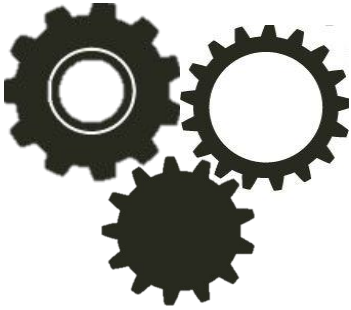
VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
Ibrahimbagh, Hyderabad-31

Approved by A.I.C.T.E., New Delhi and
Affiliated to Osmania University, Hyderabad-07

Sponsored by
VASAVI ACADEMY OF EDUCATION
Hyderabad

SYLLABI UNDER CBCS FOR
B.E VII & VIII SEMESTERS OF MECHANICAL ENGINEERING
(R-16)
WITH EFFECT FROM 2019-20
(For the students admitted in 2016-17)



DEPARTMENT OF MECHANICAL ENGINEERING

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VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
SCHEME OF INSTRUCTION AND EXAMINATION (R-16)
B.E. – MECH : SEVENTH SEMESTER (2019-20)

B.E (MECH) VII Semester								
Course Code	Course Title	Scheme of Instruction			Scheme of Examination			
		Hours per Week			Duration in Hrs	Maximum Marks		Credits
		L	T	D/P		SEE	CIE	
THEORY								
PC710ME	Thermal Turbomachines	3	-	-	3	70	30	3
PC720ME	Non Conventional Machining & CAM	3	-	-	3	70	30	3
PC730ME	Refrigeration & Air conditioning	3	-	-	3	70	30	3
PE7XXME	Professional Elective-II	3	-	-	3	70	30	3
PE7XXME	Professional Elective-III	3	-	-	3	70	30	3
PE7XXME	Professional Elective-IV	3	-	-	3	70	30	3
PRACTICALS								
PC711ME	Thermal Engineering Lab	-	-	2	3	50	25	1
PC721ME	CAE & CAM Lab	-	-	2	3	50	25	1
PW719ME	Project Seminar	-	-	2	-	-	25	1
	TOTAL	**18**	**-**	**6**	**-**	**520**	**255**	**21**
	GRAND TOTAL	**24**				**775**		**21**

1) Student should acquire one online certificate course during III semester to VIII semester
2) Left over hours allotted to CC / RC / TC

With effect from the Academic Year 2019-20

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF MECHANICAL ENGINEERING

List of Professional Electives Stream wise (R-16)								
	Design engineering		Manufacturing engineering		Thermal engineering		Industrial engineering	
	Course Code	Title	Course Code	Title	Course Code	Title	Course Code	Title
VII-Semester								
PE-II	PE710ME	Production Drawing	PE720ME	Computer Integrated Manufacturing	PE730ME	Fuels and Combustion	PE740ME	Supply Chain Management
PE-III	PE750ME	Composite Materials	PE760ME	Non Destructive Testing	PE770ME	Advanced Fluid Dynamics	PE780ME	Basics of Value analysis and Value Engineering
PE –IV	PE790ME	Robotics	PE712ME	Product Life Cycle Management	PE713ME	Automobile Engineering	PE714ME	Operations Research

With effect from the Academic Year 2019-20

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

THERMAL TURBO MACHINES

SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:70	Course Code: **PC710ME**
Credits : 03	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
The objective of the course is to understand compressible flows and their application to normal shocks; study basic principles, governing equations and analysis of flow through turbo machines, jet propulsion and rocket propulsion systems.	1 understand the basics of compressible flow and analyse the flow through a normal shock and evaluate the flow properties downstream of a shock. 2 apply thermodynamic concepts to analyze turbo machines. 3 analyse flow through turbo machines such as compressors, steam and gas turbines. 4 calculate the performance of turbo machinery. 5 estimate the performance of jet and rocket propulsion systems.

UNIT-I: INTRODUCTION TO COMPRESSIBLE FLOWS

Speed of propagation of pressure waves, Mach number, Acoustic velocity, mach cone and mach angle; pressure field due to a moving source of disturbance; static and stagnation properties.

Introduction to flow in constant area ducts with friction – Fanno flow, variations of flow properties, variation of mach number with duct length.

Introduction to flow in constant area ducts with Heat Transfer – Rayleigh line, Rayleigh flow relations, Variation of flow properties, Maximum heat transfer.

Introduction to shocks waves – Development of Normal shock waves, governing equations, Prandtl– Meyer relation, Rankine– Hugoniot equations, Stagnation pressure ratio across the shock. basic problems.

UNIT-II: ROTO DYNAMIC COMPRESSORS

Introduction and general classification. Comparison of Reciprocating and Rotary compressors. Positive displacement Rotary compressors: Roots Blower and Vane blower; basic problems

Centrifugal Compressors: Principle of Operation, T-s diagram, Euler's Equation, velocity triangles, types of blades, Nomenclature of an aerofoil blade, Analysis of Flow, pre whirl, slip factor and its effect on work input, work done and pressure rise in a centrifugal compressor, performance characteristic, basic problems

Axial Flow Compressors: Construction, Principle of operation, velocity triangles. Analysis of Flow, Work done factor, Stage efficiency, Degree of reaction, Performance characteristics; basic problems, chocking, Surging and stalling.

UNIT-III: STEAM TURBINES

Classification, flow over blades, De Laval Turbine - Nozzle efficiency, Blade efficiency and Gross stage efficiency of Impulse turbine, Velocity diagrams for Impulse turbine , blade efficiency of Impulse turbine, Optimum blade speed ratio, Maximum work done and blade efficiency of Impulse turbine, Simple problems, Compounding of steam turbines– pressure compounding, velocity compounding and pressure – velocity compounding- pressure velocity variations.

Parson Reaction turbine- Velocity diagram, Degree of reaction, blade efficiency, Maximum work done, Calculation of height of blades, Balancing of End thrust.

UNIT-IV: GAS TURBINES

Applications and Classification of Gas Turbines– constant pressure and constant volume gas turbines, Joule cycle– configuration diagram and temperature – entropy diagram, Thermal efficiency, Maximum pressure ratio in terms of temperature ratio, optimum pressure ratio for maximum work output with and without considering machine efficiencies, Improvement of gas turbine plant performance– Inter– cooling, Reheating and Regeneration. Basic Problems on Joule cycle.

UNIT-V: JET PROPULSION

Introduction, Jet engine types, Application of jet engines, air craft propulsion theory, Energy flow through jet engines, thrust, thrust power and propulsive efficiency. Turbo jet, Turbo prop, Turbo fan engines, Ramjet engines, pulse jet engines, Thrust augmentation; Simple Problems

Rocket Propulsion: Type of Propellants, Types of Rocket engines, Rocket propulsion theory– Rocket applications, Simple Problems

Learning Resources:

1. Yahya S.M. "Fundamentals of compressible flow", New Age International publishers, January 2016.
2. Yadav R. "Steam and Gas Turbines and Power plant Engineering"', Central Publishing House Ltd, Allahabad , 2007.
3. Ganesan, V., "Gas Turbines", Tata McGraw Hill Book Company, New Delhi, 2010.
4. Vasandani, V.P. and Kumar, D.S., "Treatise on Heat Engineering", Chand and Co Publishers, New Delhi, 2011.
5. Cohen H Rogers and G.F.C. and H.I.H. Saravanamuttoo, "Gas Turbine Theory", Longman, 5th Edition, New York 2004.

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	20
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **1 Hour**

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

NONCONVENTIONAL MACHINING AND CAM

SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:70	Course Code: **PC720ME**
Credits : 03	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
The objective of the course is to study the principles and technology of various modern machining processes; study the types of NC machines, components and other advanced technologies.	1 study the principle and process of ultrasonic, abrasive jet, water jet machining methods. 2 study the principle and process of chemical machining, ECM, EDM, PAM, EBM and LBM. 3 explain the basic concepts of CNC machines and their programming. 4 explain the importance of group technology, computer aided process planning, flexible manufacturing system. 5 understand the latest technologies in computer aided manufacturing.

UNIT-I

Modern machining processes: Need, Classification

Ultrasonic machining: Elements of the process, tool feed mechanism, abrasive feed mechanism Applications and limitations.

Abrasive Jet machining : Principle , advantages and disadvantages, applications

Water jet machining: Principle , advantages, applications

UNIT-II

Electro chemical machining: Elements of ECM process and principle of operation, applications

Chemical machining: Elements of process and principle of operation, applications

Electrical discharge Machining: Components of EDM, principle of operation, Dielectric fluids and their requirements, applications.
Principle of operation of Plasma arc machining, electron beam machining and Laser beam machining

UNIT-III: Numerical Control of Machine Tools
Features and elements of NC. Positional, paraxial and contouring types. Definitions of axes, Definitions of interpolation, post– processor, preparatory and miscellaneous functions, canned cycles, tool length and cutter radius compensation. CNC programming using G and M codes for simple turning and milling operations.

UNIT-IV
Computer Numerical Control: CNC, DNC and adaptive control systems. Typical configurations and relative features. Machining centers, Introduction to FANUC, SINUMERIC controllers.
Industrial Robots: Robot Anatomy, Configurations, Controls, Drivers, Programming methods and applications.

UNIT-V
Group Technology: Part families, layout, part classification and coding system. Opitz, MICLASS and CODE system
Computer Aided Process Planning: Variant and Generative process planning.
Flexible Manufacturing System & Computer Integrated Manufacturing System: Building blocks of Flexible Manufacturing systems and their control, Elements of CIMS. CAD/CAM Integration, Introduction to 3D printing and Reverse Engineering.

Learning Resources:

1. P.C. Pandey and H.S. Shan, "Modern Machining processe",THM Education Pvt. Ltd., New Delhi
2. Ibrahim Zeid, "CAD/CAM, Theory and Practice", McGraw Hill Inc. New York, 2011.
3. Grover, MP and Zimmers E.W., "CAD/CAM", Prentice Hall of India, 1989.
4. Rao P.N., "CAD/CAM: Principles and Applications", 2nd Edition, Tata McGraw Hill, New Delhi, 2004.
5. YoramKoren, "Computer Control of Manufacturing Systems", McGraw Hill Inc. New York, 1994

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2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **1 Hour**

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

REFRIGERATION AND AIR CONDITIONING

SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:70	Course Code: **PC730ME**
Credits : 03	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
The objective of this course is to discuss basics of refrigeration and describe the working of different types of refrigeration systems; explain the principles of psychrometry, list different equipment used in air conditioning plant and study working of different types of refrigeration systems.	1 classify refrigerants and analyze the performance of air refrigeration and air craft refrigeration systems. 2 solve problems in vapour compression refrigeration systems and evaluate their performance. 3 compare VAR and VCR systems and express working principles various refrigeration systems. 4 define different properties of psychrometry and list different air conditioning systems. 5 compute cooling loads of an air conditioning building, identify different equipment used and explain different applications of Refrigeration and Air conditioning systems.

UNIT-I

Introduction to Refrigeration: Definition of Refrigeration and Air–conditioning –Necessity of Refrigeration and its applications – Methods of Refrigeration, unit of Refrigeration and COP. Reversed Carnot cycle – limitations, effect of operating temperatures.

Properties of Refrigerants: Classification of RefrigerantsRefrigerant nomenclatureDesirable properties of Refrigerants – Thermodynamic, Chemical and Physical properties. Alternative Refrigerants to HCFC refrigerants and Future refrigerants.

Aircraft refrigeration System: Analysis of Bell Colemen cycle / reversed Brayton cycle, open and dense air system. Application to aircraft refrigeration, simple cooling system, bootstrap simple evaporative system, regenerative cooling system and reduced ambient cooling system.

UNIT-II: Vapor Compression Refrigeration System

Working principle and essential component of a simple vapour compression refrigerator cycle, compressor, condenser, evaporator and expansion devices. Analysis of the cycle, COP, Representation of the cycle on T –S, P– H Charts.

Dry and wet compression, effect of operating conditions like evaporating pressure, condenser pressure, liquid sub cooling and vapour super heating performance of the system.

Applications of VCR system: Domestic Refrigerator and water cooler.

Low temperature refrigeration system (with single load system) – compound compression with water inter cooler and flash inter cooler with single expansion valve. Cascade refrigeration system – analysis, advantages and applications.

UNIT-III

Vapour absorption Refrigeration system: Simple absorption system, COP, practical Ammonia refrigeration absorption system, Lithium Bromide absorption system, Electrolux Refrigerator, common refrigerant and absorbents properties. Comparison with vapour compression refrigeration system.

Working principle, advantages and applications of Steam Jet Refrigeration System, Thermoelectric refrigeration system, pulse tube refrigeration system and solar refrigeration system

Introduction to Cryogenics: Linde system and Claude system, applications of cryogenics.

UNIT-IV

Psychrometry: Psychrometric properties, Psychrometric chart and its construction and representation of Psychrometric processes on the chart – heating & cooling with humidification and dehumidification and adiabatic dehumidification, adiabatic chemical dehumidification and mixing processes, types and working of psychrometers.

Introduction to Air conditioning: Requirement of comfort air conditioning, Thermodynamics of human body, body temperature, metabolism, body defense, effect of heat on performance, ASHRE comfort chart, effective temperature.

UNIT-V

Cooling load calculations for building air conditioning:

Different sources of heat:Heat flow due to conduction,sun load due to direct solar radiation,load from occupants, equipment load, infiltration air load and miscellaneous heat sources,fresh air load, Energy conservation for building air conditioning.

Design of Air conditioning system: All fresh air load, Re circulated air, Re circulated air with Reheat coil and Re circulated air used for heating the air coming out of conditioner.

Concept of by-pass factor, sensible heat factor, Apparatus Dew Point, Room Sensible Heat Factor (RSHF), Gross Sensible Heat Factor (GSHF).

Air conditioning systems and Equipments: Working of Window/Split air conditioner, packaged air conditioner and central air conditioning system. Types of equipment used in Air conditioning systems such as Humidifiers, Dehumidifiers, filters, grills fans and blowers.

Note: Use of R&AC tables and charts permitted.

Learning Resources:

1. Stocker W.S., "Refrigeration & Air Conditioning", 2nd Edition, Tata McGraw-Hill, New Delhi, 1985.
2. Roy J.Dossat., "Principles of Refrigeration-SI Version", 4th Edition, Wiley Eastern Limited, New Delhi, 2016.
3. Arora C.P., "Refrigeration and Air Conditioning", 3rd Edition, Tata Mc Graw-Hill, New Delhi, 2010.
4. Arora S.C. and DomkundwarS,"A course in refrigeration and air conditioning," 8th Edition, Dhanpat Rai & Co, 2010.
5. Manohar Prasad., "Refrigeration and Air conditioning", 3rd Edition, New Age International publishers, New Delhi, 2016.
6. Prof Ramgopal, IIT Kharagpur, Web and Video material of NPTEL.

Data Book:

Dr.S.S.Banwait & Dr.S.C.Laroiya., "Birla's Properties of Refrigerant &Psychrometric Tables &charts in S.I. Units".

The break-up of CIE: Internal Tests + Assignments + Quizzes

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2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **1 Hour**

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

PRODUCTION DRAWING (PE-II)

SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:70	Course Code: **PE710ME**
Credits : 03	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVE	**COURSE OUTCOMES** *On completion of the course, students will be able to*
The objective of this course is to practice the conventional representation of machine elements;limits, fits and tolerances; surface finish and surface treatments; make production drawings and process sheets for a given assembly.	1 familiar with conventional representation. 2 understand the use of limits fits and surface finish symbols. 3 prepare production drawings and process sheets.

UNIT-I

Layout of drawing sheet, title block, conventional representation of : Materials, machine components.

UNIT-II

conventional representation of : welding symbols, hydraulic, pneumatic symbols, surface treatment

UNIT -III

Limits and Fits: Basic definition of terms, alpha numeric designation of limits / fits. Types of Fits.

UNIT -IV

Tolerances of form and position, surface roughness, process sheet.

UNIT-V

Part drawings from assemble drawings, indicating conventions: Petrol engine connecting rod, foot step bearing, hydraulic cylinder, stuffing box, hooks joint, piston, screw jack, single tool post.

N.B.: Tolerance charts to be provided in the examination hall for calculation of limits.

Learning Resources:

1. K.L. Narayana, P. Kannaiah and K. Venkata Reddy, "Production Drawing", New Age International Pvt. Ltd., Revised Ed. 1997.
2. T. Narasimha Reddy, T. A. Janardhan Reddy and C. Srinivasa Rao, "Production Drawing Practice", Hitech Publishers, 2001.
3. R.K. Jain, "Engineering Metrology", Khanna Publishers, 2009.

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Duration of Internal Test: **1 Hour**

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

COMPUTER INTERGRATED MANUFACTURING (PE-II)

SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:70	Course Code: **PE720ME**
Credits : 03	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVE	**COURSE OUTCOMES** *On completion of the course, students will be able to*
The objective of the course is to understand the various islands of automation in an industry and also calculate the relevant parameters of automation	1 understand the effect of manufacturing automation strategies and derive production metrics.
	2 analyze automated flow lines and assembly systems, and balance the line.
	3 design automated material handling and storage systems for a typical production system.
	4 design a manufacturing cell and cellular manufacturing system.
	5 Understand the various automated inspection systems

UNIT-I: MANUFACTURING AUTOMATION

Automated Manufacturing Systems, Computerized Manufacturing Support Systems, Reasons for Automation, Automation Strategies-The USA Principle, Ten Strategies for Automation and Process Improvement, Automation Migration Strategy.

UNIT-II

Automated Flow lines: System Configurations, Workpart Transfer Mechanisms, Storage Buffers, Control of Production Line, Analysis of Transfer Lines-Transfer Lines with No Internal Parts Storage, Transfer Lines with Internal Storage Buffers.

Manual Assembly Lines: Assembly Workstations, Work Transport Systems, Line Pacing, Coping With Product Variety, Analysis of Single Model Assembly Lines-Repositioning Losses, The Line Balancing Problem,

Line Balancing Algorithms-Largest Candiate Rule, Kilbridge and Wester Method, Ranked Positional Weights Method.

UNIT-III: AUTOMATED ASSEMBLY SYSTEMS

System Configurations, Parts Delivery at Workstations, Applications, Quantitative Analysis of Assembly Systems- Parts Delivery System at Workstations, Multi-station Assembly machines, Single Station Assembly Machines, Partial Automation.

UNIT-IV: AUTOMATIC MATERIAL HANDLING AND STORAGE SYSTEMS

Design Considerations in Material Handling, Material Transport Equipment-Industrial Trucks, Automated Guided Vehicles, Monorails and Other Rail-Guided Vehicles, Conveyors, Cranes and Hoists, Analysis of Vehicle Based Systems, Conveyor Analysis. Automated Storage/Retrieval Systems, Carousel Storage Systems, Engineering Analysis of AS/RS and Carousel Systems.

UNIT-V: AUTOMATED INSPECTION SYSTEMS

Overview of Automated Identification Methods, Bar Code Technology, Radio Frequency Identification, Other AIDC Technologies-Mangnetic Stripes, Optical Character Recognition, and Machine Vision.

Learning Resources:

1. Mikell P Groover, "Automation, production Systems and Computer Integrated Manufacturing",3rd Edition, Prentice Hall Inc., New Delhi, 2007.
2. Nanua Singh, "System Approach to Computer Integrated Manufacturing", Wiley & Sons Inc., 1st Edition, 1996.
3. Andrew Kusiak, Intelligent Manufacturing System, Prentice Hall Inc., New Jersey, 1992.

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Duration of Internal Test: **1 Hour**

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

FUELS AND COMBUTION (PE-II)

SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:70	Course Code: **PE730ME**
Credits : 03	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
The objective of the course is to classify and study fuels and their properties; study stoichiometry relations and the combustion process; familiarize different types of burners; know alternate fuels for IC Engines.	1 identify the different sources of fuel and characterize the fuels.
	2 understand the thermodynamics and kinetics of combustion.
	3 solve the problems related to theory of combustion, air requirement for burning fuel.
	4 conceptualize design considerations of burners.
	5 use alternate fuels in IC Engines

UNIT-I

Types of Fuels – solid, liquid and gaseous fuels; family of coal, origin of coal, analysis and properties of coal, properties related to combustion, handling and storage; action of heat on coal, oxidation of coal, hydrogenation of coal; efficient use of solid fuels; manufactured fuels; agro fuels; solid fuel handling.

UNIT-II

Origin and classification of Petroleum; refining and other conversion processes; composition of petroleum with respect to combustion; properties and testing of petroleum products; various petroleum products; nature of Indian Crudes & Petroleum refining in India; storage and handling of liquid fuels; liquid fuels combustion equipment.

Types of gaseous fuels; Natural gas, methane from coal mine, Producer gas, water gas, blast furnace gas, LPG.

UNIT-III

Combustion of Fuels: Stoichiometry relations; theoretical air required for complete combustion; calculation of minimum amount of air required for known composition; calculation of dry flue gases if fuel composition is known; calculation of composition of fuel and excess air supplied from exhaust gas analysis; flue gas analysis (O_2, CO_2, NO_X, SO_X).

UNIT-IV

Ignition and concept of ignition; auto-ignition temperature; flame propagation; various methods of flame stabilization; Incorporation in burner design,basic features of solid, liquid and gaseous fuel burner, design consideration of different types of coal, oil and gas burners, recuperative and regenerative burners.

UNIT-V

Alternate fuels for IC engines: Edible oils and non–edible oils for use in diesel engines, gaseous fuels like hydrogen, CNG, LPG for use in petrol engine.

Learning Resources:

1. Samir Sarkar, "Fuels and Combustion", 3rd Edition, Universities Press, 2009.
2. Sharma S P, "Fuels and Combustion", Tata McGraw-Hill, New Delhi, 2000.
3. Roger A, "Combustion Fundamentals", McGraw-Hill, New Delhi, 2000.
4. Kenneth K Kou, 'Principles of Combustion', Wiley & sons Publications, New York 2002.
5. S.R. Turns, "An introduction to combustion – Concepts and applications", Tata McGraw- Hill, 2000.

The break-up of CIE: Internal Tests+ Assignments + Quizzes

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3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **1 Hour**

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

SUPPLY CHAIN MANAGEMENT (PE-II)

SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:70	Course Code: **PC740ME**
Credits : 03	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVE	**COURSE OUTCOMES** *On completion of the course, students will be able to*	
The objective of the course is to know the significance of supply chain management in engineering, maintain inventory and pricing.	1	apply supply chain management concepts in engineering applications.
	2	design a supply chain network.
	3	estimate the demand and supply in a supply chain.
	4	manage inventory and optimize demand and supply gaps.
	5	plan an effective transportation and warehouse management systems.

UNIT-I: INTRODUCTION-SUPPLY CHAIN MANAGEMENT (SCM)

Logistics and SCM, types of supply chains, major drivers of supply chain; objective and importance of SCM, structure of a supply chain, roles of facilities, inventory, transportation, information, and pricing in SCM.Examples of supply chains.

UNIT-II: DESIGNING SUPPLY CHAIN NETWORK

Design options for distribution network, online sales and the distribution network, Indian commodities distribution channels, role of network design in supply chain, factors influencing network design decisions, impact of globalization on supply chain networks.

UNIT-III: PLANNING DEMAND & SUPPLY IN A SUPPLY CHAIN

Supply chain planning, demand planning and forecasting, forecasting error, aggregate planning, and aggregate planning strategies, operational practices in supply chain, Just-in-time, Kanban, Vendor-managed inventory, managing supply & demand, supply chain security management.

UNIT-IV: PLANNING & MANAGING INVENTORIES IN A SUPPLY CHAIN

classification of inventory, role of cycle inventory in supply chain, control of inventories in retail and services, economies of scale to exploit fixed costs and quantity discounts, short-term discounting: Trade promotions, managing uncertainty: safety inventory and optimal level of product availability.

UNIT-V

Designing and planning transportation networks: role of transportation in supply chain, modes of transportation and their performance characteristics, design options for a transportation network, Mumbai Dabbawalas: A highly responsive distribution network.

Sourcing decisions in supply chain: role of sourcing in a supply chain, In-house or outsource?, supplier selection-auctions and negotiations, sharing risk and reward in the supply chain.

Learning Resources:

1. Sunil Chopra & Peter Meindl, "Supply Chain Management – Strategy, Planning and Operation", 6th Edition, Pearson India Education Services Pvt. Ltd., 2018.
2. N. Chandrasekaran, "Supply Chain Management – Process, System, and Practice", Oxford University Press, 2010.
3. R. P. Mohanty, S. G. Deshmukh, "Supply Chain Management – Theory & Practices", Biztantra, New Delhi, 2010.
4. Martin Christopher, "Logistics & Supply Chain Management", 5th Edition, Financial Times Series,2010.
5. Dobler Donald. W, David N.Burt, "Purchasing &Supply Management Text & Cases", McGraw-Hill, 1996.
6. ChitaleK. Gupta R.C, "Materials Management-Text and Cases", Prentice-Hall of India Pvt. Limited, 2007.

The break-up of CIE: Internal Tests+ Assignments + Quizzes

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2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **1 Hour**

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

COMPOSITE MATERIALS (PE-III)

SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:70	Course Code: **PE750ME**
Credits : 03	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVE	**COURSE OUTCOMES** *On completion of the course, students will be able to*
The objective of the course is to understand the basic principles and importance of composite materials and analyse the composite materials.	1 understand the importance of composite materials in engineering applications.
	2 manufacturing and testing of composites.
	3 analysis of the composites for various elastic constantsat macro level and micro level.
	4 understand the basic theories of failures associated with composites.
	5 calculate the strength of laminates in composites.

UNIT-I: INTRODUCTION

Definition and classification of Composites (PMC, MMC, CMC), FRP Composites, Fiber Reinforcements: Fiber Types and its properties, Fiber Forms, matrix materials and its properties: Thermoset Matrices, Thermoplastic matrices, Applications of Composite Materials.

UNIT – II

Manufacturing Processes: Hand– Lay– Up, Bag Molding, Autoclave processing, compression Molding, Resin Transfer Molding, Pultrusion, filament winding, Gel time test for resins, curing cycle.

Measurement of basic composite properties: Fiber and matrix tests, Tensile test, compressive test, in plane shear test, interlaminar shear test, flexure test.

UNIT-III: MICROMECHANICS OF COMPOSITES

Basic concepts: Volume and Mass fraction, Heterogeneous, Anisotropic, Orthotropic, Transversely lsotropic and Isotropic Materials.
Mechanical Properties: Prediction of Elastic constants, micromechanical approach, Halpin– Tsai equations.
Thermal properties: Thermal Expansion, Moisture Expansion, Transport Properties.

UNIT-IV: MACRO MECHANICS OF COMPOSITES

Elastic constants of a lamina, relations between engineering constants and reduced stiffness and compliances, variation of lamina properties with orientation, Classification of Laminated composites, analysis of laminated composites, stresses and strain with orientation, Inter laminar stresses and edge effects.

UNIT-V: STRENGTH OF ORTHOTROPIC LAMINA

Tensile and compressive strength of unidirectional fiber composites, fracture modes in composites, delamination failure, Maximum stress theory, maximum strain theory Tsai– Hill Criterion, Tsai– Wu Criterion.
Laminate Strength: First ply Failure, Fiber Failure, Truncated Maximum–Strain Criterion.

Learning Resources:

1. Ronald F.Gibson, "Principles of composite Materials Mechanics", McGraw– Hill Inc, 1994.
2. Krishna, K.Chewla. "Composite materials", Springer– Verlag, 1987.
3. Carl. T.Herakovich, "Mechanics of Fibrous Composites", John Wiley sons inc., 1998
4. Ever J.Barbero, "Introduction to composite Materials Design", Taylor & Francis, 1999.
5. Jones, R.M., "Mechanics of composite Materials", McGraw– Hill Inc. 1967.

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	20
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **1 Hour**

With effect from the Academic Year 2019-20

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

NON-DESTRUCTIVE TESTING (PE-III)

SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:70	Course Code: **PE760ME**
Credits : 03	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1 To study the importance of various non-destructive testing method.	1 understand the importance and practical applications of various non-destructive methods in industry.
2 To study different methods to find the surface and subsurface defects in the components.	2 evaluate the surface and sub surface defects of the components produced in industry.
3 To study different methods of finding surface, internal defects and properties of the components.	3 apply the methods for inspecting surface, internal defects and to find mechanical properties of the components.
4 To study computer aided inspection processes to find defects in components used in medical field.	4 select appropriate computer aided method of inspection of the components depending upon applications.
5 To study inspection method using light source.	5 apply appropriate methods based on light as source of inspection and machine vision.

UNIT-I

Types of defects and characteristics - NDT overview – quality assurance– visual inspection–comparative features of conventional Non destructive Testing and Evaluation Methods including Optical, Radiography, Ultrasonic Testing, Dye penetrate testing, Eddy current testing .

UNIT-II

Leak testing – liquid penetrant testing – penetrant used – equipment – penetration, emulsification, and solvent removal. Eddy current testing – material conductivity – coil impedance–coils and instruments– skin effect – frequently used inspection probes.

UNIT-III

Radiography –sources of radiation –shadow formation, enlargement and distortion – recording media Infrared and thermal testing – imaging systems – detectors – analysis methods.

Ultrasonic testing – generation of ultrasound – methodologies – transducers and equipment used – flaw detection - sensitivity and calibration.

UNIT-IV

Magnetic particle testing–magnetization methods–continuous and residual methods – sensitivity – demagnetization.

Computer aided image processing methods for radiography and ultrasonic's, tomography in these areas.

Optical techniques of non-destructive evaluation: Principles of Photo elasticity, holographic Interferometry

UNIT-V

Laser speckle techniques; use of fibre optics, non-invasive techniques in medical field and NDT.

Machine Vision-system components, Sensors, specifications for resolution & range.

Learning Resources:

1. Barry Hull, 'Non-Destructive Testing' –Vernon John, ELBS/ Macmillan, 1988.
2. Baldev Raj, T.JayaKumar, M.Thavansimuthee, 'Practical Non-Destructive Testing', Narosa Publishing House, New Delhi, 1997.
3. Journals: British Journal of NDT, Materials Evaluation, ISNDT Journal.
4. ASM Handbook: Non-Destructive Evaluation and Quality Control, ASM International, Vol. 17, 1989
5. Ravi Prakash, Non-Destructive Testing Techniques, New Age Science, 2009

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Duration of Internal Test: **1 Hour**

With effect from the Academic Year 2019-20

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

ADVANCED FLUID DYNAMICS (PE-III)

SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:70	Course Code: **PE770ME**
Credits : 03	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1 To evaluate control volume analysis to develop basic equations and to solve problems.	1 use the governing equations of fluid flow and apply them to flow problems.
2 To describe and use differential equations to determine pressure and velocity variations in internal and external flows.	2 explain the mathematical formulation of internal and external flow problems.
	3 analyze the boundary layer concept to the fluid flow problems.
3 To examine the concept of viscosity and it's importance in real flows.	4 understand physics of turbulence and turbulent fluid models applied to specific flow conditions.
	5 apply the basic principles to derive the equation for viscous flow, including laminar flow & turbulent flow.

UNIT-I: INVISCID FLOW OF INCOMPRESSIBLE FLUIDS

Lagrangian and Eulerain Descriptions of fluid motion- Path lines, Stream lines, Streak lines, stream tubes – velocity of a fluid particle, types of flows – Stream and Velocity potential functions. Basic Laws of fluid Flow: Potential flow, Condition for irrotationality, circulation & vorticity Accelerations in Cartesian systems normal and tangential accelerations, Euler's, Bernouli equations.

UNIT-II: VISCOUS FLOW

Equation of Fluid flow - Continuity & Momentum equation. Derivation of Navier - Stoke's Equations for viscous compressible flow – Exact solutions to certain simple cases: Plain Poisoulle flow – Coutte flow with and without pressure gradient – Hagen Poisoulle flow.

UNIT-III: BOUNDARY LAYER CONCEPTS

External Flow-Prandtl's contribution to real fluid flows –Blasius solution - Prandtl's boundary layer theory – Boundary layer thickness for flow over a flat plate – Approximate solutions – Creeping motion (Stokes) – Oseen's approximation – Von-Karman momentum integral equation for laminar boundary layer.

UNIT-IV: INTERNAL FLOW

Boundary layer development-Hydrodynamic entry length-Smooth and rough boundaries – Equations for Velocity Distribution and frictional Resistance in smooth rough Pipes – Roughness of Commercial Pipes – Moody's diagram.

UINT-V: INTRODUCTION TO TURBULENT FLOW

Introduction to Turbulent Flow: Fundamental concept of turbulence – Time Averaged Equations – Boundary Layer Equations – Prandtl Mixing Length Model – Universal Velocity Distribution Law: Van Driest Model –Approximate solutions for drag coefficients – More Refined Turbulence Models – k - ε model.

Learning Resources:

1. Frank M. White "Fluid Mechanics" -Mc Graw Hill, 8th Edition, 2006.
2. Potter M.C, David C. Wiggert, Bassem H. Ramadan, "Mechanics of Fluids", Cengage Learning, 5th Edition, 2017.
3. Jog C.S, "Fluid Mechanics", Cambridge University Press, 3rd Edition, 2015.
4. Munson, Okiishi, Huebsch, Rothmayer, "Fluid Mechanics", Wiley, 7th Edition, 2015.
5. Modi P.N, and Seth S.M., "Hydraulics and Fluid Mechanics Including Hydraulics Machines", Standard book house, 21st Edition, 2017.

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Duration of Internal Test: **1 Hour**

With effect from the Academic Year 2019-20

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

BASICS OF VALUE ANALYSIS AND VALUE ENGINEERING (PE-III)

SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:70	Course Code: **PE780ME**
Credits : 03	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*	
The objective of the course is to understand the importance of value engineering and its application Industry. Familiarize with the procedure of Value analysis and value engineering, implementation of value engineering and getting certificate	1	applying the concept of value engineering to the mechanical engineering.
	2	analyze the procedure of value analysis and value engineering and various phases of it.
	3	understand various stages in value engineering.
	4	auditing of value engineering and procedure for its certification

UNIT-I: INTRODUCTION

Meaning of Value Engineering (VE), Difference from other initiatives, Value and its types, Relationship between value vis-à-vis person, time and environment, History of Value Engineering / Value Analysis / Value Management, World bodies of Value Engineering & their activities, Multi-disciplinary team approach in Value Engineering study.

UNIT-II

Value Engineering Job Plan: Introduction, comparison of job plans of various value engineering. Finance and human relations in VE.

Orientation Phase: training associates in Value Analysis and Value Engineering (VAVE). Different trainings and certifications available in VAVE, Method to conduct VAVE studies.

UNIT-III

Information Phase: information needed for VAVE, Method to collect and analyze information, ABC Analysis, Pareto Analysis, Breakeven analysis.

Function Analysis Phase: Breakdown item into elements and sub-elements, questions to be asked, introduction to functions, practice session, types of functions (use and sell function), levels of function (basic and secondary), identify various functions, elements of cost, procedure for cost allocation, cost allocation to function, concept of worth, process flow for determining worth, discussions on worth, meaning of FAST, use of FAST, development history of FAST, different types of FAST. Ground rules of FAST, FAST diagram.

UNIT-IV

Creative Phase: Definition of creativity, misconceptions about creativity, introduction to creative techniques like TRIZ, 3P, lateral adoption and others

Evaluation Phase: selection of criteria, feasibility analysis, weighted evaluation methods, decision matrix.

UNIT-V

Recommendation Phase: Need for recommendation, method to make presentation, impact analysis and justification report, implementation plan, presentation skills.

Implementation Phase: Detailed design, verification and validation, certification, change implementation.

Audit Phase: Need for audit, types of audit, how to do audit.

Learning Resources:

1. SS.Iyer, "Value Engineering: A How to Manual ", New age International Publisher- 2nd Edition 2009
2. Anil Kumar Mukhopadhaya, " Value Engineering Mastermind: From Concept to Value Engineering Certification" SAGE, New Delhi.
3. Del. L.Yonker, "Value engineering analysis and methodology", CRC press, Newyork, 2015.
4. Dr.M.A.Bulsara, Dr.H.R.Thakkar, "Product Design And Value Engineering", Charotar publishers, 1st Edition 2015.
5. Lawrence D.Miles, "Techniques of Value Analysis and Engineering", 3rdEdition Newyork.
6. Anil Kumar Mukhopadhaya, "Value Engineering Mastermind: From Concept to Value Engineering Certification", SAGE, New Delhi,

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Duration of Internal Test: **1 Hour**

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

ROBOTICS (PE-IV)

SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:70	Course Code: **PE790ME**
Credits : 03	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
The objective of the course is to study robot anatomy, configuration, sensors, drives and applications of robots; to study forward, Inverse kinematics, dynamics and control.	1 explain basic terminology of robotics and summarize various applications of robots.
	2 apply direct and inverse kinematics to different robot manipulators using principles of D-H transformation.
	3 utilize Jacobian matrix for velocity relationship of joints and end effector and plan trajectory of robots using different techniques like cubic polynomial etc.
	4 estimate robot dynamics using Lagrange and Newton-Euler methods and develop control laws.
	5 explain different types of end effectors, sensors and drives that are needed for effective working of robots.

UNIT-I

Laws of robotics, Basic terminology, Basic configurations, Degrees of freedom, work envelope, motion control methods. Application in industry – material handling, loading & unloading, processing, welding & painting applications, assembly and inspection, Robot specification requirements.

UNIT-II

Rotation matrix. Euler angles. RPY representation, Homogeneous transformation matrix. Denavit – Hartenberg convention. Direct and

inverse kinematics for industrial robots for position and orientation, Redundancy.

UNIT-III

Manipulator Jacobian. Joint–End effector velocity, Direct and inverse velocity analysis, Trajectory planning, interpolation, cubic polynomial , linear segments with parabolic blending, Static force and moment transformation, Singularities.

UNIT-IV

Robot dynamics: Lagrangian and Newton–Euler formulation for RR & RP manipulators.
Control: individual joint, computed torque.

UNIT-V

End effectors: classification and working principle.
Sensors: Position, velocity, vision, proximity and range, tactile and force.
Drives for robots: Electrical, hydraulic and pneumatic.

Learning Resources:

1. M.W.Spong and M.Vidyasagar,"Robot Dynamics and Control", 1st Edition, John Wiley and sons,1990.
2. R.K.Mittal and I.J.Nagrath, "Robotics and Control", Tata McGraw-Hill, 2003.
3. Mikell P. Groover, Mitchell Weiss, Roger N. Nagel and Nicholas G. Odrey, "Industrial Robotics: Technology, Programming and Applications", McGraw-Hill Companies, 1986.
4. H.Asada and J-J.E.Slotine, "Robot Analysis and Control", Wiley Interscience, 1986.
5. K.S. Fu,R.C.Gonzalez and C.S.G. Lee , "Robotics, Control Sensing Vision and Intelligence", McGraw Hill, Int. Ed. 1987.

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Duration of Internal Test: **1 Hour**

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

PRODUCTION LIFE CYCLE MANAGEMENT (PE-IV)

SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:70	Course Code: **PE712ME**
Credits : 03	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
The objective of the course is to discuss various components of PLM like workflow, PDM process, collaborative product development, tools for communication and optimization, digital manufacturing, PLM strategy and management.	1 understand the concepts, processes and workflow in PLM.
	2 analyze the reasons for implementing a PLM system and its justification.
	3 study the prototype development, testing, validation and marketing.
	4 design and optimization of products.
	5 digital manufacturing and developing a PLM strategy and assessment.

UNIT-I

Introduction to Product Life Cycle Management: Definition, PLM Lifecycle model, Threads of PLM, Need for PLM, Opportunities and benefits of PLM, Views, Components and Phases of PLM, PLM feasibility study, PLM visioning.

PLM Concepts, Processes and Workflow

Characteristics of PLM, Environment driving PLM,PLM Elements, Drivers of PLM, Conceptualization, Design, Development, Validation, Production, Support of PLM.

Unit-II

Product Data Management (PDM) Process and Workflow: PDM systems and importance, reason for implementing a PDM system, financial justification of PDM implementation. Versioning, check-in and checkout, views, Metadata, Lifecycle, and workflow. Applied problems and solution on PDM processes and workflow.

Unit-III

Collaborative Product Development : Engineering vaulting, product reuse, smart parts, engineering change management, Bill of materials and process consistency, Digital mock-up and prototype development, design for environment, virtual testing and validation, marketing collateral.

Unit-IV

Tools of Communication for collaborative work : Creation of 3DXML and CAD drawing using CAD software. Creation of an animation for assembly instructions on 3D via composer, creation of an acrobat 3D document. Applied problems and solutions on tools of communication for collaborative work.

Knowledge and optimization of design products: Know how, best practices, parameterization of design, Applied problems and Solution on optimization of products using power copy, publication, parameters, formula, rule, check, design table, configuration, reaction.

Unit-V

Digital Manufacturing-PLM: Digital manufacturing, benefits manufacturing, manufacturing the first-one, Ramp up, virtual learning curve, manufacturing the rest, production planning.

Developing a PLM strategy and conducting a PLM assessment

Strategy, Impact of strategy, implementing a PLM strategy, PLM initiatives to support corporate objectives. Infrastructure assessment, assessment of current systems and applications.

Learning Resources:

1. Grieves Michael, Product Lifecycle Management- Driving the Next Generation of Lean Thinking, McGraw-Hill, 2006. ISBN 0071452303
2. Antti Saaksvuori, AnselmiImmonen, Product Life Cycle Management - Springer, 1st Edition (Nov.5, 2003)
3. Stark, John, Product Lifecycle Management: 21st Century Paradigm for Product Realization, Springer-Verlag, 2004. ISBN 18523
4. Concurrent Engineering: Shortening Lead Times, Raising Quality, and Lowering Costs (Paperback) by John R. Hartley

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Duration of Internal Test: **1 Hour**

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

AUTOMOBILE ENGINEERING (PE-IV)

SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:70	Course Code: **PE713ME**
Credits : 03	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1 To study the engine components in detail.	1 identify types of Automobiles and engine components, valve operation mechanisms and fuel injection system in petrol and Diesel engines.
2 Acquire knowledge of different types of cooling and lubrication systems.	2 describe the engine cooling, lubrication and modern ignition systems.
3 Understand the need of suspension and steering systems.	3 know the wheel alignment , suspension mechanisms and construction of tyres.
4 Acquire knowledge on operation of gear and brake mechanisms.	4 analyze the Working principle and operation of gear mechanisms and operation of brake systems.
5 Understand emissions and servicing of automobile.	5 know the servicing procedure of engine and pollution control techniques.

UNIT-I: INTRODUCTION

Types of automobiles, Electrical and Hybrid Vehicles: series and parallel systems, Fuel cell vehicle; chassis and body, components of chassis. Engine components: cylinder block, cylinder head, crankcase, inlet and exhaust manifolds, gaskets, cylinder liners, constructional features of piston, piston slap, methods to overcome piston slap. Piston rings, compression rings, oil control rings, crank shaft. Valve Operating Mechanisms, fuel supply system for petrol and diesel engines. Petrol Injection System: single point and multipoint injection, mechanical and electronic injection; Introduction to CRDI system for diesel engines.

UNIT-II

Lubricating System: Petroil System, splash system, pressure lubrication: Wet sump and Dry Sump.

Cooling System: Air Cooling, Water cooling: Thermosyphon, pump circulation system, components of cooling system : Radiator, Thermostat Control and Anti Freezing agents.

Ignition System: Battery Ignition System, Magneto Ignition System and Electronic Ignition System.

Starting motor: Bendex drive Mechanism, Automobile Air Conditioning.

UNIT-III

Suspension System: Rigid axle and Independent suspension system: Double wish bone type, Macpherson strut system, Air suspension system.

Steering System: front axle, types of stub axles, Wheel alignment, steering geometry: Caster, Camber, Toe-In, Toe-Out, King Pin Inclination .Ackerman steering mechanism, rack and pinion steering gear mechanism, Steering Linkage for vehicle with Rigid axle front Suspension System and with independent front suspension.

Wheels and Tyres : types of wheels: Disc wheels, wire wheels, alloy wheels, Wheel dimensions, Basic construction of tyres, tube type and tubeless type tyres.

UNIT-IV

Power Train: Single Plate Clutch and Multi plate Clutch, Manual Gear Box : Constant Mesh , Sliding Mesh, synchromesh . Automatic Gear Box, Torque Converter, Propeller Shaft, Universal Coupling, Differential.

Brakes: Types, Drum and Disc brakes, Mechanical and Hydraulic Brakes, Air Brakes, Master Cylinder, Wheel Cylinder, Hand Brake Linkage, **ABS** and SRS Airbag system.

UNIT –V

Automobile Emissions and control: emissions from automobiles, Euro Norms and Bharath Norms, Pollution Control Techniques. Catalytic Converters, EGR and Nano Fuel Additives.

Service Procedure: Tools and Equipment for Repair Engine Overhauling.

Learning Resources:

1. Crouse & Anglin, "Automobile Engineering", 10th Edition, Tata McGraw Hill Publishing Co. Ltd., New Delhi,. 2007.
2. Kirpal Singh, "Automobile Engineering", Vol.I& II, 13th Edition, Standard Publishers, New Delhi 2013.
3. R.B Gupta, "Automobile Engineering" 7th Edition, Satya Prakashan, New Delhi, 2015.
4. Joseph Heitner, "Automotive Mechanics", 2nd Edition, Affiliated East West Pvt. Ltd.2013.
5. C.P. Nakra, "Basic Automobile Engineering", 7th Edition, Dhanpat Rai Publishing C (P) Ltd.,2016

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Duration of Internal Test: **1 Hour**

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

OPERATIONS RESEARCH (PE-IV)

SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:70	Course Code: **PE714ME**
Credits : 03	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
The objective of the course is to understand the application of mathematics for real time problem solving to LPP, sensitivity analysis under set of constraints, applying mathematical techniques to solve transportation problem and assignment problems, applying time value money and ignoring the same to find the optimal replacement of machines, applying Johnsons rules to find the best sequence to minimize elapsed time and minimum no of servers to minimize waiting time of the customers and optimal utilization of servers.	1 Optimization of resources in multi disciplinary areas through linear programming under different conditions. 2 Sensitivity analysis of a linear programming problem as per customer requirements to suit various Organizations. 3 Minimization of total cost to apply for transportation techniques for the transhipment of Goods and products. 4 Optimum replacement of a machine by considering or ignoring time value of money using individual/group replacement policy. 5 Minimization of total elapsed time for sequencing problem processed through different. minimize waiting time of the customer and optimization of no. of servers.

UNIT – I

Introduction: Definition and scope of operations research.

Linear programming: Introduction, Formulation of linear programming problems, graphical method of solving LP problem, Simplex method, maximization and minimization, degeneracy in LPP, unbounded and infeasible solutions. Introduction of software to solve LPP.

UNIT – II

Duality: Definition, Relationship between optimal primal and dual solutions. Economic interpretation, Post optimal analysis (restricted to variation of resources i.e., RHS), Dual simplex method.

UNIT – III

Transportation model: Finding an initial feasible solution– north west corner method, least cost method, Vogel's approximation method, finding the optimal solution, optimal solution by stepping stone and MODI methods, special cases in transportation problems – Unbalanced transportation problem.

Assignment Problem: Hungarian method of assignment problem, maximization in assignment problem, unbalanced problem, problems with restrictions, travelling salesman problems.

UNIT –IV

Replacement models: Introduction, replacement of items that deteriorate ignoring change in money value, replacement of items that deteriorate considering change in money value with time, replacement of items that fail suddenly – individual replacement policy, group replacement policy.

Game theory: Introduction, 2 person zero sum games, maximin–minimax principle, principle of dominance, solution for mixed strategy problems graphical method for 2 x n and m x 2 games.

UNIT – V

Sequencing models: Introduction, general assumptions, processing n jobs through 2 machines, processing 'n' jobs through m machines processing 2 jobs through m machines.

Queuing theory: Introduction, single channel – poission arrivals – exponential service times with infinite population and finite population.

Learning Resources:

1. Hamady A. Taha, "Operations Research – An introduction", 6th Edition, PHI Pvt. Ltd., 1997.
2. S.D. Sharma, "Operations Research", Kedarnnath, Ramnath& Co., Meerut, 2009.
3. Harvey M. Wagner, "Principles of Operations Research", 2nd Edition, PHI Pvt. Ltd., 1980.
4. V.K. Kapoor, "Operations Research", S. Chand Publishers, New Delhi, 2004.
5. S.S. Rao, "Engineering Optimization – Theory and Practice", 4th Edition, John Wiley & Sons Inc., 2009.

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Duration of Internal Test: **1 Hour**

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

THERMAL ENGINEERING LAB

SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 0:0:2	SEE Marks:50	Course Code: **PC711ME**
Credits : 01	CIE Marks:25	Duration of SEE: 03Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
The objective of the course is to apply basic knowledge and laws of thermodynamics, heat transfer and principles of turbomachinery on different turbomachinery and heat transfer equipment.	1 evaluate the performance of thermal turbomachines such centrifugal blower and axial flow fan.
	2 study the pressure distribution on various aerodynamic models and calculate lift and drag coefficients using low speed wind tunnel.
	3 study the various modes of heat transfer using heat transfer equipment.
	4 determine the COP of air conditioning / refrigeration system.

List of Experiments

1. Determination of COP of the Air conditioning system.
2. Determination of percentage relative humidity and study of humidification on and dehumidification process in Air conditioning systems.
3. Determination of COP of the Refrigeration systems using capillary tube / thermostatic expansion valve.
4. Determination of overall efficiency of centrifugal blower.
5. Determination of overall efficiency of axial flow fan.
6. Pressure distribution on symmetrical and non– symmetrical specimen in wind tunnel.

7. Measurement of lift and drag force of the models in the wind tunnel test section.
8. Determination of thermal conductivity of metal bar.
9. Determination of the efficiency of pin– fin subjected to natural and forced convection.
10. Determination of effectiveness of heat parallel flow and counter flow heat exchanger
11. Determination of emissivity of given test plate.
12. Determination of Stefan Boltzman constant.

From the above experiments, each student should perform at least 12 (Twelve) experiments.

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for assessment for day to day evaluation			18
Duration of Internal Test: 2 **Hours**			

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

CAE AND CAM LAB

SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 0:0:2	SEE Marks:50	Course Code: **PC721ME**
Credits : 01	CIE Marks:25	Duration of SEE: 03Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
The objective of the course is to understand the CAE software applicability for analyzing structural and thermal problems and generate CNC part programs for various profiles to manufacture on CNC machines & to manufacture component using additive manufacturing technology.	1 select appropriate finite element for solving structural and thermal problems.
	2 correlate mathematical formulation using FE method.
	3 simulate real life structural and thermal problems.
	4 develop CNC programming for the given simple turning and milling operations & manufacture component using additive manufacturing technology.

List of Experiments

I. CAE Lab

1. Introduction to FEA software. Analysis using 1-d bar elements.
2. Analysis of Trusses
3. Analysis of Beams with different boundary conditions
4. Analysis of Beams with different loading conditions
5. Analysis of Plane stress and Plane strain problems
6. Analysis of axi-symmetric problems
7. Analysis of three dimensional objects by modeling them in FEA software
8. Modal Analysis of Beams.
9. Harmonic Analysis of Beams
10. Transient Analysis of Beams

11. Steady state Heat Transfer Analysis of a composite wall and a Fin
12. Developing a 3-D Model in a modeling software and analyzing it by importing into FEA software

II. CAM Lab

1. Write manual part programs for CNC lathe for operations like plain turning, step turning, taper turning.
2. Write manual part programs for CNC milling for operations like linear interpolation, circular interpolation, contouring and pocketing.
3. Manufacture of a 3-D component using additive manufacturing.

From the above experiments, each student should perform at least 12 (Twelve) experiments.

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for assessment for day to day evaluation			18
Duration of Internal Test: **2Hours**			

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

PROJECT SEMINAR

SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 0:0:3	SEE Marks:--	Course Code: **PW719ME**
Credits : 01	CIE Marks:25	Duration of SEE: ---

COURSE OBJECTIVE	**COURSE OUTCOME** *On completion of the course, students will be able to*
The objective of the course is to actively involve the students in the initial work required to undertake the final year project.	do the literature search to identify the project, define the specifications, understand tools and techniques to be used in the project for design, manufacturing and analysis.

The objective of the project seminar is to actively involve the students in the initial work required to undertake the final year project. It may comprise of:

1. Problem definition and specifications.
2. A broad understanding of the available techniques to solve a problem of interest.
3. Presentation (oral and written) of the project.

The Department can initiate the work related to project allotment at the end of III year II semester and complete it in the first two weeks of the fourth year I semester.

First 4 weeks of IV year Ist semester will be spent on special lectures by faculty members, research scholar and speakers from industries and R&D institutions. The objective of these talks is to expose students to real life / practical problems and methodologies to solve them.

A seminar schedule will be prepared by the coordinator for all the students. It should be from the 5th week to the last week of the semester and should be strictly adhered to.

Each student will be required to

1. Submit a one page synopsis of the seminar to be delivered.
2. Give a 20 minute presentation followed by 10 minutes discussion.
3. Submit a technical write up on the talk delivered.

At least two teachers will be associated with the evaluation of the project seminar for the award of the sessional marks which should be on the basis of performance of all the three items stated above.

NOTE: Three periods of contact load will be assigned to each project guide.

No. of Presentations	1	Max. Marks for presentation:	25
Marks are awarded based on synopsis, presentation and write-up.			
Duration of Presentation: **20 min**			

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
SCHEME OF INSTRUCTION AND EXAMINATION (R-16)
B.E. – MECH : EIGHTH SEMESTER (2019-20)

B.E (MECH) VIII Semester								
Course Code	Course Title	Scheme of Instruction			Scheme of Examination			
		Hours per Week			Duration in Hrs	Maximum Marks		Credits
		L	T	D/P		SEE	CIE	
THEORY								
PE8XXME	Professional Elective-V	3	-	-	3	70	30	3
PE8XXME	Professional Elective-VI	3	-	-	3	70	30	3
PW819ME	Project / Internship	-	-	18	3	50	50	9
	TOTAL	**6**	**-**	**18**		**190**	**110**	**15**
	GRAND TOTAL	**24**				**300**		**15**

1) Student should acquire one online certificate course during III semester to VIII semester
2) Left over hours allotted to CC / RC / TC

With effect from the Academic Year 2019-20

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
SCHEME OF INSTRUCTION AND EXAMINATION (R-16)
B.E. – MECH : EIGHTH SEMESTER (2019-20)

List of Professional Electives Stream wise (R-16)								
	Design engineering		Manufacturing engineering		Thermal engineering		Industrial engineering	
	Course Code	Title	Course Code	Title	Course Code	Title	Course Code	Title
VIII-Semester								
PE-V	PE810ME	Theory of Elasticity and Plasticity	PE820ME	Additive Manufacturing	PE830ME	Power Plant Engineering	PE840ME	Optimization Techniques
PE -VI	PE850ME	Control System Theory	PE860ME	Flexible Manufacturing Systems	PE870ME	Design and Analysis of Heat Exchangers	PE880ME	Entrepreneurship

With effect from the Academic Year 2019-20

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

THEORY OF ELASTICITY (PE-V)

SYLLABUS FOR B.E.VIII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:70	Course Code: **PE810ME**
Credits : 03	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVE	**COURSE OUTCOMES** *On completion of the course, students will be able to*
The objective of the course is to understand elasticity, various elastic constants, properties of materials, Hooks law for various conditions and usage of various theories of failure.	1 understand the importance of elasticity in engineering applications.
	2 determine the stress for various conditions.
	3 determine the strain for various conditions.
	4 understand the basic 3 dimensional stress strain relationships of various materials.
	5 calculate the strength of materials using various theories.

UNIT-I: BASIC CONCEPTS OF STRESS

Definition, State of stress at a point, stress tensor, invariants of stress tensor, principal stresses, stress ellipsoid.

UNIT-II

Derivation for maximum shear stress and planes of maximum shear stress, octahedral shear stress, deviatoric and hydrostatic components of stress, invariance of deviatoric stress tensor, plane stress.

UNIT-III: BASIC CONCEPTS OF STRAIN

Deformation tensor, strain tensor and rotation tensor; invariants of strain tensor, principle strains, derivation for maximum shear strain and planes of maximum shear strain, octahedral shear strain, deviatoric and hydrostatic components of strain tensor, invariance of deviatoric strain tensor, plane strain.

UNIT-IV: GENERALIZED HOOKE's LAW

Stress-strain relationships for an isotropic body for three dimensional stress space for plane stress and plane strain conditions, differential equations of equilibrium, compatibility equations, material (D) matrix for Orthotropic Materials.

UNIT-V

True stress and true strain, Von-Mise's and Tresca yield criteria, Haigh-Westergardstress space representation of Von-Mise's and Tresca yield criteria, effective stress and effective strain.

Learning Resources:

1. Timoshenko and Goodier, "Theory of Elasticity", McGrawHill Publications 3rd Edition.
2. L.S.Srinath – Advanced Mechanics of Materials. TMH .2009
3. George E Dieter, Mechanical Metallurgy, McGraw Hill Publications 1988
4. Theory of Elasticity – Dr.Sadhusingh, Khanna Publications,2010

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	20
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **1 Hour**

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

ADDITIVE MANUFACTURING (PE-V)

SYLLABUS FOR B.E.VIII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:70	Course Code: **PE820ME**
Credits : 03	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVE	**COURSE OUTCOMES** *On completion of the course, students will be able to*
The objective of the course is to understand the fundamentals of various additive manufacturing technologies, learn different types of liquid, solid and powder based AM systems, discuss rapid tooling, applications of AM systems.	1 understand the fundamentals of Additive manufacturing Technologies to analyze Problems.
	2 identify different types of liquid based AMT and its methodology to manufacture the Products.
	3 identify different types of solid based AMT and its methodology to manufacture the Products.
	4 identify different types of powder based AMT and its methodology to manufacture the products.
	5 study the applications of AMT in various sectors.

UNIT-I

Introduction, Prototyping fundamentals, Historical development, Fundamentals of rapid prototyping, Advantages of Rapid prototyping, Commonly used terms, Rapid prototyping process chain, 3D modeling, Data Conversion, and transmission, Checking and preparing, Building, Post processing, AM data formats, Classification of AM process

UNIT-II

Liquid based AM systems: Stereo lithography Apparatus(SLA): Models and specifications, Process, Working principle, photopolymers, Photopolymerisation, Layering technology, laser and laser scanning, Applications, Advantages and disadvantages, Case studies

Solid ground curing(SGC): Models and specifications, Process, Working principle, Applications, Advantages and disadvantages, Case studies

UNIT-III: SOLID BASED AM SYSTEMS

Laminated object manufacturing(LOM): Models and specifications, Process, Working principle, Applications, Advantages and disadvantages, Case studies.

Fused Deposition Modeling (FDM): Models and specifications, Process, Working principle, Applications, Advantages and disadvantages, Case studies.

UNIT-IV: POWDER BASED AM SYSTEMS

Selective laser sintering (SLS): Models and specifications, Process, Working principle, Applications, Advantages and disadvantages, Case studies.

Three dimensional printing (3DP): Models and specifications, Process, Working principle, Applications, Advantages and disadvantages, Case studies.

UNIT-V

Rapid Tooling: Introduction to RT, conventional tooling v/s RT, need for RT, RT classification: Indirect RT methods: spray metal deposition, RTV epoxy tools, ceramic tools, Investment casting, spin casting, die casting, sand casting, 3Dkeltool process. Direct RT : direct AIM, LOM tools, DTM RT process, EOS direct tool process and direct metal tooling using 3DP

Applications of AM systems: Application – material relationship, Application in design, Application in engineering, analysis and planning, aerospace industry, automotive industry, jewelery industry, coin industry, GIS Application, arts and architecture.

RP medical and bio engineering Application: planning and simulation of complex surgery, customized implant and prosthesis , design and production of medical devices, forensic science and anthropology, visualization of bio-molecules.

Learning Resources:

1. Chua C.K., Leong K.F. abd LIM C.S., "World Rapid prototyping : Principles and Applications", 2nd Edition, Scientific Publications, 2004.
2. D.T.Pham and S.S. Dimov, "Rapid Manufacturing", Springer, 2001.
3. AmithabaGhose, "Rapid prototyping", Eastern Law House, 1997.
4. Paul F. Jacobs, "Stereolithography and other RP & M Technologies", ASME Press, 1996.
5. Paul F. Jacobs, "Rapid Prototyping & Manufacturing", ASME Press, 1996.

The break-up of CIE: Internal Tests + Assignments + Quizzes

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2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **1 Hour**

With effect from the Academic Year 2019-20

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

POWER PLANT ENGINEERING (PE-V)

SYLLABUS FOR B.E.VIII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:70	Course Code: **PE830ME**
Credits : 03	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
The objective of the course is to impart knowledge on various sources of energy, types of power plants, their working and economics of power generation.	1 identify the various sources of energy for power generation and explain the working of various sub systems such as coal handling, ash handling in a steam power plant.
	2 describe the combustion process and the various sub systems in air and gas circuit, feed water and cooling water circuit.
	3 describe the working of a hydro power plant.
	4 describe the working of a nuclear power plant.
	5 estimate the cost of power generation and the environmental effects of various power plants.

UNIT – I

Introduction to sources of Energy: Resources and development of Power in India.

Steam Power plant: selection of site for a thermal power plant, Plant Layout, Working of different circuits, Types of Coal, Properties of Coal, Coal Handling, Fuel handling equipment and their choice, Coal storage systems.

UNIT-II

Combustion Process: Overfeed and underfeed fuel beds, Travelling grate stokers, Spreader stokers, Retort stokers, Pulverized fuel burning systems and its components, working principle of Cyclone furnace, Ash Handling Systems, draught system, Dust collectors.

Cooling Towers and Heat rejection, Corrosion and feed water treatment.

UNIT-III: HYDRO ELECTRIC POWER PLANT

Water Power, Hydrological Cycle, measurement of run-off, selection of site for a hydro electric power plant, Essential features of a hydro power plant. Hydrographs, Flow duration curve and mass curve-related numerical problems, Storage and Pondage, Classification of dams and spillways.

UNIT-IV: NUCLEAR POWER PLANT

selection of site for a nuclear power plant, Nuclear fuels, conversion and breeding, fertile materials, methods of enriching uranium, Nuclear Reactors, working of reactors, Pressurized water reactor, Boiling Water Reactor, Sodium Graphite Reactor, Fast Breeder Reactor, Gas cooled Reactor, Radiation Hazards and Shielding, Radioactive waste disposal.

UNIT-V

Power plant Economics and Environmental considerations

Capital cost, Investment of fixed charges, Operating costs, General arrangement of power distribution, Load curves, Average Load and Load Factor, Delivery Factor, Related exercises.

Effluents from Power plants and impact on environment

Pollutants and Pollution standards, Methods of Pollution control.

Learning Resources::

1. Rajput, R.K, "A Text Book of Power Plant Engineering', 3rd Edition, Laxmi Publications, New Delhi,2005.
2. Arora S.C, Domukundwar S, "A Course in Power Plant Engineering", Dhanapat Rai &Sons, New Delhi, 2005
3. Yadav R, "Steam &Gas Turbines and Power Plant Engineering", 7th Edition, Central publishing House, Allahabad, 2007
4. Nag P.K, "Power Plant Engineering",2nd Edition, Tata Mc Graw Hills Co. Ltd., New Delhi, 2002.
5. Wakil M.M, "Power Plant Technology", Mc Graw Hill publications, New York, 2005.

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	20
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **1 Hour**

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

OPTIMIZATION TECHNIQUES (PE-V)

SYLLABUS FOR B.E.VIII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:70	Course Code: **PE840ME**
Credits : 03	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
The objective of the course is to understand the importance of optimization to various practical problems and solve them with simple mathematical techniques.	1 applying the concept of simple mathematic for practice problem for optimization.
	2 analyze the one Dimensional problem and their application to Mechanical engineering. Procedure.
	3 understand constrained and unconstrained optimization.
	4 apply dynamic programming techniques to solve problem in shop floor.

UNIT-I

Introduction: Engineering applications, Statement of optimization, classification of optimization.

Classical optimization: Single variable, multi variable with and with optimization.Mutli variable with inequality constraints Khun -Tucker conditions**.**

UNIT-II: ONE DIMENSIONAL MINIMIZATION

Uni-modal Function, Unrestricted search, Exhaustive search, Dichtomous search, Interval Halving method, Fibonacci and golden bisection Method, Newton and Quasi Newton method.

UNIT-III: NON LINEAR-UNCONSTRAINED OPTIMIZATION-I

classification, scaling of design variables, Random search methods, Univeriate search, pattern Directions, Hook Jeeves, Powel method, Rosenbrock method.

UNIT-IV: NON LINEAR-UNCONSTRAINED OPTIMIZATION-II
characteristics, Random search methods, complex method, sequential linear programming, Zoutendijk's method, Penality method,

UNIT-V
Dynamic programming: Multi stage decision processes, concept of sub optimization, few example problems
Integer programming: Gomory's cutting plane method, Branch and bound method.

Learning Resources:

1. SS. Rao, "Engineering Optimization theory and practice", New age international 3rd Edition 2013.
2. K.Deb, "Engineering Optimization", New age international 3rd Edition New Delhi.
3. JasbirS.Arora,"Introduction to Optimum Design", Mc Grawhill International edition, 4th Edition Singapore.
4. J.K Sharma, "Operations Research", S Chand,9th Edition, New Delhi.

The break-up of CIE: Internal Tests+ Assignments + Quizzes

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2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **1 Hour**

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

CONTROL SYSTEMS THEORY (PE-VI)

SYLLABUS FOR B.E.VIII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:70	Course Code: **PE850ME**
Credits : 03	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
The objective of the course is to describe physical systems through mathematical models and graphical representations and assess their response and stability in frequency and time domains and design suitable control methods.	1 develop Transfer functions for various systems using mathematical modelling.
	2 simplify the systems given in pictorial representation and examine the steady state and transient behavior.
	3 estimate the system behaviour using Routh criterion, Root locus and Bode diagrams.
	4 assess the frequency response of the control systems using Polar and Nyquist plot and explain the principle of compensators.
	5 model the system in state space domain and test for controllability and observability.

UNIT-I: CONTROL SYSTEMS CLASSIFICATION

Examples of control systems, Open Loop & Closed Loop Systems. Mathematical models and Transfer functions from governing equations of mechanical, electrical, hydraulic, pneumatic, and thermal systems. Force-Voltage and Force-Current analogy.

UNIT-II

Block diagrams, Block diagram reduction. Signal flow graphs, Mason's gain formula. Transient response of 1^{st} order system to Step, Ramp, Parabolic and Impulse inputs. Time domain specifications of 2^{nd} order systems,

Response of 2nd order systems to Step input. Steady state error, Static and Dynamic Error Coefficients, Sensitivity.

UNIT-III

Routh stability criteria, Root Locus method for negative feedback systems.

Frequency Response, Bode plots. Experimental determination of transfer functions.

UNIT-IV

Polar and Nyquist Plots , Nyquist stability criteria. Gain and Phase Margins.

Introduction to compensator design (**qualitative treatment only**): Lead, Lag and Lag–Lead compensators.
PID controller, Correlation between transient and frequency response.

UNIT-V

State– space representation of linear control systems. Conversion of Transfer function into State Space, Conversion of State-Space in to Transfer Function, Solution of state equations by Laplace transformation technique and Time Domain technique. State Transition Matrix . Zero Input Response and Zero State Response. Concept of Controllability and Observability.

Learning Resources:

1. R.C. Dorf, "Modern Control Systems", Addison Wesley, 1989
2. M. Gopal, "Control Systems", Tata McGraw-Hill, 2004.
3. Ogata, K. "Modern Control Engineering", Prentice Hall, 2004
4. Norman S. Nise, "Control Systems Engineering", John Wiley & Sons, Inc., 2001.
5. William J. Palm, III, Modelling, Analysis, and Control of Dynamic Systems, John Wiley & Sons Inc., 2nd Edition, 1999.

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	20
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **1 Hour**

With effect from the Academic Year 2019-20

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

FLEXIBLE MANUFACTURING SYSTEMS (PE-VI)

SYLLABUS FOR B.E.VIII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:70	Course Code: **PE860ME**
Credits : 03	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1 set up schemes for machine and accessory layouts for effective manufacture under CIM.	1 interpret meaning, importance and utility of various layouts
2 have a thorough knowledge in part family identification using group technology.	2 Specify equipment for FMS operations after detailed study through group technology, process planning and technology planning
3 analyze mathematically the manufacturing situations so as to prevent bottlenecks in manufacture under CIM.	3 Plan for FMS operations and its schemes using JIT etc.
4 be in a position to choose the most appropriate material handling scheme of relevance in CIM operations.	4 distinguish material handling requirements for traditional manufacture and those needed in FMS environment
5 plan for hardware and software for the various computational resources and electronic devices used in FMS.	5 Specify the hardware and software requirements and integrate different subsystems

UNIT-I: EVOLUTION OF MANUFACTURING SYSTEMS

FMS definition and description, General FMS considerations, Manufacturing cells, Cellular versus Flexible Manufacturing. Systems Planning: Objective, introduction planning, preparation guidelines, the project team, supplier selection, system description and sizing, facility preparation planning, FMS layouts. Human resources: staff considerations, team work, communication and involvement, the supervisors role, personnel selection, job classifications, employee training.

UNIT-II: MANUFACTURING'S DRIVING FORCE

Definition, description and characteristics. Just in-time manufacturing, definition and description, benefits and relationship to FMS, implementation cornerstones, quality and quantity application principles. Single manufacture Cell – design scheduling of jobs on single manufacturing cells. Group Technology: Concepts, classification and coding, benefits and relationship to FMS, design of group technology using rank order clustering technique.

UNIT-III: FMS DESIGN – USING BOTTLENECK, EXTENDED BOTTLENECK MODELS, PROCESSING AND QUALITY ASSURANCE

Turning centres, Machining centre, construction and operations performed, axes, programming, and format information, work-holding and work-changing equipment, automated features and capabilities, cleaning and deburring – station types and operation description, importance to automated manufacturing, coordinate measuring machines, types, construction and general function, operation cycle description, importance to flexible cells and systems.

UNIT-IV: AUTOMATED MOVEMENT AND STORAGE SYSTEMS

AGVs, Robots, automated storage and retrieval systems, storage space design, queuing carousels and automatic work changers, coolant and chip Disposal and recovery systems, auxiliary support equipment, cutting tools and tool Management – introduction, getting control of cutting tools, Tool Management, tool strategies, data transfer, tool monitoring and fault detection, guidelines, work holding considerations, General fixturing, Modular fixturing. FMS and the relationship with workstations – Manual, automated and transfer lines design aspects.

UNIT-V : FMS

computer Hardware, Software, Communications networks and Nanotechnology – general functions, and manufacturing usages, hardware configuration, programmable logic controllers, cell controllers, communications networks. FMS implementation.

Learning Resources:

1. William Luggen, "Flexible Manufacturing Systems", Prentice-Hall, Newjersy, 1991
2. Parrish, D.J., "Flexible Manufacturing", - Butter Worths – Heinemann, Oxford, 1993.
3. Groover, M.P., "Automation, Production Systems and CI", - Prentice Hall India, 1989.
4. Kusiak, A., "Intelligent Manufacturing Systems", Prentice Hall, 1990.
5. Ranky, P.G., "Design and Operation of FMS, IFS Publishers, UK, 1988

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	20
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **1 Hour**

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

DESIGN AND ANALYSIS OF HEAT EXCHANGERS (PE-VI)

SYLLABUS FOR B.E.VIII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:70	Course Code: **PE870ME**
Credits : 03	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
The objective of the course is to design various types of heat exchangers, condensers and cooling towers.	1 to understand types of heat exchangers.
	2 to design the heat exchangers.
	3 to design industrial heat exchanger.
	4 to design compact heat exchangers.
	5 to design condensers and cooling towers.

UNIT-I: **CLASSIFICATION OF HEAT EXCHANGERS**

Parallel flow, counter flow and cross flow; shell and tube and plate type; single pass and multipass; once through steam generators etc;

UNIT-II: **PROCESS DESIGN OF HEAT EXCHANGERS**

Heat transfer correlations, Overall heat transfer coefficient, LMTD, sizing of finned tube heat exchangers, U tube heat exchangers, fouling factors, pressure drop calculations.

UNIT-III: **DESIGN OF SHELL AND TUBE HEAT EXCHANGERS**

Thickness calculation, Tubesheet design using TEMA formula, concept of equivalent plate for analysing perforated analysis, flow induced vibration risks including acoustic issues and remedies, tube to tube sheet joint design, buckling of tubes, thermal stresses.

UNIT-IV: **COMPACT AND PLATE HEAT EXCHANGERS**

Types – Merits and Demerits – Design of compact heat exchangers, plate heat exchangers, performance influencing parameters, limitations

UNIT-V: CONDENSORS AND COOLING TOWERS

Design of surface and evaporative condensers – cooling tower – performance characteristics.

Learning Resources:

1. T.Taborek, G.F.Hewitt and N.Afgan, "Heat Exchangers, Theory and Practice", McGraw-Hill Book Co.1980.
2. Walker, "Industrial Heat Exchangers- A Basic Guide", Mc Graw Hill Book Co. 1980.
3. Nicholas Cheremistoff, "Cooling Tower", Ann Arbor Science Pub 1981.
4. Arthur, P. Frass, "Heat Exchanger Design", John Wiley and Sons, 1988.
5. J.P. Gupta, "Fundamentals of heat exchangers and pressure vessel technology", Hemisphere publishing corporation, Springer-Verlag (outside NA), 1986
6. Donald Q. Kern and Alban D. Kraus, "Extended surface hear transfer", Mc Graw Hill Book Co., 1972
7. E.A.D. Sanders, "Heat Exchangers, Selection Design and Construction", Layman Scientific & Technical; co published with John Wiley & sons.

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	20
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **1 Hour**

With effect from the Academic Year 2019-20

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

ENTREPRENEURSHIP (PE-VI)

SYLLABUS FOR B.E.VIII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:70	Course Code: **PE880ME**
Credits : 03	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
The objective of the course is to understand entrepreneurship and its challenges, generate ideas, create a business plan, manage projects, utilize behavioral aspects in projects.	1 take-up entrepreneurship as a career choice.
	2 analyze the feasibility of a new business plan and prepare a viable business plan
	3 generate ideas for new and innovative entrepreneurial ventures.
	4 apply the project management techniques like PERT and CPM to a venture.
	5 incorporate the behavioral aspects for effective performance.

UNIT-I: INDIAN INDUSTRIAL ENVIRONMENT

Competence, Opportunities and Challenges, Entrepreneurship and Economic growth, Small Scale Industry in India, Objectives, Linkage among small, medium and heavy industries, Types of enterprises, Corporate Social Responsibility.

UNIT-II

Identification and characteristics of entrepreneurs, First generation entrepreneurs, environmental influence and women entrepreneurs, Conception and evaluation of ideas and their sources, Selection of Technology, Collaborative interaction for Technology development, Blue Ocean Strategy.

UNIT-III: BUSINESS PLAN

Introduction, Elements of Business Plan and its salient features, Technical Analysis, Profitability and Financial Analysis, Market and Demand Analysis, Feasibility studies, Executive Summary, Design thinking concepts, Value proposition canvas and Lean Canvas.

UNIT-IV: PROJECT MANAGEMENT

during construction phase, project organization, project planning and control using CPM, PERT techniques, Human aspects of project management, Assessment of tax burden.

UNIT-V: BEHAVIORAL ASPECTS OF ENTREPRENEURS

Personality, determinants, attributes and models, Leadership concepts and models, Values and attitudes, Motivation aspects, Change behaviour.
Time Management: Approaches of time management, their strengths and weaknesses. Time management matrix and the urgency addiction

Learning Resources:

1. Vasant Desai, "Dynamics of Entrepreneurial Development and Management", Himalaya Publishing House, 1997.
2. Robert D. Hisrich, Michael P. Peters, "Entrepreneurship", Tata Mc Graw Hill Publishing Company Ltd., 5th edition, 2005
3. Prasanna Chandra, "Projects - Planning, Analysis, Selection, Implementation and Review", Tata Mcgraw-Hill Publishing Company Ltd. 1995.
4. Sudha G.S., "Organizational Behavior", National Publishing House, 1996.
5. Stephen R. Covey and A. Roger Merrill, "First Things First", Simon and Schuster Publication, 1994.
6. Rajeev Roy, "Entrepreneurship", Oxford University Press, 2008.

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	20
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **1 Hour**

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

Project work/Internship

SYLLABUS FOR B.E.VIII-SEMESTER

L:T:P(Hrs/week):: 0:0:18	SEE Marks:50	Course Code: **PW819ME**
Credits : 15	CIE Marks:50	Duration of SEE: --

The department will appoint a project coordinator who will be in-charge of the following.

- Grouping of students (Maximum of 3 in a group)
- Allotment of project guide
- Project progress monitoring at regular intervals
- Attendance monitoring for those students doing project in Industry/Internship.

The project allotment should be completed by the IV week of VII semester so that students get enough time for completion of their project.

All the projects are to be checked for progress at least twice in a semester. CIE (sessional) marks (50 marks) are based on the performance in the two presentations which are awarded by a committee based on project rubrics.

The SEE marks (50 marks) are awarded by an external examiner based on a viva-voce deputed by the Controller of Examinations.

Norms of final documentation of the project report will be provided by the Department.

No. of Presentations for CIE marks	2	Max. Marks for each CIE presentation:	25
Marks are awarded based on synopsis, presentation and write-up.			
Duration of Presentation: **20 min**			