

COURSE STRUCTURE AND DETAILED SYLLABI FOR

II B.TECH., (II & II SEMESTERS)

UNDER ACADEMIC REGULATIONS R20

FOR

B. Tech Regular (Full-Time) Four Year Degree Course

(For the Batches Admitted from 2020-2021)

&

B. Tech (Lateral Entry Scheme)

(For the Batches Admitted From 2021-2022)

Mechanical ENGINEERING



SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

Accredited by NBA, New Delhi & NAAC, Bengaluru | Affiliated to JNTUA, Ananthapuramu, Recognized by the UGC under Section 12(B) and 12(F) | Approved by AICTE, New Delhi.

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**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)**

R.V.S. NAGAR, CHITTOOR-517 127, ANDHRA PRADESH

DEPARTMENT OF MECHANICAL ENGINEERING

Course Structure and Scheme of Examination

II B. Tech I Semester-ME

Regulations: R20

Sl.No	Category	Course Code	Course Name	Hours per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		CIA	SEE	Total
1	BS	20AHS10	Numerical Methods	3	0	0	3	40	60	100
2	PC	20AME03	Engineering Materials	3	0	0	3	40	60	100
3	PC	20AME04	Thermodynamics	3	0	0	3	40	60	100
4	PC	20ACE11	Mechanics of Solids	3	0	0	3	40	60	100
5	PC	20AME05	Manufacturing Processes	3	0	0	3	40	60	100
6	PC	20AME06	Engineering Materials and Testing Lab	0	0	3	1.5	40	60	100
7	PC	20AEE12	Electrical and Electronics Lab	0	0	3	1.5	40	60	100
8	PC	20AME07	Manufacturing Processes Lab	0	0	3	1.5	40	60	100
9	SC	20AME08	MATLAB/Dassault	1	0	2	2	40	60	100
10	MC	20AMB02	Universal Human Values	2	0	0	0	100	-	-
11		20ANSS1/ 20ANCC1	NCC/NSS	0	0	2	-	-	-	-
12	AC	20AHS11	Quantitative Aptitude and Reasoning-1	4	0	0	-	-	-	-
Total credits				22	0	14	21.5	460	540	1000
Total Periods				36						
TOTAL MARKS										1000
category										credits
Basic science course										3
Professional core courses										16.5
Skill oriented course										2
Total credits										21.5

II B.Tech II Semester-ME

Regulations : R20

Sl.No	Category	Course Code	Course Name	Hours per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		CIA	SEE	Total
1	BS	20AHS13	Probability and Statistics	3	0	0	3	40	60	100
2	ES	20ACE12	Fluid Mechanics and Hydraulic Machinery	3	0	0	3	40	60	100
3	HS	20AMB03	Managerial Economics and Financial Analysis	3	0	0	3	40	60	100
4	PC	20AME09	Thermal Engineering	3	0	0	3	40	60	100
5	PC	20AME10	Kinematics of Machinery	3	0	0	3	40	60	100
6	PC	20AME11	Thermal Engineering Lab	0	0	3	1.5	40	60	100
7	PC	20AME12	Computer Aided Machine and production Drawing Lab	0	0	3	1.5	40	60	100
8	ESC	20ACE18	Fluid Mechanics and Hydraulic Machinery Lab	0	0	3	1.5	40	60	100
9	SC	20AME13	Dassault	1	0	2	2	40	60	100
10	AC	20AHS15	Quantitative Aptitude and Reasoning-2	4	0	0	-	-	-	-
Total credits				20	0	11	21.5	360	540	900
Total Periods				31						

Internship 2 Months (Mandatory) during summer vacation/ Community Serve Project

Minor courses (The hours distribution can be 4-0-0 or 3-1-0 or 3-0-2)	3	0	2	4	
Honors/ courses (The hours distribution can be 4-0-0 or 3-1-0 or 3-0-2)	4	0	0	4	
Category					Credits
Basic Science Courses					3
Professional core Courses					9
Engineering Science Courses					4.5
Skill oriented course course*					2
Humanities and Social Sciences					3
TOTAL CREDITS					21.5



Scheme of Instruction and Examination under R20 Regulations

HONOR DEGREE with SPECIALIZED TRACKS

S.NO.			COURSE NAME	L-T-P	POOL	CR	PRE-REQ.	OFFERED TO
1	II-II	20AME62	New Product Development	4-0-0	EDP	4	EM	ME
2		20AME63	Automotive Chassis	4-0-0	AE	4	TE, AE	ME
3		20AME64	Drives and Actuators for Industrial Automation	4-0-0	RM	4	KOM, IR	ME
4		20AME65	Elements of Nanoscience and Nanotechnology	4-0-0	NT	4	EC	ME
1	III-I	20AME66	Tribology in Design	4-0-0	EDP	4	KOM	ME
2		20AME67	Engine Management Systems	4-0-0	AE	4	AE	ME
3		20AME68	Design of Controls Systems	4-0-0	RM	4	KOM, MEMS	ME
4		20AME69	Computational Fluid Dynamics	4-0-0	TE	4	NM, FMHM, TE	ME
1	III-II	20AME70	Model Analysis of Mechanical System	4-0-0	EDP	4	DOM, MT	ME
2		20AME71	Non-Linear System Dynamics	4-0-0	RM	4	DOM	ME
3		20AME72	Advanced Heat Transfer	4-0-0	TE	4	TD, HT	ME
4		20AME73	Nano-biotechnology	4-0-0	NT	4	EC	
1	III-II	20AME74	Optimization Technique in Design	4-0-0	EDP	4	PS, MT	ME
2		20AME75	FEM in Automobile	4-0-0	AE	4	NM, HT	ME
3		20AME76	Design of Boilers and Heat Exchangers	4-0-0	TE	4	TD, TE	ME
4		20AME77	Nano architectonics	4-0-0	NT	4	EC	ME
1		20AME78	Advanced Thermodynamics	4-0-0	TE	4	TD	ME
2		20AME79	Vehicle Dynamics	4-0-0	AE	4	AE, DOM	ME
3	IV-I	20AME80	Solid State Drives	4-0-0	RM	4	DOM, MEMS	ME
4		20AME81	Green nanotechnology	4-0-0	NT	4	EC	ME

POOL – 1: Engineering Design and Production-EDP

POOL – 2: Automotive Engineering- AE

POOL – 3: Robotics & Mechatronics- RM

POOL – 4: Thermal Engineering - TE

POOL – 5: Nanotechnology – NT



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DEPARTMENT OF MECHANICAL ENGINEERING

Scheme of Instruction and Examination under R20 Regulations

General MINOR DEGREE IN A DISCIPLINE

Courses for Minor Degree in Mechanical Engineering

Sl.No		Category	Course Code	Category	Hours/week			Credits	Maximum Marks		
					L	T	P		Internal	External	Total
1	II-II	PC	20AME82	Thermodynamics and Internal Combustion Engines	3	0	2	4	40	60	100
2	III-I	PC	20AME83	Engineering Materials and Manufacturing Technology	3	0	2	4	40	60	100
3	III-II	PC	20AME84	Metrology and Measurement System	3	0	2	4	40	60	100
4	III-II	PC	20AME85	CAD/CAM	3	0	2	4	40	60	100
5	IV-I	PC	20AME86	Robotics & Automation	3	0	2	4	40	60	100
Total credits					15	0	10	20	320	480	800



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DEPARTMENT OF MECHANICAL ENGINEERING

Scheme of Instruction and Examination under R20 Regulations

MINOR DEGREE with Specialized Industrial Tracks

Courses for Minor Degree in Mechanical Engineering

S.NO.	Year & SEM	Subject Code	COURSE NAME	L-T-P	CR	PRE-REQ.	OFFERED TO
TRACK-1 (Design)							
1	II-II	20AME87	Human Factors and Ergonomics	4-0-0	4	SOM	ME
2	III-I	20AME88	Vibration Analysis and Control	4-0-0	4	KOM	ME
3	III-II	20AME89	Design and Manufacturing for Assembly	4-0-0	4	DME	ME
4	III-II	20AME90	Computer integrated Manufacturing	4-0-0	4	CAD/CAM	ME
5	IV-I	20AME91	Geometric Dimensioning and Tolerance	4-0-0	4	NIL	ME
TRACK2 (Materials and Manufacturing)							
1	II-II	20AME92	Materials characterization techniques	4-0-0	4	EM	ME
2	III-I	20AME93	Advanced Tool Engineering	4-0-0	4	MT	ME
3	III-II	20AME94	Design and Analysis of Experiments	4-0-0	4	SM, DOM, DM,	ME
4	III-II	20AME95	Supply Chain and Logistics Management	4-0-0	4	MT	ME
5	IV-I	20AME96	Advanced Manufacturing Management	4-0-0	4	CAD/CAM	ME
TRACK-3 (Automobile Engineering)							
1	II-II	20AME97	Fuels and Combustion	4-0-0	4	EC, TD	ME
2	III-I	20AME98	Automotive Components	4-0-0	4	TE	ME
3	III-II	20AME99	Automotive Electricals and Electronics	4-0-0	4	BEE	ME
4	III-II	20AMEA0	Electric Vehicle and Fuel Cell Technology	4-0-0	4	TE & BEE	ME
5	IV-I	20AMEA1	Vehicle Inspection and Maintenance	4-0-0	4	TE, AE MeT	
TRACK 4 (Robotics)							
1	II-II	20AMEA2	Manufacturing Automation	4-0-0	4	MT	ME
2	III-I	20AMEA3	Industrial Process Automation	4-0-0	4	MT, IE	ME
3	III-II	20AMEA4	Machine Vision System	4-0-0	4	MeT	ME
4	III-II	20AMEA5	IOT & Smart Manufacturing	4-0-0	4	MT,	ME
5	IV-I	20AMEA6	Machine learning in Robotics	4-0-0	4	KoM	ME

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II B.Tech - I Semester (Common to All Branches)

L	T	P	C
3	1	0	3

20AHS10

NUMERICAL METHODS

Outcomes:

After completion of the course the student will be able to

1. **Analyze** the transcendental equations and solve them using different methods.
2. **Apply** numerical techniques to solve engineering problems.
3. **Analyze** the data using Correlation and regression to draw the valid conclusion.
4. **Apply** the solutions of ordinary differential equations and partial differential equations to real world problems.

UNIT-I

SOLUTION OF TRANSCENDENTAL EQUATIONS AND INTERPOLATION:

Introduction - Intermediate value theorem - The Bisection method - The method of false position - Newton - Raphson Method - Problems. **INTERPOLATION:** Forward Differences - backward differences-Newton's forward and backward differences formulae for interpolation -Problems on Interpolation - Lagrange's interpolation formula - Inverse interpolation - Problems.

UNIT-II

NUMERICAL DIFFERENTIATION AND INTEGRATION

Approximation of derivatives using interpolation polynomials-First and Second order derivatives – Problems on numerical differentiation. Newton Cotes formulae - Numerical integration using Trapezoidal rule, Simpson's $\frac{1}{3}$ rule and Simpson's $\frac{3}{8}$ Rule.

UNIT-III

CURVE FITTING:

Fitting of Curves by method of Least - squares – Fitting of Straight lines – Fitting of second degree Parabola-Fitting of the exponential curve- Fitting of the power curve – Problems – Regression- Correlation – Problems on interpretation of data – Drawing conclusions.

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II B.Tech – I Semester

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3 - - 3**

20AME03 Engineering Materials

Pre-request: Nil

Outcomes:

After completion of the course, the student will be able to:

1. Identify various phases of metals and alloys through appropriate phase diagrams.
2. Describe steels and cast irons for a given application.
3. Select the heat treatment process for various applications.
4. Apply nonferrous metals and alloys for engineering applications.
5. Identify the suitable ceramics, plastics and composites for various applications.

UNIT I

12Hrs

Structure of Metals: Crystal Structures: Unit cells, Metallic crystal structures, Imperfection in solids: Point, Line, interstitial and volume defects; dislocation strengthening mechanisms and slip systems, critically resolved shear stress.

Constitution of Alloys: Necessity of Alloying, substitutional and interstitial solid solutions-Phase diagrams & simple problems: Interpretation of binary phase diagrams and microstructure development; eutectic, peritectic, peritectoid and monotectic reactions. Iron-Iron-carbide diagram and microstructural aspects of ferrite, cementite, austenite, ledeburite, and cast iron.

UNIT II

12Hrs

Steels: Plain carbon steels, use and limitations of plain carbon steels. AISI & BIS classification of steels. Classification of alloy steels. Microstructure, properties and applications of alloy steels-stainless steels and tool steels.

Cast irons: Microstructure, properties and applications of white cast iron, malleable cast iron, grey cast iron, nodular cast iron and alloy cast irons.

UNIT III

9Hrs

Heat Treatment of Steels: Annealing, tempering, normalizing and hardening, isothermal transformation diagrams for Fe-Fe₃C alloys and microstructure development. Continuous cooling curves and simple problems and interpretation of final microstructures and properties- austempering, martempering, case hardening - carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening, and vacuum and plasma hardening.

UNIT IV

6Hrs

Non-ferrous Metals and Alloys: Microstructure, properties and applications of copper, aluminium, titanium, nickel and their alloys. Study of Al-Cu phase diagram.

UNIT V

6Hrs

Ceramics, Polymers and Composites: Structure, properties and applications of ceramics, polymers and Bio -composites. Introduction to super alloys and nanomaterials.

Text Books:

1. V.Raghavan, Material Science and Engineering, 5/e, Prentice Hall of India, 2004.
2. R.Balasubramaniam, Callister's Material Science and Engineering, 2/e, Wiley India, 2014.

References

1. Y. Lakhtin, Engineering Physical Metallurgy, University Press of the Pacific, 2000.
2. S.H.Avner, Introduction to Physical Metallurgy, 2/e, Tata McGraw- Hill, 1997.
3. L.H.Van Vlack, Elements of Material Science and Engineering, 6/e, Pearson Education, 2008.
4. George E.Dieter, Mechanical Metallurgy, 3/e, McGraw-Hill, 2013.

Mapping of COs with POs & PSOs

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

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II B.Tech – I Semester

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20AME04 Thermodynamics

Pre-request: Nil

Outcomes:

After completion of the course, the student will be able to:

1. Apply the principles of Thermodynamics to conduct analysis of various thermal engineering systems and processes using MAT Lab complying entropy to environment.
2. Apply the properties and principles of steam to solve problems in the power generation system using steam tables, mollier charts.
3. Analyze the working principles of different air standard power cycles in solving problems in various engineering applications and their performance using IC Engine software.

UNIT- I Basic Concepts and First Law of Thermodynamics 10Hrs

Basic concepts -concept of continuum, Macroscopic and Microscopic approach: Thermodynamic systems -closed, open and isolated: Property, State, Path and Process, Quasi-static process, Work, Modes of work, work and heat transfer for different thermodynamic processes, Zeroth law of thermodynamics –concept of Temperature and Heat. First law of thermodynamics–SFEE -Application to closed and open systems. Related problems.

UNIT-II Second Law of Thermodynamics 10Hrs

Second law of thermodynamics –Kelvin’s and Clausius statements of Second Law, Heat Engines, Refrigerator and Heat Pump, Coefficient of Performance, Clausius theorem, Clausius in-equality, Reversibility and Irreversibility, Carnot cycle-, efficiency, Carnot theorem and corollaries, Absolute thermodynamic temperature scale, related problems.

UNIT-III Entropy and Thermodynamics Relations 10 Hrs

Concept of Entropy, entropy of ideal gas, change of entropy for different non-flow processes, principle of increase of entropy –absolute entropy, Effect of Entropy on Environment, Availability and Irreversibility. Exact differentials, T-D relations: Maxwell’s relations, Clausius Clapeyron equations, Joule-Thomson coefficient. energy and exergy analysis using Matlab.

UNIT-IV Properties of Steam and Applications 12 Hrs

Formation of steam, Types of steam, Steam tables and uses, Dryness fraction of steam, External work done during evaporation, Internal energy of Steam, Entropy of steam –Mollier diagram, related problems.

Steam Power Cycles and Boilers,

Steam power cycles, standard Rankine cycle, Reheat and Regenerative cycle. related problems BOILERS: Classification based on Working principles & Pressures of operation - L.P & H.P Boilers – Mountings and Accessories – Boiler horse power, equivalent evaporation, efficiency – Draught: classification – artificial draught, induced and forced draught, Height of chimney for given draught and discharge, condition for maximum discharge, efficiency of chimney– Related simple problems for the design of chimney.

UNIT-V Air Standard Cycles

13 Hrs

Power Cycles: Stirling Cycle, Ericsson Cycle, Otto Cycle, Diesel Cycle, Dual Combustion Cycle, Brayton Cycle, Atkinson Cycle, Lenoir Cycle. Description and representation on P–V and T-S diagram, comparison, thermal efficiency. Mean effective pressure, related problems and problems solving using Matlab tool.

Gas Turbines: Simple gas turbine plant – Ideal cycle, essential components – Closed and Semi-closed cycles – merits and demerits, methods for increasing efficiency, combustion chambers. related simple problems

Jet Propulsion: Principle of Operation – Classification of jet propulsive engines – Turbo jet, Turbo prop, Pulse jet –Working Principles with schematic diagrams and representation on T-S diagram. related simple problems

(Use of standard thermodynamic steam tables and Mollier diagram are permitted)

Textbooks:

1. P.K. Nag., Engineering Thermodynamics, Tata McGraw Hill, New Delhi, 5th Edition, 2014.
2. R.K. Rajput, Thermal Engineering, Hyderabad, Lakshmi Publications Pvt. Ltd, 9th Edition, 2013.

References:

1. J.P. Holman, Thermodynamics, 3rd Edition, Tata McGraw Hill, 1995.
2. C.P. Arora, Thermodynamics, Tata McGraw Hill, New Delhi, 12th reprint 2007.
3. Cengel, Thermodynamics – An Engineering Approach, 3rd Edition, Tata McGraw Hill, New Delhi, 2003.
4. R. Yadav, Steam & Gas Turbines and Power plant engineering, 7th revised Edition, Central Publishing House, Allahabad, 2009.

Mapping of COs with POs & PSOs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2		1		1					
CO2	3	2	2									
CO3	3	2	2		1							

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II B.Tech I Semester (ME)

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(20ACE11) Mechanics of Solids

Outcomes:

After completion of the course the student will be able to:

1. Understand the concepts and applications of stresses and strains
2. Determine the internal forces in the beams
3. Formulate the expressions for deflection for different loading conditions
4. Formulate the expressions for shear stress distribution across the various members
5. Formulate the expressions for longitudinal and circumferential stresses in thin and thick cylinders

UNIT I

SIMPLE STRESSES AND STRAINS: Elasticity and Plasticity – Types of stresses and strains – Hooke's law – Stress – Strain curve - Working stress – Factor of safety – Lateral strain, Poisson's ratio and Volumetric strain – Elastic moduli and the relationship between them – Bars of varying Section – composite bars – Temperature stresses. **STRAIN ENERGY:** Resilience – Gradual – sudden - impact and shock loadings-Simple applications.

UNIT II

SHEAR FORCE AND BENDING MOMENTS: Types of supports – Types of beams – Shear force and bending moment diagrams for simply supported - cantilever and over hanging beams with point loads - uniformly distributed load - uniformly varying loads and couples.

UNIT III

THEORY OF SIMPLE BENDING: Assumptions made in the theory of simple bending – Derivation of bending equation: $M/I = f/y = E/R$ – Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), Design of simple beam

SHEAR STRESS DISTRIBUTION: Derivation of formula – Shear stress distribution in rectangular – triangular – circular - I and T sections.

UNIT IV

DEFLECTIONS OF BEAMS: Bending into a circular arc – slope - deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads - U.D.L uniformly varying load. **TORSION OF CIRCULAR SHAFTS AND SPRINGS:** Theory of pure torsion - Torsional theory applied to circular shafts – Power transmission - Close and open coiled helical springs under axial loads and axial twist.

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II B.Tech – I Semester

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3 - - 3**

20AME05 Manufacturing Processes

Pre-request: Nil

Outcomes:

After completion of the course, the student will be able to:

1. Describe the basic components, principles of various casting process and apply the principle to design gating systems for an industrial application.
2. Classify working principle of various welding processes and identify the causes and remedies of defects.
3. Demonstrate the principle of different metal forming processes and identify the causes and remedies of defects.
4. Describe the various manufacturing processes of plastics, ceramics, and powder metallurgy.
5. Explain the principles, different methods, and identify applications of additive manufacturing.

UNIT - I Casting Processes

9 Hrs

Introduction: Importance and selection of manufacturing processes. Introduction to casting process, process steps; pattern and design of gating system; Solidification of casting: Concept, solidification of pure metal and alloy; Special casting processes: Shell casting, investment casting, die casting, centrifugal casting, casting defects and remedies.

UNIT – II Metal Joining Processes

9 Hrs

Classification of welding processes, types of welds and welded joints and V-I characteristics & problem, arc welding, weld bead geometry, submerged arc welding, gas tungsten arc welding, gas metal arc welding. applications, advantages and disadvantages of the above processes, Plasma Arc welding, Laser Beam Welding, Electron Beam Welding and Friction Stir Welding. Heat affected zones in welding; soldering and brazing: Types and their applications, Welding defects: causes and remedies.

UNIT – III Metal Forming & Forging

10 Hrs

Introduction, nature of plastic deformation, hot and cold working of metals, mechanics of metal forming; Rolling: Principle, types of rolling mill and products, roll passes, forces in rolling and power requirements, defects and remedies.

Extrusion: Basic extrusion process and its characteristics, hot extrusion and cold extrusion, wire drawing, tube drawing, defects and remedies.

Principles of forging, tools and dies. Types: Smith forging, drop forging, forging hammers, rotary forging and forging defects and remedies. Sheet metal forming: Mechanics of sheet metal working, blanking, piercing, bending, stamping, defects and remedies.

UNIT - IV Plastic Processing, Ceramics and Powder Metallurgy

9 Hrs

Plastics: Types, properties and their applications, processing of plastics, extrusion of plastics, transfer moulding and compression moulding, injection moulding, thermoforming, rotational moulding, and blow moulding

Ceramics: Classification of ceramic materials, properties and their application, ceramic powder preparation; Processing of ceramic parts: Pressing, casting, sintering; Secondary processing of ceramics: Coatings, finishing.

Powder Metallurgy: Principle, manufacture of powders, steps involved.

UNIT - V Additive Manufacturing Processes

8 Hrs

Additive manufacturing evolution, additive manufacturing processes and their relationship with subtractive manufacturing, reverse engineering, extrusion, and beam deposition techniques, materials, Applications of additive manufacturing.

Text Books:

1. P.N. Rao, Manufacturing Technology, 2nd Edition, Tata McGraw Hill, 2008.
2. Kalpakjain, Manufacturing Technology, Chennai, 4th Edition, Pearson Edition, 2002.
3. Ian Gibson, David W. Rosen, Brent Stucker, Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, 2nd Ed., Springer Science & Business Media, 2015.

References:

1. R.K. Jain, Production Technology New Delhi, 2nd Edition, Kanna Publishers, 2001.
2. B.S. Raghuwanshi, Workshop Technology, Volume-I, 2nd Edition Dhanpat Rai & Co Pvt. Ltd, 2014.
3. Andreas Gebhardt, Understanding additive manufacturing: rapid prototyping, rapid tooling, rapid manufacturing, Hanser Publishers, 2011.

Mapping of COs with POs & PSOs

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

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II B.Tech – I Semester

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20AME06 Engineering Materials and Testing Lab

Pre-request: Nil

Outcomes:

After completion of this course the student will be able to:

1. Choose the microscopes and different machinery for studying metallurgical properties.
2. Differentiate the structures of ferrous and non-ferrous metals and alloys.
3. Analyse the behaviour of metals and alloys in different heat treatments.
4. Compare various classes of metals, relationship between structure and their performance in different environments.

LIST OF EXPERIMENTS

1. Study of specimen preparation for metallographic examination and sample mounting in specimen mounting press.
2. Preparation and study of the Microstructure of pure Aluminium and pure Copper
3. Study of the Microstructures of Non-Ferrous alloy Brass and Cast Irons.
4. Preparation and study of the Microstructure of Low Carbon steel and High Carbon steel.
5. Determination of Harden ability of steel by Jominy end Quench test.
6. Hardness measurement of various heats treated and non-treated steels.
7. Find the hardness of the composite materials.
8. Study the stress–strain characteristics of mild steel rod using universal testing machine.
9. Determination of direct shear strength of rod using compressive testing machine.
10. Estimation of the modulus of elasticity of given material by measuring deflection in beams
 - a. Simply supported beam.
 - b. Over hanging beam.
 - c. Cantilever beam.
11. Determination of modulus of rigidity of given material using torsion testing machine and spring testing machine.
12. Determination of impact strength (Izod and Charpy) using impact testing machine.

Mapping of COs with POs & PSOs

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

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II B.Tech – I Semester , ME

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**20AEE12 ELECTRICAL AND ELECTRONICS ENGINEERING LAB
(Mechanical Engineering)**

Course outcomes:

After completion of this course the student will be able to:

1. Analyze the Efficiency of DC machines by different methods
2. Analyze the speed control of DC shunt machine
3. Analysis of Diode, Transistor and SCR Characteristics
4. Analysis of the Rectifiers and CRO operations

LIST OF EXPERIMENTS

Any TEN experiments are required to be conducted:

1. Swinburne's Test on DC shunt machine and Predetermination of efficiency as motor and generator.
2. Brake test on DC shunt motor. Determination of performance characteristics
3. Speed control of dc shunt motor - Armature voltage control - Field control
4. OC & SC tests on Single-phase transformer (Predetermination of efficiency and Regulation at given power factors and determination of equivalent circuit)
5. Brake test on 3-phase Induction motor (performance characteristics)
6. Regulation of alternator by synchronous impedance method
7. Forward and Reverse bias characteristics of PN Junction diode
8. Full Wave Rectifier with and without filters
9. Input and Output characteristics of Transistor in CE configuration
10. Characteristics of SCR
11. Frequency response in CE Amplifier
12. VI Characteristics or Zener Diode.

References books:

1. D. P. Kothari and B. S. Umre, Laboratory Manual for Electrical Machines, I.K International Publishing House Pvt. Ltd., 2017

Online Learning Resources/Virtual Labs:

- [http://em-coep.vlabs.ac.in/List%20of%20experiments.html?domain=Electrical Engineering](http://em-coep.vlabs.ac.in/List%20of%20experiments.html?domain=Electrical%20Engineering)
http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/Sadhya/experimentlist.html

Mapping of CO's- PO's-PSO's

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	--	--	1	--	--	--	--	--	3	2	1
CO2	3	3	2	3	--	--	2	--	--	--	--	--	1	1	3
CO3	3	2	3	1	--	--	2	--	--	--	--	--	2	2	2
CO4	3	2	2	3	--	--	2	--	--	--	--	--	2	1	1

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)**

II B.Tech – I Semester

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20AME07 Manufacturing Processes Lab

Pre-request: Nil

Outcomes:

After completion of this course the student will be able to:

1. Demonstrate the principle and basic components of conventional and additive manufacturing process.
2. Select the suitable manufacturing processes to produce the desired components in domestic and industrial applications.
3. Create different types of components using conventional and additive manufacturing techniques.

LIST OF EXPERIMENTS

1. Gating Design and pouring time and solidification time calculations.
2. Sand Properties Testing – Exercise for Strength and Permeability.
3. Moulding, Melting and Casting for ferrous/ non-ferrous materials.
4. TIG/MIG Welding.
5. Friction stir welding.
6. Spot Welding (Any other Special Welding Processes).
7. Press Tool: Blanking and Piercing operation.
8. Study of simple, compound and progressive dies.
9. Hydraulic Press: Bending operation.
10. Injection Moulding
11. Blow Moulding
12. Additive manufacturing with reverse engineering

Mapping of COs with POs & PSOs

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	3	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	3	3	-
CO3	3	3	3	-	3	-	-	-	3	-	-	3	3	3	3

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)**

II B.Tech – I Semester

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20AME08 Modelling using Catia

Pre-request: Computer Aided Engineering Drawing

Outcomes:

After completion of the course, the student will be able to:

1. Identify the various sketcher and modelling tools for design of engineering parts
2. Create the three-dimensional components using padding tools.
3. Create parts using modelling software Boolean Operations.

Unit-I

CATIA as a CAD software:- Concept of Parametric Modelling, Feature Based Modeling, User Interface, Mouse operations, File types and Management, drawing profiles. Major user industries of Catia.

Unit-II

Sketcher: Profile toolbar, operation (corner, chamfer, transformations, project 3D element), constraints, types of constraints, workbench. sketch tools, tools (Sketch solving status, sketch analysis, output feature), visualization toolbar, user selection filter.

Unit-III

Modelling of Machined component, Material Addition and Removal (Pad, Pocket, Shaft, Groove), Sketch and Positioned Sketch, Types of Fillets, Types of Chamfers, Types of Holes. Modelling of Machined component - 2. Pattern (Rectangular, Circular, User), Thread/Tap, Datum Features (Plane, Axes, Points), Simple Draft. Frequently used commands for Machined components in Catia- Modelling of Machined Component (Part Modelling)

Unit-IV

Advance Design features: - Axis System, Types of draft, Shell, Stiffener, rib slot, Multisection solid, removed multisection solid, Apply Material, Measure, Render.

Introduction To Multibody concept: - Copy Paste, Paste special, Insert body, Boolean Operations (Add, remove, Intersect), Transformation (Translation, Mirror, Scaling, Affinity).

Unit-V

Multibody concept: - Standard example, Negative body concept (Boolean Operations)- Advance Features: - Parameters, Formula, Relations, Design Table.

Internal examination: (Max 40 Marks)

Average day-to-day evaluation = 20 marks

Internal Test = 20 marks

Internal Test

Question paper pattern (**Max 20 Marks**)

Paper setting: Answer any two out of three questions. Prepare rough sketches in the Manual book and later on execute in the computer using Catia. 20 marks for computer work.

1. First two questions from unit I carries 5 marks one question to be answered, Second question from Unit II (Assembly or Disassembly) compulsory and carries 15 marks.
2. Internal exam duration 2 Hours.

External /Final examination Question paper pattern (**Max 60 Marks**)

(Internal Evaluation & Paper setting)

Paper setting:

1. Answer three out of five questions. First three questions from unit I out off which two question to be answered .Each carries 10 marks. Four and five questions are from Unit-II (Assembly or disassembly) and anyone has to be answered compulsory and carries 40 marks.

Prepare rough sketches in the Manual book and later on execute in the computer using Solidworks/Catia.V5.60 marks for computer work.

2. Final exam duration 3 Hours.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)**

II B.Tech – I Semester (EEE, ECE, CSE)

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**20AMB02 UNIVERSAL HUMAN VALUES-I
(Mandatory course)**

Course Outcomes:

After completion of the course students will be able to

1. Apply the principles of natural acceptance to design a happy and prosperous living with responsibility.
2. Analyse the elements of sentient 'I' and material human body to design a living with responsibility for happiness and prosperity.
3. Apply the principles of 'trust' and 'respect' for designing a society with universal human order.
4. Analyse the situations causing imbalance in nature and further design an ecosystem for peaceful co-existence.
5. Apply the principles of science technology and management to solve contemporary problems professionally and ethically.

UNIT – I: Introduction - Need, Basic Guidelines, Content and Process for Value Education

Purpose and motivation for the course, recapitulation from Universal Human Values-I; Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration; Continuous Happiness and Prosperity- A look at basic Human Aspirations; Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority; Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario; Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

UNIT – II: Understanding Harmony in the Human Being - Harmony in Myself

Understanding human being as a co-existence of the sentient 'I' and the material Body; Understanding the needs of Self ('I') and 'Body' - happiness and physical facility; Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer); Understanding the characteristics and activities of 'I' and harmony in 'I'; Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail; Programs to ensure Sanyam and Health.

UNIT – III: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship; Understanding the meaning of Trust; Difference between intention and competence; Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship; Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals; Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

UNIT – IV: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

Understanding the harmony in the Nature; Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature;

Understanding Existence as Co-existence of mutually interacting units in all- pervasive space; Holistic perception of harmony at all levels of existence

UNIT – V: Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values; Definitiveness of Ethical Human Conduct; Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order; Competence in professional ethics: a) Ability to utilize the professional competence for augmenting universal human order b) Ability to identify the scope and characteristics of people friendly and eco- friendly production systems, c) Ability to identify and develop appropriate technologies and management patterns for above production systems.

Strategy for transition from the present state to Universal Human Order:

- a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers
- b. At the level of society: as mutually enriching institutions and organizations.

Textbooks:

1. R R Gaur, R Asthana, G P Bagaria, “A Foundation Course in Human Values and Professional Ethics”, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1.
2. R R Gaur, R Asthana, G P Bagaria, “Teachers’ Manual for A Foundation Course in Human Values and Professional Ethics”, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2.

Reference Books:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantik, 1999.
2. N. Tripathi, “Human Values”, New Age Intl. Publishers, New Delhi, 2004. The Story of Stuff (Book).
3. Mohandas Karamchand Gandhi “The Story of My Experiments with Truth” E. F. Schumacher. “Small is Beautiful” Slow is Beautiful –Cecile Andrews J C Kumarappa “Economy of Permanence” Pandit Sunderlal “Bharat Mein Angreji Raj” Dharampal.
4. Rediscovering India. Mohandas K. Gandhi, “Hind Swaraj or Indian Home Rule” India Wins Freedom - Maulana Abdul Kalam Azad Vivekananda - Romain Rolland (English) Gandhi - Romain Rolland (English).

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Quantitative Aptitude and Reasoning-I

YEAR/SEM: III/I

CODE: 20AHS11

UNIT 1: QUANTITATIVE ABILITY - I

Vedic Maths – Square - Square root – Cube - Cube root – Fractions – Mathematical operations – Number System – Types of numbers - Divisibility Rule – Unit Digit – Factors and Factorials – Remainder Theorem – Factorization and Trailing Zeroes – LCM And HCF

UNIT 2: QUANTITATIVE ABILITY - II

Arithmetic Progression – Common Difference- Nth Term – Sum of terms – Geometric Progression – Common Ratio – Nth term – Sum of Terms – Averages - Weighted average – Percentages – Conversion – Increasing and Decreasing in quantity – Change in Percentage – Successive discount – Compound Growth

UNIT 3: REASONING ABILITY I

Coding and Decoding – Blood Relations – Directions – Number Series and Letter Series – Ranking and Ordering

UNIT 4: VERBAL I

Verbal analogy - Types - Parts of Speech – Noun, Pronoun, Adjective, Verb, Adverb, Preposition, Conjunction and Interjection - Prepositions –Preposition of Place, Preposition of Placement, Preposition of Time and Preposition of Duration - Articles – Usage of a, an, the, Omission of articles - Sentences - Pattern and Types.

UNIT 5: SOFT SKILL I

Communication Skills - Self-Confidence - Introductions & Greetings - Presentation Skills - Self-Motivation

II B. Tech - II Semester (Common to CE, ME, CSE, CSM & IT)

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20AHS13 PROBABILITY AND STATISTICS

Course Outcomes:

After completion of the course the student will be able to

1. Apply probability distributions to real life problems.
2. Analyze inference theory to make wise decisions about a population parameter.
3. Apply sampling methods in the day-to-day practical life to assess the quality of commodities.
4. Apply the testing of hypothesis for large and small samples.

UNIT-I

RANDOM VARIABLES & THEORITICAL DISTRIBUTIONS:

Introduction on Probability - Discrete and Continuous random variables – Distribution functions –Moment generating functions. Binomial distribution – Poisson distribution – Normal distribution – related properties.

UNIT-II

SAMPLING DISTRIBUTIONS & ESTIMATION:

Population - Sample - Parameter and Statistic -Characteristics of a good estimator - Consistency–Invariance property of Consistent estimator - Sufficient condition for consistency- Unbiasedness – Sampling distributions of means (known and unknown)- sums and difference. Estimation- Estimator, Estimate, Point estimation – Interval estimation – Bayesian estimation.

UNIT-III

TEST OF HYPOTHESIS:

Null Hypothesis-Alternative hypothesis-Critical region – Level of Significance-Type I error and Type II errors-One tail test -Two tail tests - Hypothesis concerning one and two means – Hypothesis concerning one and two proportions.

UNIT-IV

TEST OF SIGNIFICANCE: Student's t-test, test for a population mean, equality of two population means, paired t-test, F-test for equality of two population variances, χ^2 -Chi-square test for goodness of fit and test for attributes.

ANALYSIS OF VARIANCE - One way and two-way classifications.

UNIT-V

QUEUING THEORY: Introduction - Queues with impatient customers: Balking and renegeing-Classification, stationary process, Binomial process, Poisson process, Birth and death process, - M/M/1 Model –Problems on M/M/1 Model.

Text Books:

1. Miller and John Freund. E, Probability & Statistics for Engineers, New Delhi, Pearson Education, 2014.
2. S.P.Gupta,Statistical Methods,33rdEdition,publications SultanChand& Sons.2021.
3. Iyengar, T.K.V., Krishna Gandhi B., Probability & Statistics, New Delhi, S. Chand & Company, 2014.

References Books:

1. Arnold O Allen, Probability & Statistics, Academic Press. 2014.
- 2.Manoj Kumar Srivastava and Namita Srivastava, Statistical Inference Testing of Hypotheses, Prentice Hall of India,2014.

CO-PO's Mapping:

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

(AUTONOMOUS)

B.Tech-II Year-II Sem / III Year – I Sem

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20AMB03 MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
(Common to All Branches)

Outcomes:

After the completion of the course student will be able to

1. Explain the fundamental concepts and theoretical principles of the Economics
2. Apply economic principles for problem solving.
3. Identify market structures and types of business organizations.
4. List features, steps, merits, uses & limitations of Pay Back, ARR, NPV, PI & IRR methods of Capital Budgeting
5. Explain the basic concepts of book keeping and accounting, and analyze financial statements.

UNIT –I

INTRODUCTION TO MANAGERIAL ECONOMICS

Managerial Economics: Definition, Nature and Scope –Demand analysis: Law of demand, Demand determinants, Elasticity of Demand: Definition, Types, Measurement and Significance –Demand forecasting methods (Survey methods, Statistical methods, Expert opinion method, Test marketing, Controlled experiments, Judgmental approach)

UNIT –II

THEORY OF PRODUCTION AND COST ANALYSIS

Production function –Cobb Douglas Production function –Laws of Returns–Internal and External economies of scale COST ANALYSIS: Cost concepts, Fixed vs. Variable costs, Explicit vs. Implicit Costs, Out of Pocket costs Vs Imputed costs, Opportunity Cost and Sunk costs BREAK EVEN ANALYSIS: Concept of Break EvenPoint (BEP)–Break Even Chart –Assumptions underlying and Practical significance of BEP (Simple Problems).

UNIT –III

INTRODUCTION TO MARKETS AND BUSINESS ORGANIZATIONS:

Market structures –Types of Competition –Features of perfect competition, Monopoly, Monopolistic competition –Price-Output Determination under perfect competition and Monopoly –Types of Business organization –Features, Merits and demerits of Sole proprietorship, Partnership and Joint stock companies –Types of companies –Public enterprises –Types and Features –Changing business environment in post –Liberalization scenario.

UNIT –IV

CAPITAL AND CAPITAL BUDGETING:

Capital and its Significance –Types of capital –Estimation of fixed and working capital requirements –Methods and sources of raising capital –Capital Budgeting Methods: Payback Method, Accounting Rate of Return (ARR), and Net Present Value (NPV) Method (Simple Problems).

UNIT –V

FINANCIAL ACCOUNTING AND FINANCIAL ANALYSIS THROUGH RATIOS:

Double entry book keeping –Journal –Ledger –Trial Balance –Trading Account and balance sheet with simple adjustments Ratio analysis: Computation of Liquidity Ratios (Current and Quick Ratio), Activity Ratios (Inventory Turnover Ratio and Debtor Turnover Ratio), Capital Structure Ratios (Debt-Equity Ratio and Interest Coverage Ratio) and Profitability Ratios (Gross Profit Ratio, Net Profit Ratio, Operating Ratio, P/E Ratio and EPS).

TEXT BOOKS:

1. Aryasri A. R., Managerial Economics and Financial Analysis, 4/E, TMH, 2009.
2. Varshney R.L. and K.L. Maheswari, Managerial Economics, Sultan Chand & Sons, 19/E, 2009.
3. Siddiqui S.A. and Siddiqui A.S., Managerial Economics and Financial Analysis, New Age international, 2009.

REFERENCES:

1. Gupta R.L., Financial Accounting, Volume I, Sultan Chand & Sons, New Delhi, 2001
2. James C. Van Horne, Financial Management policy, 12/E, PHI, 2001.
3. Joel Dean, Managerial Economics, PHI, 2001.

(AUTONOMOUS)

II B.Tech II Semester (ME)

(20ACE12) FLUID MECHANICS AND HYDRAULIC MACHINERY

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Outcomes:

After completion of this course the student will be able to:

1. Apply how to find pressure on surfaces and in pipes
2. Apply how to find frictional losses in a pipe when there is a flow between two places
3. Able to know types of flow and its measurements and applications
4. Able to classify the turbines and design criteria based on water availability
5. Able to identify the suitable pump required for different purposes.

UNIT I

FLUID PROPERTIES AND STATICS: Dimensions and units - Definition of a fluid – Physical properties of fluids – Density, Specific weight, Specific volume, Specific gravity, Compressibility, Vapor pressure, Surface tension, Capillarity and Viscosity. Pascal’s law – Pressure variation in a static fluid – Atmospheric, gauge and absolute pressures – Measurement of pressure – Piezometer – U–tube and inverted U–tube manometers – Bourdon’s pressure gauge – Hydrostatic forces on plane surfaces– Buoyancy-Buoyant Force and Centre of Buoyancy Metacentre and Metacentric Height- Stability of Submerged and Floating Bodies.

UNIT II

FLUID KINEMATICS AND FLUID DYNAMICS: Types of flow, velocity field, one and two-dimensional flow analysis, circulation and vorticity, stream function and velocity potential function, potential flow, standard flow patterns, combination of flow patterns, flow net. Continuity equation, Euler’s equation of motion, Bernoulli’s equation, Impulse momentum equation and applications (pipe bend).

UNIT III

Reynolds’s experiment – Reynolds’s number - Minor losses in pipe flow - Darcy– Weisbach equation – Variation of friction Factor – Moody’s chart – Pipes in series –Pipes in parallel. Flow Measurement: Velocity measurement by Pitot tube and Pitot static tube – Discharge measurement by Venturimeter and orifice meter – Turbine Flow meter.

UNIT IV

BOUNDARY LAYER THEORY: Dimensional Analysis as a tool in design of experiments, identification of non-dimensional numbers and their significance, dimensional analysis methods. Boundary Layer Theory – Formation, growth and separation – Mathematical models for boundary layer flows.

UNIT V

HYDRAULIC TURBINES: Elements of hydroelectric power plants- Heads and efficiencies of turbines – Classification of turbines –Pelton wheel-Modern Francis turbine – Kaplan

turbine Main components and working principle- Expressions for work done and efficiency – Working proportions and design of each.

CENTRIFUGAL PUMPS: Classification and types of pumps – Components and working of a centrifugal pump – Work done by the impeller– Heads and efficiencies – NPSH- Priming – Priming devices – Minimum starting speed – Multistage pumps – Pumps in series and parallel – Submersible pumps – Limiting suction head – Cavitation – Expression for specific speed

Text Books:

1. P.N. Modi & S.M. Seth, Hydraulics and Fluid Mechanics including Hydraulic Machines, New Delhi, Standard Book House, 14th Edition 2002.
2. R.K. Bansal, A Text book of Fluid Mechanics and Hydraulic machinery, 9th Edition, Laxmi Publications (P) Ltd, 2010.

References:

1. Nachleba, Hydraulic Turbines, New Delhi, 1st Edition, Tata McGraw Hill Publishing Co.Ltd, 2012.
2. Streeter & Wylie, Fluid Mechanics, 10th Edition, T M H Publications, 1997.

Mapping of COs with POs & PSOs

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

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)**

II B.Tech – II Semester

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20AME09 Thermal Engineering

Pre-request: Nil

Outcomes:

After completion of the course, the student will be:

1. Apply the working principles of condensers, nozzles, and steam Turbines in designing design of thermal power plant using Software Tools.
2. Apply the principles of performance evaluation and combustion process concepts in the design of IC engines using Ansys complying to pollution standards.
3. Apply the principles of pneumatics for analyzing various characteristics of compressors for the selection of a suitable compressor.

UNIT-I Steam Nozzles & Steam Condensers

11Hrs

Steam Nozzles: Function of nozzle, applications, types, Flow through nozzles, thermodynamic analysis, assumptions, nozzle efficiency, condition for maximum discharge, critical pressure ratio, diameters of throat and exit for maximum discharge, super saturated flow through nozzle. Related problems. Design and Analysis of Flow pattern using Ansys software.

Steam Condensers: Requirements of steam condensing plant, Classification of condensers, working principle of different types, vacuum efficiency and condenser efficiency, mass of cooling water required for condensation of steam, Effect of air leakage. Related problems.

UNIT-II Steam Turbines

12Hrs

Impulse Turbine: Mechanical details – classification of steam Turbines, De-Laval Turbine - its features, velocity triangles for moving blade, combined velocity triangle for moving blades, effect of friction – power developed, axial thrust, blade or diagram efficiency, Gross or Stage efficiency- combined velocity diagram for axial discharge – condition for maximum efficiency. Methods to reduce rotor speed-Velocity compounding, pressure compounding, Pressure and velocity compounding variation along the flow– Governing of impulse turbine-related problems

Reaction Turbine: Mechanical details – principle of operation, thermodynamic analysis of a stage, power developed, degree of reaction, Height of blades –velocity diagrams for moving blades – Parson’s reaction turbine – condition for maximum efficiency- Governing of reaction turbine, Related problems, Design and Analysis of Flow pattern on blades using Ansys software

UNIT-III I.C Engines, Testing and Performance

12Hrs

I.C. Engines: Definition of Engine and Heat Engine, I.C Engine Classification – Parts of I.C. Engines, Working of I.C. Engines, Two Stroke & Four Stroke I.C. Engines, SI & CI Engines, Valve and Port Timing Diagrams. Actual Cycles and their Analysis: Introduction, Comparison of Air Standard and Actual Cycles, Time Loss factor, Heat loss factor, Exhaust blow down, Loss due to Rubbing Friction, Actual and Fuel-Air Cycles of C.I Engines.

Testing and Performance: Parameters of Performance - Measurement of Cylinder Pressure, Fuel Consumption, Air Intake, Exhaust Gas Composition and their effect on environment, Brake Power – Determination of Frictional Losses and Indicated Power – Performance Test – Heat Balance Sheet, Related problems. Performance evaluation using IC engine software

UNIT-IV Combustion in S.I and C.I Engines

8Hrs

Combustion in S.I Engines: stages of combustion, Normal Combustion and abnormal combustion – Importance of flame speed and effect of engine variables – Types of Abnormal combustion, pre-ignition and knocking—combustion chamber – requirements, types.

Combustion in C.I Engines: Four stages of combustion – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and Combustion. Induced turbulence – open and divided combustion chambers and nozzles used

UNIT-V Compressors

13Hrs

Compressors: Classification – Reciprocating –positive displacement, Rotary and dynamic machinery –Power producing and power absorbing machines, fan, blower and compressor

Reciprocating: Principle of operation, work required, efficiencies – isothermal, isentropic, polytropic, mechanical and volumetric efficiency and effect of clearance, multi-stage compression, under cooling, saving of work, minimum work condition for stage compression, ratio of cylinder diameters. related problems.

Rotary (Positive displacement type): Roots Blower, vane sealed compressor, Lysholm compressor – mechanical details and principle of working – efficiency considerations.

Dynamic Compressors: Centrifugal compressors: Mechanical details and principle of operation–work done- velocity and pressure variation. Energy transfer-impeller blade shape-losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient – velocity diagrams – power. Axial flow compressors: Mechanical details and principle of operation–velocity diagrams – degree of reaction – simple problems

(Use of standard thermodynamic steam tables and mollier charts are permitted)

Text Books:

1. R.K. Rajput, Thermal Engineering, Hyderabad, Lakshmi Publications Pvt. Ltd, 9th Edition, 2013.
2. V. Ganesan, I.C. Engines, Noida, 4th Edition, Tata McGraw Hill, 2014.
3. R.S. Khurmi &J.K.Gupta, Thermal Engineering, 15th Edition, Hyderabad, S.Chand, 2013.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)**

II B.Tech – II Semester

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3 1 - 3**

20AME10 Kinematics of Machinery

Pre-request: Applied Mechanics

Outcomes:

1. Know the basics of mechanism and perform kinematic analysis for designing the machines.
2. Describe the usage of lower pairs for different mechanisms in the engineering applications.
3. Compute the velocity and acceleration analysis of various mechanisms using graphical methods.
4. Design and kinematic analysis of various cam profiles based on follower motion and design the specified contour profiles for high speed applications.
5. Explain the different types of gears, gear trains and their importance in the power transmissions.

UNIT-I Mechanisms and Machines

12Hrs

Machine and Mechanism, Rigid and Resistant bodies, Types of Constrained Motion, Elements or Links, Linkage, Kinematic Pairs, Types of Joints, Classification of Kinematic Pairs, Degree of freedom and mobility of Mechanisms, Mechanical advantage and Transmission angle. kinematic chain – Inversion of mechanism (quadric cycle chain, single and double slider crank chains).

UNIT II Mechanism with Lower Pairs

10Hrs

Introduction, Pantograph, Exact and approximate straight line motion mechanisms and its types.

Automobile Steering Gear: Conditions for correct steering, Ackermann and Davis steering gear mechanism.

Hooke's Joint: Single and double Hooke's joint.

UNIT III Velocity and Acceleration Analysis

12Hrs

Analysis of simple mechanisms (Single slider crank mechanism and four bar mechanism) – Velocity by Instantaneous centre and relative velocity method, Kennedy's theorem, Acceleration diagrams, Coriolis acceleration, Klein's construction.

UNIT IV Cams and Followers 13Hrs

Introduction, Types of cams and followers, Terminology, High speed cams, Undercutting, Motions of the follower, Construction of cam profiles, Tangent cam with roller follower, Circular arc cam with flat faced follower.

UNIT V Gears

Classification of Gears, Gear terminology, law of gearing, velocity of sliding, Form of teeth - cycloidal and involute profiles, Length of path and arc of contact, contact ratio, Interference in involute gears, minimum number of teeth, Comparison of Cycloidal and Involute tooth

forms.

GEAR TRAINS: Introduction, Train value, Types of Gear Trains - Simple, Compound, Reverted and Epicyclic gear trains, Epicyclic gear trains - Analysis of Epicyclic gear trains, Torques in Epicyclic gear trains, Automotive transmission gear trains, differential gear trains.

Text Books:

1. S.S. Rattan, Theory of Machines and Mechanisms, Noida, 4th Edition, Tata McGraw Hill Publishers, 2016.
2. Bansal R.K., “Theory of Machines”, Laxmi Publications Pvt Ltd., New Delhi, 20th edition 2009.

References:

1. Joseph Edward Shigley and John Joseph Uicker JR, Theory of Machines and Mechanisms SI Edition, Oxford University Press, 2014
2. R.L. Norton, Kinematics and Dynamics of Machinery, McGraw Hill Publishers, 2017.
3. Sadhu Singh, Theory of Machines, New Delhi, 2nd Edition, Pearson Edition, 2012.
4. Thomas Bevan, Theory of Machines CBS
5. Rao J.S. and Dukkipati R.V., “Mechanism and Machine Theory”, Second Edition, Wiley Eastern Limited, 2006.

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	3	3	-	2	-	-	-	-	-	-	2	3	-	-
CO2	3	2	3	-	-	-	-	-	-	-	-	2	3	-	-
CO3	3	3	3	3	2	-	-	-	-	-	-	2	3	-	-
CO4	3	3	-	3	3	-	-	-	-	-	-	3	3	-	3
CO5	3	3	3	3	3	-	-	-	-	-	-	3	3	-	3
AVG	3	2.8	3	1.8	2	-	-	-	-	-	-	2	3	-	1.2

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)**

II B.Tech – II Semester

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20AME11 Thermal Engineering Lab

Pre-request: Nil

Outcomes:

After completion of the course the student will be able to

1. Identify the properties of fuels like flash point, fire point and calorific value.
2. Demonstrate the working principle, components of different types of engines, compressors, refrigeration and air conditioning systems.
3. Compute the frictional power of an I.C. engine by conducting retardation test or morse test.
4. Calculate the various efficiencies of engine and compressors by conducting performance test and to determine the cop of refrigeration and air conditioning systems.

LIST OF EXPERIMENTS

1. Determination of Flash point and Fire point of petrol/diesel using Abel's/Pensky Marten's apparatus.
2. Determination of Viscosity of lubricating oil using Redwood Viscometer /Say bolt Viscometer.
3. Study of Bomb and Junker's gas calorimeter to determine the Calorific value of fuels.
4. Study of the constructional details & working principles of two-stroke petrol engine and to draw Port Timing Diagram of an I.C. Engine.
5. Study of the constructional details & working principles of four stroke diesel engine and to draw Valve Timing Diagram of an I.C. Engine.
6. Performance test and Preparation of Heat balance sheet on 4-stroke, single cylinder diesel engine test rig.
7. Retardation test on 4-stroke, single cylinder diesel engine test rig.
8. Morse test on 4-stroke, 4- cylinder petrol engine test rig.
9. Performance and emission test on 2- stroke, single cylinder petrol engine test rig.
10. Performance test on refrigeration test rig.
11. Performance test on computerized air condition test rig.
12. Performance test on two stage reciprocating Air compressor.
13. Determination of air fuel ratio & volumetric efficiency with variable compression ratio engine on 4-stroke, single cylinder petrol engine test rig.
14. Performance, Emission test on computerized 4-stroke, single cylinder diesel engine test rig.

Note: Minimum of 12 Experiments need to be performed

CO's Mapping with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	3	-	-	-	3	3	-
CO2	3	3	-	-	-	-	-	-	3	-	-	-	3	3	-
CO3	3	3	-	-	3	-	-	-	3	-	-	-	3	3	-
CO4	3	3	-	-	-	-	-	-	3	-	-	-	3	3	-

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
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20AME12 Computer Aided Machine and Production Drawing Lab

Pre-request: Computer Aided Engineering Drawing

Outcomes:

After completion of the course, the student will be able to:

1. Demonstrate the conventional representations of materials and machine components.
2. Model the three-dimensional machine components using CAD system.
3. Create assembly models of the machine parts and sectional views of machine components using modelling software.
4. Create manufacturing drawing with dimensional and geometric tolerances.

Unit-I

DRAWING OF MACHINE ELEMENTS AND SIMPLE PARTS

- a) Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
- b) Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
- c) Keys, cotter joints and knuckle joint.
- d) Riveted joints for plates
- e) Bushed journal, foot step bearing.

Unit-II

PRODUCTION DRAWING PRACTICE

- I. **Assembly of** Assembly of bolt and nut with different screw thread, Assembly of keys and cotter joints, Riveted joints Couplings Stuffing box Petrol engine connecting rod, Eccentric, Screw jack, Plummer block, Light duty non return valve, Details of slip bush, Main spindle of lathe tail stock, Single tool post.
- II. Tolerances of Form and position: Symbols representing the characteristics to be Tolerance-Indication of Geometrical Tolerances on a Drawing -Indication of Surface roughness & machining symbols.

***** Part drawing will be generated and assembled in the solid works software.**

List of Experiments (Any Ten)

1. Assembly of bolt and nut with different screw thread
2. Assembly of keys and cotter joints.
3. Riveted joints

4. Couplings
5. Stuffing box and Connecting rod
6. Eccentric
7. Screw jack
8. Plummer block
9. Light duty non return valve
10. Details of slip bush
11. Main spindle of lathe tail stock
12. Single tool post

Text Books:

1. K.L. Narayana, P. Kannaiah & K. Venkata Reddy, Machine Drawing, NewAge Publishers 4th Edition, 2012.
2. R.K. Dhawan, Machine Drawing, 2nd Edition, S. Chand Publications, 1996.

References:

1. P.S. Gill, Machine Drawing, Madhurai, 12th Edition, Sk Kataria & Sons, 2009.
2. Rajput, Machine Drawing, Hyderabad, 4th Edition, S.Chand Publications, 2002.

Internal examination: (Max 40 Marks)

Average day-to-day evaluation = 20 marks

Internal Test = 20 marks

Internal Test

Question paper pattern (Max 20 Marks)

Paper setting: Answer any two out of three questions. Prepare rough sketches in the Manual book and later on execute in the computer using Solidworks/Catia. 20 marks for computer work.

3. First two questions from unit I carries 5 marks one question to be answered, Second question from Unit II (Assembly or Disassembly) compulsory and carries 15 marks.
4. Internal exam duration 2 Hours.

External /Final examination Question paper pattern (Max 60 Marks)

(Internal Evaluation & Paper setting)

Paper setting:

1. Answer three out of five questions. First three questions from unit I out of which two question to be answered .Each carries 10 marks. Four and five questions are from Unit-II (Assembly or disassembly) and anyone has to be answered compulsory and carries 40 marks. Prepare rough sketches in the Manual book and later on execute in the computer using Solidworks/Catia. 5.60 marks for computer work.

2. Final exam duration 3 Hours.

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

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)**

II B.Tech II Semester (ME)

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(20ACE18) FLUID MECHANICS AND HYDRAULIC MACHINES LAB

Course Outcomes (CO):

By performing the various tests in this laboratory the student will be able to know the principles of discharge measuring devices and head loss due to sudden contraction and expansion in pipes and working principles of various pumps and motors.

List of Experiments:

1. Verification of Bernoulli's equation.
2. Calibration of Venturi meter.
3. Calibration of Orifice meter
6. Determination of Coefficient of discharge for an external mouth piece by Constant head method.
7. Determination of Coefficient of discharge for an external mouth piece by variable head method.
8. Calibration of contracted Rectangular Notch.
9. Calibration of contracted Triangular Notch. Determination of friction factor
10. Determination of loss of head in a sudden contraction.
11. Determination of loss of head in a sudden Expansion.
12. Performance test on Impulse turbines
13. Performance test on reaction turbines (Francis and Kaplan Turbines)
14. Impact of jet
15. Performance test on centrifugal pumps, determination of operating point and efficiency

References:

1. Fluid Mechanics & Hydraulic Machines A Lab Manual by Ts Desmukh (Author), Laxmi Publications (P) Ltd
2. Fluid Mechanics & Machinery Laboratory Manual by N Kumara Swamy (Author), Charotar Books Distributors.
3. Lab. Manual of Fluid Mechanics & Machines by Gupta, Chandra (Author), cbspd (Publisher).

Online Learning Resources/Virtual Labs: <http://eerc03-iiith.vlabs.ac.in/>

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

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)**

II B.Tech – II Semester

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20AME13 Surface Modelling using Catia

Pre-request: Computer Aided Engineering Drawing, Modelling using Catia

Outcomes:

After completion of the course, the student will be able to:

1. Identify the various drafting tools for engineering parts
2. Apply the GDN & T commands for three-dimensional components.
3. Create parts using surface modelling tools.

UNIT-I

Drafting-Introduction to Drafting & Detailing Theory: - (types Generative – Interactive), Initial Drafting setting, Sheet Background, Views (ortho, ISO), Dimensions (Types- Generate Dimension & Create Dimension).

UNIT-II

Views: - (Aux, Section, Details, Clipping, Broken), View properties, DATUMS & Tolerance

Annotations: - GD & T, Symbols, Note, Leaders, Table, Symbols (Machining, Roughness, Welding, Custom), Dress-up Toolbar.

UNIT-III

Surfacing Modelling based Plastic Component: - Environment, Tool bars, Surface Creation (Extrude, Revolve, Sphere, Cylinder), Surface Modification, Surface Editing (Trim, Split, Shape Fillet, Close Surface, Thickness).

UNIT-IV

Surfacing: - Offset (All 3 types), Fill, Blend, Join, healing, Project-Combine.

Advanced Surfacing: - Adaptive Sweep, Sweep (ALL), Multisession Surface.

UNIT-V

Wire-frame Modelling: - Point, Line, Planes, Curves, Circle-Conic, STANDARD EXAMPLES. Use of wire frame modelling,

Internal examination: (Max 40 Marks)

Average day-to-day evaluation = 20 marks

Internal Test = 20 marks

Internal Test

Question paper pattern (**Max 20 Marks**)

Paper setting: Answer any two out of three questions. Prepare rough sketches in the Manual book and later on execute in the computer using Catia. 20 marks for computer work.

1. First two questions from unit I carries 5 marks one question to be answered, Second question from Unit II (Assembly or Disassembly) compulsory and carries 15 marks.
2. Internal exam duration 2 Hours.

External /Final examination Question paper pattern (**Max 60 Marks**)

(Internal Evaluation & Paper setting)

Paper setting:

1. Answer three out of five questions. First three questions from unit I out off which two question to be answered .Each carries 10 marks. Four and five questions are from Unit-II (Assembly or disassembly) and anyone has to be answered compulsory and carries 40 marks.

Prepare rough sketches in the Manual book and later on execute in the computer using Solidworks/Catia.V5.60 marks for computer work.

2. Final exam duration 3 Hours.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
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II B.Tech – II Semester

**L T P C
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20AME20 New Product Development

Pre-request: Nil

Course Outcome:

Upon successful completion of the course the students will be able to

1. Demonstrate key concepts and principles concerning the role of product innovation and their contribution to generate competitive advantage in firms.
2. Identify key concepts and principles concerning the activities and competencies involved in new product development.
3. Evaluate key concepts and principles concerning- the range of tools and methods that are used to manage new product development.
4. Analyse the product design and its architecture applicable in various domains.
5. Apply the concepts of product evaluation, prototyping, quality checking and testing the products.

UNIT 1: New Product Development

10Hrs

Introduction to New Product Development, Need for developing new products – Evolution of design, types of design – the design process –product life cycle – generic product development process – Strategic Planning and Opportunity Identification for new products – Identifying Market Opportunities-sustainability for design and manufacturing.

UNIT 2: Translation of needs into Specifications

10Hrs

Understanding Customer and User Needs – customer survey – need gathering methods – clarification - search-externally and internally - Explore systematically - needs importance - establishing product specification -competitive benchmarking.

UNIT 3: Creativity, Innovation and Concept Development

10Hrs

Need for design creativity - Creative thinking – creativity and problem solving - creative thinking methods- generating design concepts - systematic methods for designing – morphological methods - TRIZ methodology of Inventive Problem Solving. Concept Generations- Concept Screening- Concept Scoring - Concept Testing methods.

UNIT 4: Embodiment Design

10Hrs

Introduction to embodiment design – product architecture – types of modular architecture – steps in developing product architecture Industrial design – human factors design –user friendly design.

UNIT 5: Design for X

10Hrs

Design for serviceability – design for environment – prototyping and testing – Cost evaluation – categories of cost – overhead costs – activity based costing. Design for Quality -

Reliability - Failure Mode and Effect Analysis - Test and Inspection – Maintenance - Warranty.

Text Books

1. Karl T. Ulrich, Steven D. Eppinger, Product Design and Development, Sixth Edition, McGraw-Hill, 2015.

Reference Books

1. Robert G. Cooper, Winning at New Products: Creating Value Through Innovation, Hachette Book Group, Newyork, 2017.
2. John Starc, Product Lifecycle Management (Decision Engineering), Springer Publications, 2015.

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

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
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II B.Tech – II Semester

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20AME20 Automotive Chassis

Pre-request: Nil

Course Outcome:

Upon Successful Completion of this course, Students will be able to

1. Understand the various chassis systems and chassis subcomponents are present in the automotive chassis.
2. Identify the suitable frame, steering and drive line system for the different automobile vehicles.
3. Identify the suitable braking, suspension system for the different automobile vehicles.
4. Identify the suitable axles, wheels and tyres for the different automobile vehicles.

UNIT I Chassis Layouts and Frames

8Hrs

Types of Chassis Layout with reference to Power Plant Location and Drive, Automotive Frames - Material Selection and its Constructional Details, Various types, Different Loads acting on Frame, Testing of Automotive Frames.

UNIT II Steering System

9Hrs

Types of Front Axles and Stub Axles, Front Wheel Geometry, Condition for True Rolling Motion of Wheels during Steering, Steering Mechanisms, Steering Error Curve, Steering Linkages, Different Types of Steering Gears, Slip Angle, Over Steer and Under Steer, Reversible and Irreversible Steering, Power Assisted Steering.

UNIT III Drive Line

9Hrs

Propeller Shaft - Design Considerations & Constructional Details, Universal Joints, Constant Velocity Joints, Hotchkiss Drive, Torque Tube Drive, Radius Rods and Stabilizers, Final drive - Different types, Multi axle Vehicles, Differential - Working Principle and Constructional Details, Non-Slip Differential, Differential Locks.

UNIT IV Suspension System and Braking Systems

12Hrs

Need for Suspension System, Types of Suspension Springs, Constructional details and Characteristics of Single Leaf, Multi Leaf, Coil, Torsion bar, Rubber, Pneumatic and Hydro – elastic Suspension Systems, Independent Suspension System, Shock Absorbers - Types and Constructional details.

Stopping Distance, Braking Efficiency, Weight Transfer during Braking, Drum Brakes - Leading and Trailing Shoe, Braking Torque, Disc Brake - Types and Constructional Details,

Hydraulic Braking System, Pneumatic Braking System, Power-Assisted Braking System, Servo Brakes, Retarders, Types and Construction.

UNIT V Axles, Wheels and Tyres

12Hrs

Axles – Live and Dead Axles, Constructional Details, Different Types of Loads acting on Drive Axles, Rear Axle Shaft Supporting Types: Semi Floating, Full Floating, Three Quarter Floating, Axle Housings and Types.

Types of Wheels, Construction, Structure and Function, Wheel Dimensions. Structure and Function of Tyres, Static and Dynamic Properties of Pneumatic Tyres, Types of Tyres, Materials, Tyre Section & Designation, Factors affecting Tyre Life, Quick Change Wheels, Special Wheels.

Textbook

1. K.V James, D Halderman (2013) “Automotive Chassis Systems” 6th Edition, Prentice Hall Publisher.

Reference Books

1. James E Duffy (2011) “Modern Automotive Technology”, Goodheart-Willcox; Seventh Edition.
2. Jack Erjavec (2009) “Automotive Technology – A systems approach”, Cengage Learning.
3. William H. Crouse and Donald L. Anglin (2007) Automotive Mechanics, 10th edition.

Mapping of COs with POs & PSOs

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

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
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II B.Tech – II Semester

**L T P C
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20AME21 Drives and Actuators for Industrial Automation

Pre-request: Basic Electrical and Electronics

Course Outcomes

Upon completion of this course, the students will be able to:

1. Use the appropriate fluid power generation and actuation elements and fluid power symbols to design and integrate the pneumatic and hydraulic systems.
2. Select and design the basic fluid power circuits using control valves and regulating elements for various types of actuators.
3. Design and analyse the circuits using advanced techniques for manual and automatic control.
4. Identify and select the suitable electrical actuators and motors for typical applications in the industrial needs.
5. Analyse the need of appropriate drive and its functions for various actuator and valve control in mechatronic system development.

UNIT - I Fluid Power System Generation and Actuators 10Hrs

Need For Automation, Classification of Drives - Hydraulic, Pneumatic and Electric – Comparison – ISO Symbols for their Elements, Selection Criteria. Generating Elements- Hydraulic Pumps and Motor Gears, Vane, Piston Pumps – Motors - Selection and Specification - Drive Characteristics – Utilizing Elements - Linear Actuator – Types, Mounting Details, Cushioning – Power Packs – Accumulators.

UNIT - II Control and Regulating Elements 10Hrs

Control and Regulating Elements — Direction, Flow and Pressure Control Valves -Methods of Actuation, Types, Sizing of Ports. Spool Valves - Operating Characteristics - Electrohydraulic Servo Valves - Types - Characteristics and Performance.

UNIT - III Circuit Design for Hydraulic and Pneumatics 10Hrs

Typical Design Methods – Sequencing Circuits Design - Combinational Logic Circuit Design - Cascade Method – KV Mapping - Electrical Control of Pneumatic and Hydraulic Circuits - Use of Relays, Timers, Counters, Programmable Logic Control of Hydraulics - Pneumatics Circuits - PLC Ladder Programming.

UNIT- IV Electrical Actuators 10Hrs

DC Motors – Construction, Working Principle, Classification, Characteristics, Applications – Single Phase and Three Phase AC Motors – Construction, Working Principle, Classification, Characteristics and Applications, Special Electrical Motors - Servomotors - Stepper Motors,

Principle, Classification, Construction and Working - BLDC Motor and its Operating Modes - Piezo Electric Actuators – Linear Electrical Actuators - Hybrid Actuators.

UNIT - V Electrical Drive Circuits

10Hrs

Drives for Motion Control - DC Motors - Speed, Torque, Direction and Position Control - H-Bridge under PWM Mode - Control of AC Motor Drives – VFD Drives – Energy Saving AC Drives - AC Servo Drives - Speed, Breaking, Direction, Position and Torque Control – Stepper Motor Drive Circuits for Speed and Position Control - Drives for BLDC Motor - Selection of Drives – Protection and Switch gears.

TEXT / REFERENCES

1. Antony Esposito, “Fluid Power Systems and Control”, Prentice-Hall, 2006.
2. Austin Hughes, “Electric Motors and Drives Fundamentals, Types and Applications”, Fourth Edition, Elsevier, 2013
3. Gopal K.Dubey, “Fundamentals of Electrical Drives”, Narosa Publications, 2001.
4. Peter Rohner, “Fluid Power Logic Circuit Design”, the Macmillan Press Ltd., London, 1979.
5. Singh.M.D, Khanchandani.K.B, “Power Electronics”, Second Edition, McGraw-Hill, 2008.

CO’s Mapping with program outcomes

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

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
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II B.Tech – II Semester

L T P C
4 - - 4

20AME22 Elements of Nanoscience and Nanotechnology

Pre-request: Engineering Physics

Course Outcome:

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

1. Describe the concepts and properties of nanotechnology.
2. Demonstrate different classes of nanomaterials and their properties.
3. Explain various synthesis methods of nanomaterials and their applications.
4. Describe the fabrication and characterization techniques involved in nanotechnology.
5. Explain nanotechnology potentialities in various fields.

UNIT I: Basics and Scale of Nanotechnology **12Hrs**

Introduction and scientific revolutions, Time and length scale in structures, Definition of a nano system, Dimensionality and size dependent phenomena, Surface to volume ratio, Fraction of surface atoms and surface energy, Surface stress and surface defects, Properties at nanoscale – optical & mechanical, Properties at nanoscale – electronic & magnetic.

UNIT II: Different Classes of Nanomaterials **12Hrs**

Classification based on dimensionality, Quantum dots, wells and wires, Carbon-based nano materials – fullerenes and buckyballs, Carbon nanotubes and graphene, Metal based nano materials – Nanogold and Nanosilver, Metal oxide based nano materials, Nanocomposites and nanopolymers, Nanoglasses and nano ceramics, biological nanomaterials

UNIT III: Synthesis of Nanomaterials **12Hrs**

Chemical methods: Metal nanocrystals by reduction, Solvothermal synthesis and photochemical synthesis, Sonochemical routes and chemical vapor deposition (CVD), Metal oxide chemical vapor deposition (MOCVD), Physical methods: Ball milling, Electrodeposition techniques, Spray pyrolysis and flame pyrolysis, DC/RF magnetron sputtering, Molecular beam epitaxy (MBE)

UNIT IV: Fabrication and Characterization of Nanostructures **12Hrs**

Nanofabrication: Photolithography and its limitation and electron beam lithography (EBL), Nanoimprinting and soft lithography patterning, Characterization: Field emission scanning electron microscopy (FESEM) and environmental scanning electron microscopy (ESEM), High resolution transmission electron microscope (HRTEM), Scanning tunneling microscope (STM), Surface enhanced raman spectroscopy (SERS), X-ray photoelectron spectroscopy (XPS), Auger electron spectroscopy (AES), Rutherford backscattering spectroscopy (RBS).

UNIT V: Applications in Nanotechnology**12Hrs**

Solar energy conversion and catalysis, Molecular electronics, nanoelectronics and printed electronics, Polymers with a special architecture, liquid crystalline systems, Linear and nonlinear optical and electro-optical properties, Applications - nanomaterials for data storage, Photonics and plasmonics, Chemical and biosensors, Nanomedicine and nanobiotechnology, Nanotoxicology challenges.

Textbooks

- 1 T. Pradeep, "A Textbook of Nanoscience and Nanotechnology", Tata McGraw Hill Education Pvt. Ltd., 2012
- 2 Hari Singh Nalwa, "Nanostructured Materials and Nanotechnology", Academic Press, 2008
- 3 A.Nabok, "Organic and Inorganic Nanostructures", Artech House, 2009

Reference Books:

- 1 C.Dupas, P.Houdy, M.Lahmani, "Nanoscience: Nanotechnologies and Nanophysics", Springer-Verlag Berlin Heidelberg, 2007
- 2 A. S. Edelstein and R. C. Cammarata, "Nanomaterials: Synthesis, Properties and Applications", Institute of Physics Pub., 2001

Mapping of COs with POs & PSOs

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

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
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II B.Tech – II Semester

**L T P C
3 - 2 4**

20AME14 Thermodynamics and Internal Combustion Engines

Pre-request: Nil

Outcomes:

After completion of the course, the student will be able to:

1. Apply the principles of Thermodynamics to conduct analysis of various thermal engineering systems and processes, complying entropy to environment
2. Analyze the working principles of different air standard power cycles and apply for working of IC Engines.
3. Apply various performance parameters and measurements in solving the problems related to performance of IC Engine using IC Engines software, complying to pollution standards

UNIT-I Basic Concepts and First Law of Thermodynamics 12Hrs

Basic concepts -concept of continuum, Macroscopic and Microscopic approach: Thermodynamic systems -closed, open and isolated systems, Property, State, Path and Process, Quasi-static process, Work, Modes of work, work and heat transfer for different thermodynamic processes, Zeroth law of thermodynamics –concept of Temperature and Heat. First law of thermodynamics–SFEE -Application to closed and open systems. Related problems

UNIT-II Second Law of Thermodynamics 9Hrs

Second law of thermodynamics –Kelvin’s and Clausius statements of Second Law, Heat Engines, Refrigerator and Heat Pump, Coefficient of Performance, Clausius theorem, Clausius in-equality, Reversibility and Irreversibility, Carnot cycle-, efficiency, Carnot theorem and corollaries, Absolute thermodynamic temperature scale, related problems.

UNIT-III Entropy and Thermodynamics Relations 12rs

Concept of Entropy, entropy of ideal gas, change of entropy for different non-flow processes, principle of increase of entropy –absolute entropy, Effect of Entropy on Environment, Availability and Irreversibility. Exact differentials, T-D relations: Maxwell’s relations, Clausius Clapeyron equations, Joule-Thomson coefficient.

UNIT-IV Air Standard Cycles and I.C Engines 12Hrs

Power Cycles: Otto Cycle, Diesel Cycle, Dual Combustion Cycle, Description and representation on P–V and T-S diagram, comparison, thermal efficiency. Mean effective pressure, related problems.

I.C. Engines: Definition of Engine and Heat Engine, I.C Engine Classification – Parts of I.C. Engines, Working of I.C. Engines, Two Stroke & Four Stroke I.C. Engines, SI & CI Engines, differences, Valve and Port Timing Diagrams.

UNIT-IV Testing and Performance

12Hrs

Testing and Performance: Parameters of Performance - Measurement of Cylinder Pressure, Fuel Consumption, Air Intake, Exhaust Gas Composition and their effect on environment, Brake Power – Determination of Frictional Losses and Indicated Power – Performance Test – Heat Balance Sheet, Related problems. Performance evaluation using IC engine software

Textbooks:

1. R.K. Rajput, Thermal Engineering, Hyderabad, Lakshmi Publications Pvt. Ltd, 9th Edition, 2013.
2. V. Ganesan, I.C. Engines, Noida, 4th Edition, Tata McGraw Hill, 2014.
3. R.S. Khurmi & J.K. Gupta, Thermal Engineering, 15th Edition, Hyderabad, S.Chand, 2013.

References:

1. P.L. Balleny, Thermal Engineering, 20th Edition, Khanna Publishers, New Delhi, 1994.
2. R. Yadav, Steam & Gas Turbines and Power plant engineering, 7th revised Edition, Central Publishing House, Allahabad, 2009.
3. S. Domkundwar, C.P. Kothandaraman, Anand Domkundwar, Dhanpat Rai & Co. 2016.

Mapping of COs with POs & PSOs

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

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20AME15 Human Factors and Ergonomics

Pre-request: Nil

Outcomes:

On successful completion of the course, the student will be able to,

1. Analyse the importance of ergonomics and its role in the human body and work environment.
2. Identify musculoskeletal disorders in the work environment and behavioral aspects of workplace posture
3. Apply anthropometry in designing workstations
4. Analyse the ergonomical aspects of repetitive works and thereby prevent work related musculoskeletal disorders
5. Relate human sensory, cognitive, physical capabilities and limitations and suitably design workplace displays and controls.

UNIT I: Introduction

10Hrs

Introduction to Human Factors and ergonomics, ergonomics and its areas of application in the work system, a brief history of ergonomics, scientific management and work study, human relations and occupational psychology, Fitting task to the man, attempts to humanize work, modern ergonomics.

UNIT II: Human Body as a Mechanical System

12Hrs

Posture stability, Body Mechanics, anatomy of the spine and pelvis related to posture, lumbo-pelvic mechanism, low back pain and muscular fatigue, psychosocial factors and physical stressors, tolerance for collisions and shocks, spinal compression, measurement of musculoskeletal pain in the workplace, system integration, role of occupational factors.

UNIT III: Anthropometry and Workstation Design

14Hrs

Anthropometry and its uses in ergonomics, sources of human variability, factors influencing the change in body size of populations, anthropometric surveys, design to fit a target population, cost-benefit analysis and trade-offs, digital human models, workstation design and reach, design adjustable products, space planning for offices, industrial workplace layout.

Anatomy of human posture, Fundamental aspects of standing and sitting, effective workstation design, visual, postural and temporal requirements, holding times for static postures, footrests and foot rails, ergonomics of seated work, dynamic postures, visual display terminals, guidance for office workstation design, work surface design, static work-risk assessment.

UNIT IV: Repetitive Risk Assessment and Design of Manual Handling**12Hrs**

Risk factors associated with pain and injury, models of the development of work related musculoskeletal disorders (WMSDs), hand tools and handle design, limits for hand/wrist exertions in repetitive work, key board design, cell phones and E-games, cursor control devices, strain index, prevention of WMSDs.

Biomechanics of human walking (Gait), postural control in dynamic tasks, anatomy and biomechanics of manual handling, back injuries, foot-floor interface, slips, trips and falls, design of manual handling and carrying tasks, NIOSH lifting equation.

UNIT V: Display, Controls and Virtual Environments**10Hrs**

Visual design, measurement of light, avoidance of glare, key principles for display design, head mounted displays, auditory displays, Designing Displays and Controls, Key Principles for Display Design, Guiding Visual Search in Complex Displays, Auditory Displays, Design of Controls, Voice Control, System Integration.

References

1. R.S. Bridger, Introduction to Ergonomics, 2nd Edition, Taylor & Francis, 2003
2. Sanders, M.S. and McCormick E.J. Human Factors in Engineering and Design (7th Ed.). McGraw-Hill, Inc, 1997.
3. Kroemer, K.H.E., Kroemer, H.B., and Kroemer-Elbert, K.E. Ergonomics: How to Design for Ease and Efficiency (2nd Ed.). Upper Saddle River, New Jersey: Prentice Hall, 2001.
4. Wickens, C.D., Lee, J.D., Liu, Y., Gordon Becker, S.E. An Introduction to Human Factors in Engineering (2nd Ed.). Upper Saddle River, New Jersey: Pearson Prentice- Hall, 2004.
5. Dul, J. and Weerdmeester, B. Ergonomics for beginners, a quick reference guide, Taylor & Francis, 1993.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	-	-	-	-	-	-	3	3	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-	3	3	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-	3	3	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-	3	3	-

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20AME16 Materials Characterization Techniques

Pre-requisite: Engineering Materials Engineering

Course Outcome:

Upon successful completion of the course the students will be able to

1. Describe basics of crystal structures and diffraction techniques used in characterization.
2. Demonstrate the principle of microscopic and spectroscopic techniques used in materials characterization.
3. Explain the modes of operation of SEM and TEM for characterization study.
4. Discuss the advanced characterization techniques used in materials testing.

UNIT I Basic Crystallography and Need for Materials Characterization 10Hrs

Basic crystallography and Need for Material Characterization - Unit cells, Crystal structure, Primitive and Non- primitive cells, Symmetry elements and point group notations, Streographic projections - Need for Material Characterization - Methodology for Material Characterization and Analysis

UNIT II Diffraction and Imaging 12Hrs

Phenomena of diffraction; Radiation-matter Interactions and response signals; X-ray diffraction: powder diffraction, phase identification, Scherrer formula, strain and grain size determination; Fundamentals of Imaging: magnification, resolution, depth of field and depth of focus, aberration and astigmatism; X-Ray reflectivity.

UNIT III Optical Microscopic techniques 15Hrs

Special microscopy techniques and applications: Bright field and dark field imaging; confocal microscopy; interference microscopy; polarized light microscopy; phase contrast microscopy. Scanning near field laser microscopy; Image processing and quantification.

Optical Spectroscopic techniques

Principle, Working and Result Analysis of Fourier Transformation Infra-Red Spectroscopy; Raman Spectroscopy; UV-Vis Absorption Spectroscopy; Photoluminescence Spectroscopy - Ellipsometer Spectroscopy

UNIT IV Electron Microscopic Techniques 12Hrs

Basics of Electron Microscopy - Introduction - Principle of SEM, Instrumentation, Contrast formation, Operational variables, Specimen preparation, imaging modes, Applications, Limitations – FE-SEM, FIB, EDAX. TEM - Introduction, Instrumentation, Specimen preparation: Mechanical thinning, electrochemical thinning, ion milling, sputter coating and carbon coating, replica methods. Image modes - mass density contrast, diffraction contrast, phase contrast, Applications, Limitations

UNIT V Advanced Characterization Techniques

11Hrs

Rutherford back scattering (RBS), Scanning Tunneling Microscopy (STM), Atom Force Microscopy (AFM) and different operational modes, X-ray Photoelectron Spectroscopy (XPS): Auger Electron Spectroscopy (AES), Dynamic SIMS and static SIMS. Characterization of Fluids - Viscosity, Relative density, thermal conductivity

Textbooks

1. P.R. Khangaonkar, An introduction to Materials Characterization, Reprint 2013, Penram International Publishing (India) PVT Ltd., 2010.
2. Yang Leng, Materials Characterization: Introduction to Microscopic and Spectroscopic Methods, 2nd edition, ISBN: 978-3-527-33463-6, Wiley Publications, 2013.

Reference Books

1. E.J. Mittemeijer, Fundamentals of Materials Science - the microstructure-property relationship using metals as model systems, Springer, 2010.
2. Cullity, Elements of X-Ray Diffraction, by Pearson Education India; 3rd edition, 2014.

Mapping of COs with POs & PSOs

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

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20AME17 Fuels and Combustion

Pre-request: Nil

Outcomes

1. Compare various fuel properties and its efficient use.
2. Choose the right type of fuel depends on various factors such as availability, storage, handling, pollution and cost of fuel.
3. Differentiate the properties of exhaust and flue gases and execute basic engineering and science concepts for the design of various combustion equipment.

UNIT I Classification and Properties of Fuels

10Hrs

Fuels-Types and characteristics of fuels-Determination of properties of fuels-Fuel analysis-Proximate and ultimate analysis-Calorific value (CV)-Gross and net calorific values (GCV, NCV) - Bomb Calorimetry - empirical equations for CV estimation

UNIT II Solid Fuels

9Hrs

Origin of coal-Ranking of coal-Washing, cleaning and storage of coal-Renewable Solid Fuels-comparative study of Solid, liquid and gaseous fuels-selection of coal for different industrial applications-carbonization of coal.

UNIT III Liquid Fuels

9Hrs

Origin of crude oil-composition of crude petroleum-classification of crude petroleum-Removal of salt from crude oil-processing of crude petroleum-Fractionation distillation-ADU and VDU- Cracking-Hydrotreatment and Reforming.

UNIT IV Gaseous Fuels

9Hrs

Rich and lean gas-Wobbe index-Natural gas-Dry and wet natural gas-Foul and sweet NG-LPG-LNG-CNG-Methane-Producer Gas-Water gas-Coal Gasification-Gasification Efficiency.

UNIT V Combustion and Combustion Equipment

10Hrs

General principles of combustion-types of combustion processes-Combustion chemistry- Combustion Equations-Kinetics of combustion-combustion of solid fuels-Combustion calculations-air fuel ratio-Excess air calculations.

Analysis of flue gases by Orsat apparatus-Combustion of solid fuels-grate firing and pulverized fuel firing system-Fluidized bed combustion-Circulating fluidized bed boiler-Burners-Factors affecting burners and combustion.

Text Books

1. Kenneth K.K., Principles of Combustion, 2nd ed., Wiley Publications, USA, 2012
2. Phillips H.J., Fuels-solid, liquid and gases–Their analysis and valuation, 1st ed., Foster Press, USA, 2010

Reference Books

1. Speight J.G., The Chemistry and Technology of Coal, 3rd ed., Taylor and Francis Ltd., USA, 2016
2. Sarkar S., Fuels and combustion, 3rd ed., Universities Press, India, 2009

CO's Mapping with program outcomes

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

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20AME18 Manufacturing Automation

Pre-request: Manufacturing processes

Outcomes:

After completion of this course the students will be able to:

1. Describe the basic automation principles and strategies to model manufacturing systems.
2. Describe the automated handling and storage systems and to employ robots for handling
3. Applying concepts of automation in inspection and testing using sensor technology
4. Monitor production lines with smart sensors and applying artificial intelligence to manufacturing

UNIT I: Basics of Automation

8Hrs

Introduction: Automation in production systems, automation principles and strategies, basic elements of automated systems, levels automation, CNC programming. Smart manufacturing and intelligent manufacturing

UNIT II: Automated Handling and Storage System

10Hrs

Automated Handling system: Overview of material handling, Automated material handling systems, Automated guided vehicles, Robots in material handling.

Introduction to storage systems, Buffer storage, Automated storage and Retrieval Systems (AS/RS) - carousel storage, Automatic data capture, overview of automatic identification systems, bar code technology

UNIT III: Automated Manufacturing System

10Hrs

Overview and types of manufacturing systems, Flexible manufacturing systems, cellular manufacturing, automated assembly system, Group Technology, part family and machine groups, Sensor technologies, automated inspection and testing, Transfer mechanism, Analysis of transfer lines, Coordinate measuring machines, Machine vision, Rapid prototyping.

UNIT IV: Programmable and Advanced Control Strategies

12Hrs

Programming methods, modes of operation, PLC Architecture, Instructions, Instruction addressing, latches, timers and counters, SCADA, DCS, Integration of PLC, SCADA and DCS with manufacturing systems, Man-machine interfaces, Introduction to PLM.

UNIT V: Smart and Intelligent Manufacturing

10Hrs

Real-time production monitoring techniques with smart sensors, Configuration of smart shop floor, traceability and call back of defective products, Industry 4.0- Standard, Artificial

Intelligence based systems, Virtual Business, e-Commerce Technologies, Global Manufacturing Networks, IOT in manufacturing

Textbooks:

1. Mikell P. Groover, Automation, Production Systems and Computer-Integrated Manufacturing, 2016, Fourth edition, Pearson Education, New Delhi.
2. Yusuf Altintas, Manufacturing Automation, 2012, Cambridge University Press, USA

Reference Books:

1. P. Radhakrishnan, S. Subramanyan, V. Raju, CAD/CAM/CIM, New age International, New Delhi.
2. David Bedworth, Computer Integrated Design and Manufacturing, TMH, New Delhi.
3. Rajesh Mehra, Vikrant Vij, PLSc & SCADA Theory and Practice, 2011, First Edition, University Science Press, New Delhi.
4. Gupta A. K., Arora S. K., Industrial Automation and robotics, 2013, Third Edition, University Science Press, New Delhi.

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CO2	3	1	-	-	-	2	1	-	-	-	-	-	3	3	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	3	3	-
CO4	3	-	-	-	-	-	2	-	-	-	-	-	3	3	-