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-17) WITH EFFECT FROM 2020-21 (For the students admitted in 2017-18)

DEPARTMENT OF MECHANICAL ENGINEERING

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VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
SCHEME OF INSTRUCTION AND EXAMINATION (R-17)
B.E. – MECH : SEVENTH SEMESTER (2020-2021)

B.E (MECH) VII Semester								
Course Code	Name of the Course	Scheme of Instruction			Scheme of Examination			
		Hours per Week			Duration in Hrs	Maximum Marks		Credits
		L	T	D/P		SEE	CIE	
THEORY								
PC710ME	Thermal Turbo Machines	3	1	0	3	60	40	3
PC720ME	Finite Element Analysis	3	0	0	3	60	40	3
PC730ME	Refrigeration and Air conditioning	3	0	0	3	60	40	3
PE7XXME	Professional Elective-II	3	0	0	3	60	40	3
PE7XXME	Professional Elective-III	3	0	0	3	60	40	3
PE7XXME	Professional Elective-IV	3	0	0	3	60	40	3
PRACTICALS								
PC711ME	Thermal Engineering Lab	0	0	2	1	50	30	1
PC721ME	Computer Aided Engineering Lab	0	0	2	1	50	30	1
PW719ME	Project Seminar	0	0	2	-	-	30	1
	TOTAL	**18**	**1**	**6**	**-**	**460**	**330**	**21**
	GRAND TOTAL	**25**				**790**		**21**

1) Student should acquire one online course certificate during III semester to VII semester
2) Left over hours allotted to Sports / Library / Mentor Interaction / CC / RC / TC

List of Professional Electives - Stream wise (R-17)											
		Design engineering		Manufacturing engineering		Thermal engineering		Industrial engineering		Automobile Engineering	
		Course Code	Title	Course Code	Title	Course Code	Title	Course Code	Title	Course Code	Title
Sem VII	PE-II	PE710ME	Robotics	PE720ME	Computer Integrated Mfg.	PE730ME	Fuels and Combustion	PE740ME	Supply Chain Management	PE750ME	Automotive Transmission
	PE-III	PE760ME	Theory of Elasticity	PE770ME	Nano Technology	PE780ME	Advanced IC Engines	PE790ME	Production and Operations Management	PE712ME	Vehicle Dynamics
	PE-IV	PE713ME	Control System Theory	PE714ME	Additive Manufacturing Technologies	PE715ME	Computational Fluid Dynamics	PE716ME	Quality and Reliability Engineering	PE717ME	Vehicle Body Engineering

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Department of Mechanical Engineering

THERMAL TURBO MACHINES
SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 4:0:0	SEE Marks:60	Course Code: **PC710ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

COURSE OBJECTIVE *The objective of the course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able 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: COMPRESSIBLE FLOWS
Speed pressure waves, Mach number, acoustic velocity, Mach cone and Mach angle; pressure field due to a moving source of disturbance; static and stagnation properties; Fanno flow, variations of flow properties and mach number with duct length; Rayleigh flow, variation of flow properties and heat transfer; Introduction to shocks waves – normal shock waves, governing equations, Prandtl–Meyer equation, Rankine–Hugoniot equations, stagnation pressure ratio, problem solving using gas tables.

UNIT-II: ROTO DYNAMIC COMPRESSORS
Classification, Comparison of reciprocating and rotary compressors; Centrifugal compressors: principle of operation, T-s diagram, Euler Equation, velocity triangles, types of blades; basics and theory of an aerofoil, analysis of flow, pre-whirl, slip factor and its effect on work input, work done and pressure rise in a centrifugal compressor, performance characteristics and problem solving; Axial flow compressors: construction, working principle, velocity triangles, Work done factor, stage efficiency, degree of reaction, performance characteristics, chocking, surging and stalling; problem solving.

UNIT-III: STEAM TURBINES
Classification, De Laval turbine - nozzle efficiency, blade efficiency and gross stage efficiency of impulse turbine, velocity triangles, optimum blade speed ratio, maximum work done and blade efficiency; Compounding of steam turbines – pressure, velocity and pressure–velocity compounding; problem solving.
Parson reaction turbine - velocity triangles, degree of reaction, blade efficiency, maximum work done; balancing of end thrust;

UNIT-IV: GAS TURBINES
Classification and applications, constant pressure and constant volume gas turbines, Joule cycle – configuration diagram and T-s diagram, thermal efficiency, maximum pressure ratio, optimum pressure ratio for maximum work done, intercooling, reheating and regeneration; problem solving.

UNIT-V: JET PROPULSION
Introduction, jet engine types, and applications, 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; problem solving; Rocket Propulsion: type of propellants and Rocket engines, Rocket propulsion theory and applications, problem solving.

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. Rajput R.K. “Thermal engineering”, Laxmi publications Pvt. Ltd.,” 10th edition
4. Ganesan, V., “Gas Turbines”, Tata McGraw Hill Book Company, New Delhi, 2010
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:	30
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 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

SYLLABUS FOR B.E. VII-SEMESTER

FINITE ELEMENT ANALYSIS

Instruction : 3 Hours /week	SEE Marks : 60	Course Code : PC720ME
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hours

Course objectives	Course Out comes
The objectives of this course are to: understand the concept of FEA and apply it to 1-dimensional and 2-dimensional problems in the field of Mechanical Engineering.	At the end of the course, students shall be able to: 1. understand the shape functions and formulate the finite element equations for 1-D elements. 2. evaluate the deflections, stresses and strains for trusses and beams. 3. solve two dimensional problems for their deflections, stresses and strains. 4. evaluate one dimensional steady state heat transfer models. 5. estimate the dynamic behaviour of structural members and obtain the natural frequencies and mode shapes.

UNIT-I

Introduction to Finite Element Method, stress and Equilibrium, Strain, displacement, stress– strain relations.

One dimensional problems:

Finite element modelling coordinates and shape functions, Potential Energy approach, assembly of Global stiffness matrix and load vector, Finite element equations, Penalty approach, introduction to quadratic shape functions.

UNIT – II : Analysis of trusses and beams:

Element stiffness matrix for a plane truss member. Analysis of plane trusses, element stiffness matrix for a 2D-beam member (one rotation and one translation at each node), analysis of 2D beams. steady state one dimensional heat transfer analysis of composite wall and a fin.

UNIT – III: Two dimensional problems:

Element stiffness matrix for constant strain triangle element (CST), two dimensional stress analysis using CST elements and treatment of boundary conditions, introduction to Finite element modelling of axi–symmetric solids, two dimensional four noded iso–parametric elements.

UNIT – IV

Introduction of Finite Element analysis software: Pre-processing, processing, post processing.

Requirements of the position of the nodes, mesh requirements, type of elements and their degrees of freedom, convergence requirements.

Numerical integration using Gaussian Quadrature with two and three point formulae,

UNIT – V

Dynamic Analysis: Formulation of finite element model, element matrices, evaluation of Eigen values and Eigen vectors for a stepped bar and a beam,

Learning Resources:

1. Tirupathi R, Chandraputla and Ashok D Belagundu, “Introduction to finite elements in engineering”, Prentice Hall of India, 1997.
2. G.Ramamurthy, “Applied Finite Element Analysis”, I.K. International Publishing House Pvt. Ltd., New Delhi. 2009.
3. Rao S S, “The Finite Element Method in Engineering”, Pergamon Press, 1989.
4. Segerlind L J, “Applied Finite Element Analysis”, Wiley Eastern, 1984
5. Reddy J N, “An Introduction to Finite Element Method”, McGraw– Hill, 1984

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

Duration of Internal Test: **1 Hour 30 Minutes**

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Department of Mechanical Engineering

REFRIGERATION AND AIR CONDITIONING
SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:60	Course Code: **PC730ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

COURSE OBJECTIVE *The objective of the course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able 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 of 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

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	30
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3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **1 Hour 30 Minutes**

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Department of Mechanical Engineering

ROBOTICS (PE-II)
SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:60	Course Code: **PE710ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

COURSE OBJECTIVE *The objective of the course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able to*
study robot anatomy, configuration, sensors, drives and applications of robots; 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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Department of Mechanical Engineering

COMPUTER INTEGRATED MANUFACTURING (PE-II)
SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:60	Course Code: **PE720ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

COURSE OBJECTIVE *The objective of the course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able 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 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
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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:60	Course Code: **PE730ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

COURSE OBJECTIVE *The objective of the course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able 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 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
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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:60	Course Code: **PC740ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

COURSE OBJECTIVE *The objective of the course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able 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 30 Minutes**

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Department of Mechanical Engineering

AUTOMOTIVE TRANSMISSION (PE-II)
SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:60	Course Code: **PE750ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

Course objectives *The objective of this course is to*	**Course Outcomes** *On completion of the course, students will be able to*
Study the various components of the transmission system of an automobile.	1. Describe the types of gear boxes and their construction. 2. Describe the planetary gearboxes and their construction 3. study various power drives for power transmission 4. analyse the working principle and operation of automatic transmissions 5. Know the details of Hydrostatic and Electrical drives of an automobile.

UNIT – I
Gear Box: method of calculation of gear ratios for vehicles, performance characteristics in different speeds, different types of gear boxes, speed synchronizing devices, gear materials, lubrication.

UNIT – II
Spur and internal gear type planetary gearboxes, Ford T-model, Cotal and Wilson Gear box, determination of gear ratios, automatic overdrives.

UNIT – III
Fluid coupling: advantages and limitations, construction details, torque capacity, slip in fluid coupling, performance characteristics. Means used to reduce drag torque in fluid coupling.
Principal of torque conversion, single, multi stage and poly phase torque converters, performance characteristics, constructional and operational details of typical hydraulic transmission drives (e.g.) Leyland, White Hydro torque drives.

UNIT – IV
Automatic transmission: relative merits and demerits when compared to conventional transmission, automatic control of gears, study of typical automatic transmissions, Ford and Chevrolet drive, and automatic control of gear box.

UNIT – V
Hydrostatic drives: advantages and disadvantages, principles of hydrostatic drive systems, construction and working of typical hydrostatic drives, Janney Hydrostatic drive. Electrical drives: advantages and limitations, principles of Ward Leonard system of control, Modern electric drive for buses and performance characteristics.

Learning Resources:

1. Heldt P.M - Torque converters- Chilton Book Co.-1992.
2. Newton and Steeds - Motor Vehicle- Illiffee Publisher- 2000
3. Design Practices, passenger Car Automotive Transmissions- SAE Hand book- 1994
4. K.M. Gupta, Automobile Engineering,, Volume 1, Umesh Publications, 2001
5. Crouse & Anglin, “Automotive Mechanics” Mc Graw hill, 10th edition.

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

1	No. of Internal Tests:	02	Max.Marks for each Internal Test:	30
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 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

THEORY OF ELASTICITY (PE-III)
SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:60	Course Code: **PE760ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

COURSE OBJECTIVE *The objective of the course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able 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: ANALYSIS OF STRESS
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 AND ANALYSIS OF STRAIN
Deformation tensor, strain tensor and rotation tensor; invariants of strain tensor, principal 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: STRESS-STRAIN RELATIONS
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: STRESS-STRAIN REPRSENTATION
True stress and true strain, Von-Mise's and Tresca yield criteria, Haigh-Westergard stress 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:	30
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 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

NANO TECHNOLOGY (PE-III)

SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:60	Course Code: **PE770ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

COURSE OBJECTIVE *The objective of the course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1. Nanoscale advantages and challenges 2. Materials and Nano tribology 3. Zero and One dimensional Nano structures synthesis procedures. 4. Nano Fabrication Techniques 5. Special nano materials and Nano biomaterials	1 Understand the basic concepts in nano technology 2 Analyze properties and its microstructure of Nano materials 3 Intrepret Zero and One dimensional Nano structures and their applications 4 Study various Nano Material Fabrication Techniques 5 Understand the applications of special nano materials and nano bio materials

UNIT - I

Introduction: Nanoscale, Properties at Nanoscale, advantages and disadvantages, importance and challenges in Nanotechnology.

UNIT - II

Materials: Introduction, Si-based materials, Ge-based materials, Ferroelectric materials, Polymer materials, GaAs& InP (HI-V) group materials, Nanotribology and materials.

UNIT - III

Nano Structures: Zero dimensional Nanostructure, synthesis procedure by heterogeneous method, characterization techniques, properties and applications of Nano particles

One dimensional Nanostructures: Synthesis procedure, characterization procedure and principles involved, properties and applications of Nano Wires.

UNIT - IV

Nano Fabrication: Introduction, Basic fabrication techniques by Lithography and doping, MEMS fabrication techniques, Nano fabrication techniques by E-beam, Nano-imprint fabrication, Epitaxy and strain engineering

UNIT - V

Special Nano Materials: Introduction, Synthesis procedure by metal-polymer, Characterization procedures, applications

Nano Biomaterials: Introduction, Biocompatibility, anti-bacterial activity, applications

Learning Resources:

1. Willia Tllsey Atkinson, “Nano Technology”, Jaico Publishing House
2. George W. Hanson, “Fundamentals of Nanoelectronics”, Pearson Education, 2009
3. T. Pradeep, “Nano: Essentials-understanding Nano Science and Technology” TMH 2009

Text Books:

1. Dieter Vollath, “Nanomaterials: An introduction to Synthesis, properties and applications”, Wiley, 2013
2. Guozhong Cao, “Nanostructures and Nano Materials, Synthesis properties and applications”, Imperial College Press
3. Carl C Koch, “Nano materials Synthesis , Properties and applications”, Jaico Publishing House

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 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

ADVANCED IC ENGINES (PE-III)

SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:60	Course Code: **PE780ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

Course Objectives	Course Outcomes
The objectives of this course are To study the working principles of operation and combustion process of different I.C. Engines. To provide knowledge on pollutant formation, control, alternate fuels and new developments in I.C. Engines.	At the end of the course student shall be able to 1. Understand the combustion phenomena of SI engines and identify various factors influencing the combustion process. 2. Understand the combustion phenomena of CI engines and identify various factors influencing the combustion process. 3. Identify various pollutants in the combustion process of Internal Combustion Engines and study emission norms. 4. Study the feasibility of alternative fuels available to replace existing fuels in IC Engines. 5. Study new technologies in the field of Internal Combustion Engines.

UNIT– I

Introduction to I.C. Engines: Combustion Engine, Classification into External and Internal Combustion Engines, Sub classification of I C Engines on the basis of different considerations.

Combustion in S.I. Engine: Stages of combustion in S.I. Engines, effect of engine variables on ignition lag, effect of engine variables on flame propagation, Abnormal combustion, effects of detonation, effects of engine variables on knock or detonation, control of detonation, Primary Standard Reference Fuels, Octane Number, SI engine combustion chamber design principles and types of combustion chambers in SI engines.

UNIT– II

Combustion in C.I. Engine: Combustion in the C.I. Engines, stages of combustion, delay period or ignition lag, variables affecting delay period, diesel knock, factors tending to reduce knocking in SI and CI engines, methods of controlling diesel knock, Primary Standard Reference Fuels, Cetane Number,CI engine combustion chambers, methods of generating air swirl in the CI engine.

UNIT-III:

Pollutant Formation and Control: Pollutants – Sources – Formation of Carbon Monoxide, Un burnt hydrocarbons, Oxides of Nitrogen, Smoke and Particulate matter – Methods of controlling Emissions – Catalytic converters, Selective Catalytic Reduction and Particulate Traps – Methods of measurement – Emission norms and Driving cycles.

UNIT– IV

Alternate Fuels: Liquid fuels - Alcohols, Methanol and Ethanol, Gaseous fuels - Hydrogen, Natural gas and Liquefied Petroleum Gas, properties, production, storage, dispensing, fuel kits, Merits and demerits, Engine modifications, use of bio diesels.

UNIT-V

Recent Trends in I. C. Engines: Super charging and Turbo charging in I.C. Engines, Dual fuel and multi fuels engines, Lean Burn Engines, Stratified Charge Engines, homogeneous charge compression ignition (HCCI) Engines, Multi Point Fuel Injection (MPFI) systems, andGasoline Direct Injection (GDI) concepts.

Learning Resources:

1. V. Ganesan, Internal Combustion Engines- Tata Mc Graw Hill Publications, 2008.
2. S.S. Thipse, Alternate Fuels- -Jaico Publishers, 2010.
3. Heywood J.B., Internal Combustion Engines Fundamentals- Mc Graw Hill, 1988.
4. Mathur and R. P. Sharma, Internal Combustion Engines- Dhanpat Rai and Sons Publications, 2013.
5. Ramalingam. K.K., Internal Combustion Engine Fundamentals- Scitech Publications, 2002.

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

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	30
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 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

PRODUCTION AND OPERATIONS MANAGEMENT (PE-III)
SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:60	Course Code: **PE790ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

Course objectives	Course Out comes
The objectives of this course are to: study the types of plant layout, forecasting methods, cost analysis, inventory control and project management.	On completion of the course, the student will be able to: 1. classify the types of plant layouts, production systems based on product using the facilities of the plant 2. estimate the future demand using forecasting methods through qualitative and quantitative models 3. determine the requirement of resources to minimise the total cost using aggregate planning techniques. 4. determine the optimal maintenance of inventory to minimise the total cost using different inventory models. 5. construct network models to estimate the project completion time using PERT and CPM techniques.

Unit– I

Production & Operations Management: Introduction, Types of Production Systems – Job shop, Batch, Flow shop. Types of business organizations and organization structures. Calculations on productivity. Capacity planning and process planning calculations

Plant location and layout: Factors affecting plant location, Break even analysis, plant layout objectives, types of layouts, merits and demerits.

Work Study: Introduction to method study and work measurement, standard time calculations, methods of rating, work sampling.

Unit– II

Forecasting: Introduction, forecasting objectives and uses, demand patterns, qualitative models – market survey, delphi, quantitative models – moving average, weighted moving average, simple exponential smoothing, trend adjusted exponential smoothing, least square method, simple regression, multiple regression.

Forecast Errors: mean absolute deviation (MAD), mean square error (MSE), Mean Forecast Error (MFE), mean absolute percentage Error (MAPE)

Unit– III

Costs: Elements of Cost, overheads, determination of selling price of a product**.**

Aggregate planning and master scheduling: Introduction, objectives of aggregate planning, cost in aggregate planning, strategies in aggregate planning, master production scheduling.

Materials requirement planning MRP: Importance of MRP, MRP system inputs and outputs, MRP calculations.

Calculations of net amount required(units) and planned order releases in BOM structures.

Unit– IV

Inventory Control: Importance of inventory control, types of inventory models, inventory costs deterministic inventory models – basic EOQ model derivation, production model without shortages, purchase model with instantaneous replenishment and with shortages, production model with shortages, inventory model with price breaks, fixed order quality system, periodic review system, Probabilistic inventory models, determination of safety stock in deterministic and probabilistic inventory models, ABC and VED analysis, problems on ABC analysis.

Unit– V

Project Management: Network fundamentals, differences between PERT and CPM, scheduling the activities, Fulkerson's rule, Earliest and Latest times, determination of ES and EF in forward path, LS & LF in backward path, determination of critical path, Free float, independent float, Total float, program evaluation and review technique, crashing of network.

Learning Resources:

1. Joseph Monk," Operations Management", TMH Publishers, New Delhi, 2004
2. Buffa Elwood S," Modern Production / Operations Management", John Wiley Publishers, Singapore, 2002
3. Everett, E. Adam. Jr and Ronald. J. Ebert, "Production and operations management: concepts, models and behaviour" Prentice Hall of India Pvt. Ltd., New Delhi, 5th ed. 1998.
4. Panneer Selvam R, "Production and Operations Management", 2nded, PHI Learning Pvt. Ltd., New Delhi, 2006.
5. S.D. Sharma, "Operations Research", Kedarnnath, Ramnath& Co., Meerut, 2009.

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 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

VEHICLE DYNAMICS (PE-III)
SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:60	Course Code: **PE712ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

Course objectives *The objective of this course is to*	**Course Outcomes** *On completion of the course, students will be able to*
understand vibration response characteristics and stability of dynamic systems and Analyze the damped, undamped vibration system in an Automotive	1. Analyses the damped, undamped vibration system. 2. Understand free vibration and forced vibration. 3. Study of Different types of tyres and construction. 4. understand vibration response characteristics and stability of dynamic systems 5. Analysis of the vibration signals measuring.

UNIT-I
Fundamentals of Vibration: Introduction, classification of vibration: free and forced vibration, undamped and damped vibration, response of damped and undamped systems under harmonic force, analysis of single degree and two degree of freedom systems, torsional vibration, determination of natural frequencies.

UNIT-II
Vehicle Vibrations: Vehicle vibration with single degree of freedom free vibration, forced vibration, vibration due to road roughness, vibration due to engine unbalance, transmissibility of engine mounting vibration with two degree of freedom, free vibration, compensated suspension systems forced vibration.

UNIT-III
Different types of tyres - Materials used: **Tyre** construction, physics of tyre traction on dry and wet surface, tyre traction on dry and wet surface, tyre forces and moments, SAE recommended terminologies of tyre road interaction.

UNIT-IV
Numerical methods for multi degree of freedom systems: Methods, influence coefficient. Maxwell's reciprocal theorem. Dunkley's equation, orthogonality principle, method of matrix iteration - method of determination of all the natural frequencies using sweeping matrix and orthogonality principle, Holzer's method for systems with free, fixed free and fixed ends.

UNIT-V
Vibration measuring instruments - Accelerometers and vibrometers, whirling of shafts with and without air damping, discussion of speeds above and below critical speeds.

Learning Resources:

1 J S Rao V.Dukkipati, Vehicle Dynamics
2. William J Thomson, Theory of Vibration with applications.
3. William W. Seto, Theory & Problems of Mechanical Vibration. McGrawHill.
4. N.K. Giri, Problems in Automobile Mechanics, Khanna Publications.
5. S.K. Clark, Mechanics of Pneumatic Tyre. Prentice Hall.
6.Church, Mechanical Vibration, Wylie International.

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

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	30
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 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

CONTROL SYSTEMS THEORY (PE-IV)

SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:60	Course Code: **PE713ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

COURSE OBJECTIVE *The objective of the course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able 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 first order system to step, ramp, parabolic and impulse inputs. Time domain specifications of second order systems, Response of second 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", Pearson, 13th Edition, 2016.
2. M. Gopal, "Control Systems", Tata McGraw-Hill Education India, 4th Edition 2012.
3. Ogata, K. "Modern Control Engineering", Prentice Hall, 5th Edition, 2010
4. Norman S. Nise, "Control Systems Engineering", John Wiley & Sons, Inc., 7th Edition, 2015.
5. William J. Palm, III, Modelling, Analysis, and Control of Dynamic Systems, John Wiley & Sons Inc., 2nd Edition, 2013.

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 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

ADDITIVE MANUFACTURING TECHNOLOGIES (PE-IV)
SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:60	Course Code: **PE714ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

COURSE OBJECTIVE *The objective of the course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able 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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3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **1 Hour 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

COMPUTATIONAL FLUID DYNAMICS (PE-IV)
SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:60	Course Code: **PE715ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

Course objectives	Course Out comes
The objectives of this course are to: 1. equip the students with the necessary governing equations to use computational techniques to solve problems related to engineering flow problems 2. provide the essential numerical background for solving the partial differential equations governing the fluid flow and heat transfer	After completing the course, the student will be able to: 1. familiarize with the differential equations for fluid flow & heat transfer and apply numerical methods for their solution 2. find solution of partial differential equations to estimate the behaviour of the flow phenomena. 3. develop flow simulation code for heat transfer and fluid flow applications using FDM and FVM. 4. make use of different iterative methods to solve algebraic equations for Heat transfer and fluid flows 5. apply suitable grid generation methods to decompose the fluid /solid domain for obtaining the numerical solution

UNIT – I
Introduction to computational Fluid flows, CFF applications, comparison amongst Numerical, Analytical and Experimental approaches.
Review of the basic fluid dynamics: Continuity, Momentum and Energy equations, Navier Stokes equations, Reynolds and Favre averaged N– S equations. Heat transfer conduction equation for steady and unsteady flows, steady convection– diffusion equation.

Unit– II
Classification of partial differential equations – Elliptic, parabolic and hyperbolic equations. Physical examples of Elliptic, parabolic and hyperbolic partial differential equations, Well posed problem; Initial and boundary value problems.
Turbulence - Introduction, Mixing length model, K– epsilon turbulence model.

Unit– III
Concepts of Finite difference methods– forward, backward and central difference. Finite difference solution– 1-D steady state heat conduction without and with constant source term parabolic partial differential equations– Euler, Implicit method, crank Nicholson method.
Errors, consistency, stability analysis – Von Neumann analysis, convergence criteria

Unit– IV
Solution of System of Linear Algebraic Equations: Tridiagonal matrix algorithm (TDMA): Thomas algorithm Iteration methods: Jacobi, Gauss-Seidel and ADI methods.
Viscous incompressible flow, stream function– Vorticity method.
Introduction to grid generation– Types of grid –Structured and Unstructured grids– O,H,C; Grid quality parameters: Aspect Ratio, grid density, skewness, tet Vs hex.

Unit– V
Introduction to finite volume method: Finite volume formulations for diffusion equation, 1-D steady state heat conduction without and with constant source term convection diffusion equation: Central difference scheme, Upwind scheme, Exponential scheme, power law scheme. Solution algorithm for pressure velocity coupling in steady flows staggered grid, SIMPLE Algorithm.

Learning Resources:

1. John D Anderson, “Computational Fluid Dynamics”, Mc Graw Hill Inc., New York, 2003.
2. Patankar S V, “Numerical Heat Transfer and Fluid Flow”, Hemisphere Publishing Company, New York 1980.

3. H.K. Versteeg, W. Malalasekara, “An Introduction to computational Fluid Dynamics”, 2nd Ed., Pearson Education, 2007.
4. Chung T J, ”Computational Fluid Dynamics”, Cambridge University Press, New York, 2002
5. Muralidhar K, Sundararajan T, “Computational Fluid Flow and Heat Transfer”, Narosa publication House, New Delhi, 2003.

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 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

QUALITY AND RELIABILITY ENGINEERING (PE-IV)
SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:60	Course Code: **PE716ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

COURSE OBJECTIVE *The objective of the course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1. understand the process capability and control charts	1 understand importance of quality applications of various control charts and acceptance sampling in quality engineering
2. analysis the importance of tolerance design	2 estimate the loss function, and consequence of tolerance design for a product and checking of online quality control
3 relate QFD and house of quality and its use in product design	3 prepare a house of quality for a product and QFD matrix, importance of ISO and quality circles.
4 apply various techniques to improve reliability systems	4 analyze Various methods to estimate system reliability and how to improve it. Usage of weibull distribution in quality control and reliability
5 selective maintainability and availability of equipment	5 identify the best way of maintenance of an equipment, How to increase the availability and economics of reliability engineering.

Unit-I : Quality value and engineering – Quality systems – quality engineering in product design and production process – system design – parameter design – tolerance design quality costs – quality improvement. Statistical Process Control-x, R, P, C charts, process capability. Acceptance Sampling by variables and attributes, Design of Sampling Plans, Single, Double, Sequential plans.

Unit-II: Loss Function, Tolerance Design – N Type, L Type, S Type; determination of tolerance for these types, nonlinear tolerances. Online Quality Control – Variable Characteristics, Attribute Characteristics, Parameter Design.

Unit-III: Quality function deployment – House of Quality, QFD Matrix, Total Quality Management Concepts. Quality Information Systems; Quality Circles, Introduction to ISO 9000 Standards.

Unit-IV : Reliability – Evaluation of design by tests - Hazard Models; Linear, Releigh, Weibull. Failure Data Analysis System, Reliability, Reliability of series, Parallel Standey Systems; reliability prediction and system effectiveness, reliability prediction based on weibull distribution, Reliability improvement.

Unit-V : Maintainability, Availability, Economics of Reliability Engineering; Replacement of items, Maintenance Costing and Budgeting, Reliability Testing – Burn in testing by binomial, exponential models, Accelerated life testing.

Learning Resources:

1. G Taguchi, 'Quality Engineering in Production Systems', - McGraw Hill, 1989.
2. W.A. Taylor, 'Optimization & Variation Reduction in Quality', Tata McGraw Hill, 1991, 1st Edition.
3. Philipposs, 'Taguchi Techniques for Quality Engineering', McGraw Hill, 1996, 2nd Edition.
4. E.Bala Guruswamy, 'Reliability Engineering', Tata McGraw Hill, 1994.
5. LS Srinath, 'Reliability Engineering', Affiliated East West Pvt. Ltd., 1991, 3rd Edition.

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

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	30
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 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

VEHICLE BODY ENGINEERING (PE-IV)
SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:60	Course Code: **PE717ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

Course objectives *The objective of this course is to*	**Course Outcomes** *On completion of the course, students will be able to*
Study of different types of vehicle body structures and load acting.	1. Understand car body details. 2. Study of aerodynamic effect on vehicle body. 3. Understand load distribution on body. 4. Understand car body types. 5. Study of vehicle body materials.

UNIT-I

Car body details: Types of Car body – Saloon, convertibles, Limousine, Estate Van, Racing and Sports car – Visibility regulations, driver's visibility, improvement in visibility and tests for visibility. Driver seat design - Car body construction-Various panels in car bodies. Safety aspect of car body.

UNIT-II

Types of bus bodydetails: based on capacity, distance travelled and based on construction.– Bus body layout for various types, Types of metal sections used – Regulations – Constructional details: Conventional and integral. Driver seat design- Safety aspect of bus body.

UNIT-III

Load Distribution: Types of load carrying structures -closed, integral, open, flat types. Calculation of loading cases- static, asymmetric, vertical loads. Load distribution, stress analysis of structure, body shell analysis.

UNIT-IV

Body: Body design requirement, car body space nomenclature. Body frame of passenger car and commercial vehicle. Different type of car door and window regulator, car roof, wind shield, car seats and their various design.

Safety aspect: Driver's safety, use of air bag and their details.

UNIT-V

Body materials: Different types of ferrous and non-ferrous materials used in vehicle such as cast iron. Steel. Alloy steel, plastic, GR.P.Glass etc. and their properties Painting: Corrosion and anticorrosion metho. Paint and painting process

Learning Resources:

1. Grouse W and Anglin D, *Automotive Mechanics* Tata Mcgraw Hill Publication 10th edition, 2004.
2. Jack E Rjavee, *Automotive Technology- A System Approach,*
3. Thomson Asia Pte Ltd, Singapore, 3rd edition, 2004
4. K Sing *Automobile Engineering Vol-I* Standard Publishers Distributor 2003
5. Sydney F Page, *Body Engineering.*
6. Powloski, J., "Vehicle Body Engineering", Business Books Ltd., 1998.
7. James E Duffy, "Body Repair Technology for 4-Wheelers", Cengage Learning, 2009.

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

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	30
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 30 Minutes**

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:30	Duration of SEE: 03Hours

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

List of Experiments

1. Determination of thermal conductivity of insulating material using Lagged pipe apparatus.
2. Determination of heat transfer coefficient under natural convection
3. Determination of pin–fin efficiency subjected to natural and forced convection.
4. Determination of effectiveness of parallel flow and counter flow heat exchanger.
5. Determination of emissivity of a plate.
6. Determination of Stefan Boltzman constant.
7. Determination of COP of the Air conditioning system.
8. Determination of COP of the Refrigeration systems using capillary tube.
9. Pressure distribution on symmetrical and unsymmetrical specimen in wind tunnel.
10. Measurement of lift and drag forces of the model in wind tunnel.
11. Determination of overall efficiency of centrifugal blower.
12. Determination of overall efficiency of axial flow fan.

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18
Duration of Internal Test: 2 **Hours**			

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

COMPUTER AIDED ENGINEERING 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:30	Duration of SEE: 03Hours

COURSE OBJECTIVE *The objective of the course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able 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 on additive manufacturing machine.

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

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 day-to-day laboratory class work			18
Duration of Internal Test: **2 Hours**			

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): 0:0:2	SEE Marks:--	Course Code: **PW719ME**
Credits : 01	CIE Marks:30	Duration of SEE: ---

COURSE OBJECTIVE *The objective of the course is to*	**COURSE OUTCOME** *On completion of the course, students will be able 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.
4. Submission of brief report.

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.

No. of Presentations	1	Max. Marks for presentation:	30
Marks will be awarded based on synopsis, presentation and write-up using rubrics.			
Duration of Presentation: **20 min**			

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
SCHEME OF INSTRUCTION AND EXAMINATION (R-17)
B.E. – MECH : EIGHTH SEMESTER (2020-2021)

B.E (MECH) VIII Semester								
Course Code	Name of the Course	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	0	0	3	60	40	3
PE8XXME	Professional Elective-VI	3	0	0	3	60	40	3
PW819ME	Project / Internship	0	0	18	Viva -Voce	50	50	9
	TOTAL	**6**	**0**	**18**		**170**	**130**	**15**
	GRAND TOTAL	**24**				**300**		**15**
Student should acquire one online certificate course.								

List of Professional Electives - Stream wise (R-17)

		Design engineering		Manufacturing engineering		Thermal engineering		Industrial engineering		Automobile Engineering	
		Course Code	Title	Course Code	Title	Course Code	Title	Course Code	Title	Course Code	Title
Sem VIII	PE-V	PE810ME	Product Design and Process Planning	PE820ME	Flexible Manufacturing Systems	PE830ME	Power Plant Engineering	PE840ME	Optimization Techniques	PE850ME	Automotive Aero Dynamics
	PE-VI	PE860ME	Composite Materials	PE870ME	Product Life Cycle Management	PE880ME	Design and Analysis of Heat Exchangers	PE890ME	Artificial Intelligence and Neural Networks	PE812ME	Microprocessor Applications in Automobiles

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

PRODUCT DESIGN AND PROCESS PLANNING (PE-V)
SYLLABUS FOR B.E.VIII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:60	Course Code: **PE810ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

COURSE OBJECTIVE *The objective of the course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able to*
Study product and process design functions, selection and evaluation of projects, new product development, new product planning and manufacturing process planning.	1 illustrate creativity and study the techniques of innovation 2 assess the evaluation techniques for screening ideas 3 differentiate the IPR-Patents, Design patents, copy right and trade mark and their laws. 4 describe the interaction between design, manufacture, quality and testing 5 establish the machining time in various cutting operations; value engineering; GT and concepts of concurrent engineering.

UNIT – I
Product Design and Process Design functions. Selection of right product. Systematic procedure of product innovation. Factors contributing to successful technological innovation – need for creativity and innovation. Techniques of innovation like brain storming and Delphi techniques.

UNIT – II
Project selection and evaluation: Function of design – Design with Human Machine Interaction (HMI), Collection of ideas and purpose of project. Selection criteria – screening ideas for new products using evaluation techniques. Principles of ergonomics.

UNIT – III
New Production Development: Research and new product development. Patents, definitions, patent search, patent laws, international code for patents – Intellectual Property Rights (IPR).

UNIT – IV
New Product Planning: Interaction between the functions of design, manufacture, quality, testing, and marketing. Steps for introducing new products after evaluation.

UNIT – V
Process Planning: Process planning, process sheets, Selection of manufacturing process, estimation of machining time in various cutting operations – estimation of costs for manufacture. Value engineering in product design, group technology, concepts of concurrent engineering.

Suggested Reading:

1. Niebel BW & Draper AB, Production Design & Process Engg., Mc Graw Hill Kogakusha, 1974.
2. Harry Nystrom, Creativity and Innovation, Jhon Wiley & Sons, 1979.
3. Brain Twiss, Managing Technological Innovation, Pittman Publ. 1992.
4. Harry, B. Waton, New Product Planning, Prentice Hall Inc., 1992.
5. Chitale AK & Gupta R.C, Product Design & Manufacturing, – Prentice Hall of India, 1997.

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

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Duration of Internal Test: **1 Hour 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

FLEXIBLE MANUFACTURING SYSTEMS (PE-V)

SYLLABUS FOR B.E.VIII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:60	Course Code: **PE820ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

COURSE OBJECTIVE *The objective of the course is to*	**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
5 plan for hardware and software for the various computational resources and electronic devices used in FMS.	5 environment. 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

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

Duration of Internal Test: **1 Hour 30 Minutes**

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:60	Course Code: **PE830ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

COURSE OBJECTIVE *The objective of the course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able 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 electric and non conventional power plants. 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 Hydroelectric and Non-Conventional Power Plant:

Hydroelectric 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.

Non-Conventional Power Plant

Principles of wind, solar PV and solar thermal, geothermal, tidal, biogas and fuel cell power systems.

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', 5TH Edition, Laxmi Publications, New Delhi, 2016.
2. Arora S.C, Domukundwar S, "A Course in Power Plant Engineering", Dhanapat Rai &Sons, New Delhi, 2005
3. P C Sharma, "A Text Book of Powerplant Engineering", S K Kataria & Sons, 2013
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

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

Duration of Internal Test: **1 Hour 30 Minutes**

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:60	Course Code: **PE840ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

COURSE OBJECTIVE *The objective of the course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able 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:

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

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 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

AUTOMOTIVE AERO DYNAMICS (PE-V)
SYLLABUS FOR B.E.VIII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks: 60	Course Code: **PE850ME**
Credits : 03	CIE Marks: 40	Duration of SEE: 03Hours

Course objectives *The objectiveof this course is to*	**Course Outcomes** *On completion of the course, students will be able to*
Study the wind effect on vehicles by automotive aerodynamics	1. Understand the fundamentals of fluid flow 2. Study the Aerodynamic drag of cars 3. Analysing the shape of the vehicle for optimization of drag 4. Analysing the wing effect on vehicle 5. Calculating and measuring the wind effect on vehicle

UNIT-I
Scope of automotive aerodynamics - historical development trends - Fundamental of fluid mechanics - Flow phenomenon related to vehicles - External & Internal flow problem - Resistance to vehicle motion - Performance - Fuel consumption and performance - Potential of vehicle aerodynamics.

UNIT-II
Aerodynamic Drag of Cars: Cars as a bluff body - Flow field around car - drag force - types of drag force - analysis of aerodynamic drag - drag coefficient of cars - strategies for aerodynamic development - low drag profiles.

UNIT-III
Shape Optimization of Cars: Front end modification - front and rear wind shield angle - Boat tailing - Hatch back, fast back and square back
- Dust flow patterns at the rear - Effects of gap configuration - effect of fasteners.

UNIT-IV
Vehicle Handling - The origin offerees and moments on a vehicles - side wind problems - method to calculate forces and moments - vehicle dynamics under side winds - the effects of forces and moments - Characteristics offerees and moments - Dirt accumulation on the vehicle
- Wind noise - drag reduction in commercial vehicles.

UNIT-V
Wind Tunnels For Automotive Aerodynamic: Principle of wind tunnel technology - Limitation of simulation - Stress with scale models - fill scale wind tunnels - measurement techniques - Equipment and transducers - road testing methods - Numerical methods.

Learning Resources:

1. Hucho.W.H., Aerodynamic of Road Vehicles, Butterworths Co., Ltd., - 1997.
2. A. Pope, Wind Tunnel Testing, John Wiley & Sons - 2nd Edition, New York 1974.
3. Automotive Aerodynamic: Update SP-706 - SAE – 1987
4. Vehicle Aerodynamics - SP-1145 - SAE - 1996.

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 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

COMPOSITE MATERIALS (PE-VI)
SYLLABUS FOR B.E.VIII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:60	Course Code: **PE860ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

COURSE OBJECTIVE *The objective of the course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able 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 Isotropic 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

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

Duration of Internal Test: **1 Hour 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

PRODUCT LIFE CYCLE MANAGEMENT (PE-VI)

SYLLABUS FOR B.E.VIII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:60	Course Code: **PE870ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

COURSE OBJECTIVE *The objective of the course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able 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

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

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	30
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 30 Minutes**

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:60	Course Code: **PE880ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

COURSE OBJECTIVE *The objective of the course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able 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.

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VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
Department of Mechanical Engineering

ARTIFICIAL INTELLIGENCE AND NEURAL NETWORKS (PE-VI)
SYLLABUS FOR B.E.VIII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:60	Course Code: **PE890ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

COURSE OBJECTIVE *The objectiveof this course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1. Introduce artificial intelligence and problem-solving search methods 2. Present knowledge representation, reasoning, planning and decision making 3. Introduces neural network, artificial neuron, neuron properties, interference, learning algorithm along with functional models	1. Understand the concept of artificial intelligence and learn various search methods 2. Discuss the knowledge representation, logic with sequential control of reasoning 3. Analyze reasons under uncertainty with networks, and planning with sequential and complex decisions. 4. Understand the basic of neural networks, hybrid intelligence, artificial neuron 5. Interpret neural properties, node properties, learning algorithm, various functional models.

UNIT-I
AI and AI problem solving-Introduction to artificial Intelligence, Problem solving as state space search, Uniformed search
Problem solving by search-Heuristic search,Informed search, constraint satisfaction problems, Searching AND/OR graphs, Game playing, Minimax+Alpha-Beta.

UNIT-II
Knowledge representation and Reasoning-Introduction to knowledge representation, Propositional logic, First order logic -I, First order logic-II, Interference in first order logic-I, Interference in first order logic-II, Answer extraction, Procedural control of reasoning.

UNIT-III
Reason Under uncertainty- Reason Under uncertainty, Bayesian network, Decision network
Planning- Introduction to planning, Plan space planning, Planning graph and graph plan
Planning and decision making- Practical planning and acting, Sequential decision problems, Making complex decisions.

UNIT-IV
Introduction-Knowledge based information processing-A general view of knowledge based algorithm. Neural information processing. Hybrid intelligence-Artificial neuron.

UNIT-V
Basic Neuron computation models-Basic concepts of neural network-Network properties-Node properties-Sigmoid functions-System dynamics. Inference and learning algorithm. Data representation. Functional classification models- Single layer perceptions, multilayer perceptions.

Learning Resources:

1. Elaine Rich and Kevin Knight, 1991, Artificial Intelligence, 2nd Edition, TataMcGraw-Hill, New Delhi.
2. Jack Copeland, "Artificial Intelligence – A philosophical Introduction" Backwell publishing, 1993
3. Nils.j.Nilsson,"The quest for Artificial Intelligence" Cambridge University press, October 2009.
4. Limin Fu," Neural Networks in computer intelligence" Mg-Graw hill, 1995
5. Bart Kosho " Neural Networks and fuzzy systems" Prentice hall of India, 1994

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VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

MICROPROCESSOR APPLICATIONS IN AUTOMOBILES (PE-VI)
SYLLABUS FOR B.E.VIII-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks:60	Course Code: **PE812ME**
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

Course objectives	Course Outcomes
To understand fundamentals of Microprocessors and apply them for automobiles	After successfully completing the course students will be able to: 1. Describe microprocessor's components and instruction sets 2. Explain Assembly Language Programming to use in microprocessors 3. Interpret various data transfer schemes used in microprocessors 4. Explain various interfacing devices for microprocessors 5. Describe various applications of microprocessors, specifically to automobiles

UNIT-I
Components of a microprocessor-based system: Microprocessor-ALU, Register Array, Control Unit. Memory-ROM, RAM. Input/output. System Bus. Working Principle of Microprocessor.
Microprocessor Instruction Set: General 8 bit microprocessor and its architecture. 8085, Z-80 and MC 6800 MPU and its pin function - Architecture - Function of different sections. Instruction format - addressing modes - instruction set of 8085 MPU-T-STATE - Machine cycle and instruction cycles - Timing diagrams - Different machine cycles - Fetch and execute operations - estimation of execution times.

UNIT-II
Assembly Language Programming: Construct of the language programming - Assembly format of 8085 - Assembly Directive - Multiple precision addition and subtraction - BCD to Binary and Binary to BCD, Multiplication, Division, Code conversion using look up tables - Stack and subroutines.

UNIT-HI
Data Transfer Schemes: Interrupt structure - Programmed I/O - Interrupt driven I/O, DMA - Serial I/O.

UNIT-IV
Interfacing Devices: Types of interfacing devices - Input / Output ports 8212, 8255, 8251, 8279. Octal latches and tristate buffers - A/D and D/ A converters - Switches, LED's ROM and RAM interfacing.

UNIT-V
Applications: Data acquisitions - Temperature control - Stepper motor control - Automotive applications Engine control, Suspension system control, Driver information systems), Development of a high speed, high precision learning control system for the engine control.

Learning Resources:

1. Ramesh, Goankar.S., Microprocessor Architecture Programming and Applications, Wiley Eastern Ltd., New Delhi, 1986.
2. Aditya.RMathur, Introduction to Microprocessors, III Edition, Tata McGraw-Hill Publishing Co Ltd., New Delhi, 1989.
3. Ahson.S.I. Microprocessors with Applications in Process Control,Tata McGraw-Hill, New Delhi, 1986.
4. Jabez Dhinagfar .S., Microprocessor Applications in Automobiles.
5. SAE Transactions, 1986 Sec 3
6. L. Bianco and A. Labella., Automotive Micro Electronics, Elsevier science Publishers,1986.

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Duration of Internal Test: **1 Hour 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
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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 : 9	CIE Marks: 50	Duration of SEE: --

COURSE OBJECTIVE *The objective of the course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able to*
solve a real life problem related to Mechanical engineering using relavant tools and techniques, write a thesis and give a presentation.	1. define the problem by literature study. 2. design and conduct experiments using Mechanical Engineering tools to collect data. 3.analyze and interpret data using graphs. 4.make logical conclusions to justify the results.

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 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 exam.

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 using rubrics.			
Duration of Presentation: **20 min**			