	0	4	0	2

SCHEME OF EXAMINATION						
Duration of End Semester Examination in Hours	Maximum Marks - 100			Minimum marks for Pass - 50		
	Continuous assessment Examination	End Semester Examination		Continuous assessment Examination	End Semester Examination	Overall
3	60 %	40 %		-	45%	50%

PREREQUISITES:
Thermodynamics, Thermal Engineering

COURSE OBJECTIVES:	
1.	To study the valve timing diagram and performance of IC Engines
2.	To study the performance of Internal Combustion Engines.
3.	To study the heat balance procedure in IC Engines.
4.	To study the characteristics of fuels/Lubricates used in IC Engines.
5.	To study and understand the working of steam generator/turbine.

COURSE OUTCOMES (COs):		
Upon completion of this course, student will be able to:		Bloom's level
CO1:	Draw valve timing of 4-stroke engine and port timing of 2-stroke engine.	K3
CO2:	Conduct tests on internal combustion engines to evaluate the engine performance characteristics.	K3
CO3:	Conduct heat balance tests on IC engines to evaluate the engine performance and draw the heat balance sheet.	K3
CO4:	Determine the flash point and fire point of fuels and lubricants	K3
CO5:	Understand the concept and working of steam generator and turbine	K2

CO	POs												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	3	1	3	1	1	1	1	3	2	2	2	2	-	-	-
CO2	3	3	1	3	1	1	1	1	3	2	2	2	2	-	-	-
CO3	3	3	1	3	1	1	1	1	3	2	2	2	2	-	-	-
CO4	3	3	1	3	1	1	1	1	3	2	2	2	2	-	-	-
CO5	3	3	1	3	1	1	1	1	3	2	2	2	2	-	-	-

LIST OF EXPERIMENTS	
1.	Valve timing on single cylinder four stroke diesel Engine
2.	Port Timing Diagram on single cylinder two stroke petrol Engine
3.	Performance test on 4 stroke diesel engine using Mechanical Loading
4.	Performance test on 4 stroke diesel engine using Electrical Loading
5.	Performance test on 4 stroke diesel engine using Hydraulic Loading
6.	Heat balance Test on 4 stroke diesel engine using Electrical Loading
7.	Morse Test on multi cylinder petrol Engine
8.	Retardation test on 4 stroke diesel Engine
9.	Performance Test on Single Cylinder Petrol Engine.
10.	Determination of flash point and fire point of Diesel fuel
11.	Determination of flash point and fire point of Kerosene fuel
12.	Determination of kinematic viscosity of lubricating oil
13.	Study on Steam generators
14.	Study on Steam Turbines
TOTAL PERIODS:	**60**

REFERENCE BOOKS:	
1.	Ganesan.V, “Internal Combustion Engines”, Third Edition, Tata McGraw-HillPublishers2013
2.	Kothandaraman.C.P.,Domkundwar. S, Domkundwar. A.V., “A course in thermal Engineering", Fifth Edition, DhanpatRai & sons, 2018

COURSE DESIGNERS			
1.	Mr.N.Subramani	Assistant Professor	Mechanical Engineering
2.	Dr.G.Sriharan	Assistant Professor	Mechanical Engineering

Recommended by Board of Studies	Date: 24.05.2024	Syllabus version	V1.1
Approved by the Academic Council	Date:	Meeting No.	

231CES411L	STRENGTH OF MATERIALS AND FLUID MECHANICS AND MACHINERY LABORATORY	Periods per week				Credits
		L	T	P	R	
Regulation - R23		**0**	**0**	**4**	**0**	**2**

SCHEME OF EXAMINATION						
Duration of End Semester Examination in Hours	Maximum Marks - 100			Minimum marks for Pass - 50		
	Continuous assessment Examination	End Semester Examination		Continuous assessment Examination	End Semester Examination	Overall
3	60 %	40 %		-	45%	50%

PREREQUISITES:
Nil

COURSE OBJECTIVES:	
1.	To study the mechanical properties of materials when subjected to different types of loading.
2.	To study the properties of fluids and performance of pumps and turbines

COURSE OUTCOMES (COs):		
Upon completion of this course, student will be able to:		Bloom's level
CO1:	Perform Mechanical testing of given material including tension & compression, Hardness and Deformation test on solid materials.	K3
CO2:	Calculate the mechanical properties of given specimen including impact strength.	K3
CO3:	Estimate the fluid flow in a pipe using Orifice meter and Venturi meter.	K3
CO4:	Calculate the various losses in fluid flow through pipes.	K3
CO5:	Predict the efficiency of Pumps and Hydraulic turbines.	K3

CO	POs												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	2	-	-	-	-	-	2	3	-	-	-	-	2	-	2
CO2	3	2	-	3	-	-	-	2	3	-	-	-	-	2	-	2
CO3	3	2	-	-	-	-	-	2	3	-	-	-	-	2	-	2
CO4	3	2	-	-	-	-	-	2	3	-	-	-	-	2	-	2
CO5	3	2	-	-	-	-	-	2	3	-	-	-	-	2	-	2

LIST OF EXPERIMENTS	
1.	Tension test on a mild steel rod
2.	Double shear test on a mild steel rod
3.	Impact test on metal specimen
4.	Hardness test on metals – Rockwell
5.	Hardness test on metals - Brinell
6.	Deflection test on beams
7.	Compression test on helical springs
8.	Determination of the Coefficient of discharge of given Orifice meter.
9.	Determination of the Coefficient of discharge of given Venturi meter.
10.	Determination of friction factor for a given set of pipes.
11.	Conducting experiments and drawing the characteristic curves of centrifugal pump
12.	Conducting experiments and drawing the characteristic curves of reciprocating pump
13.	Conducting experiments and drawing the characteristic curves of Pelton wheel
14.	Conducting experiments and drawing the characteristic curves of Kaplan turbine
TOTAL PERIODS:	**60**

REFERENCE BOOKS:	
1.	Dr.Bansal.R.K, “Strength of Materials”, Laxmi publications, Fifth edition, Chennai, 2013.
2.	Bansal. R.K , “Fluid mechanics and hydraulic machines”, Laxmi publications, tenth Edition 2018

COURSE DESIGNERS			
1.	Mrs. L Chandrakanthamma	Assistant Professor	Civil Engineering Dept.
2.	Mrs. G Prabha	Assistant Professor	Civil Engineering Dept.

Recommended by Board of Studies	Date: 24.05.2024	Syllabus version	V 1.1
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