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
M.E (ADM) I - IV SEMESTERS OF MECHANICAL ENGINEERING
(R-24)
WITH EFFECT FROM 2024-25
(For the students admitted in 2024-25)

DEPARTMENT OF MECHANICAL ENGINEERING

+91-40-23146060, 23146061
Fax: +91-40-23146090
Website: www.vce.ac.in

VISION OF THE INSTITUTE

Striving for a symbiosis of technological excellence and human values.

MISSION OF THE INSTITUTE

To arm young brains with competitive technology and nurture holistic development of the individuals for a better tomorrow.

VISION OF THE DEPARTMENT

To establish global leadership in the field of mechanical engineering and develop competent human resources with values and ethics

MISSION OF THE DEPARTMENT

To nurture an environment of research, innovation and knowledge through the latest teaching-learning practices in mechanical engineering

PROGRAM OUTCOMES (POs)	
1	An ability to independently carry out research / investigation and development work to solve practical problems.
2	An ability to write and present a substantial technical report / document.
3	An ability to demonstrate a degree of mastery over the area of Advanced Design and Manufacturing.
4	An ability to apply appropriate techniques and modern engineering tools in the design and development of solutions for complex mechanical engineering design and manufacturing problems.
5	An ability to apply engineering and management principles as a member and leader in a team, to manage projects in a multi-disciplinary environment with life-long learning capabilities.
PROGRAM EDUCATIONAL OBJECTIVES (PEOs)	
1	To have an in-depth technical knowledge in the chosen field of specialization in mechanical engineering
2	To demonstrate commitment to solve technical problems and to work in multi disciplinary teams
3	To exhibit the skills to contribute to their organization and make well informed decisions
4	To advance professionally through publications in the form of reports and technical papers.
5	To have life long learning.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

SCHEME OF INSTRUCTION AND EXAMINATION (R-24)
M.E. – MECH : FIRST SEMESTER (2024-2025)

M.E (ADM) I 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								
PI24PC100ME	Metal Cutting and Forming	3	-	-	3	60	40	3
PI24PC110ME	Computer Integrated Design and Manufacturing	3	-	-	3	60	40	3
PI24PEXXXME	Professional Elective-I	3	-	-	3	60	40	3
PI24PEXXXME	Professional Elective-II	3	-	-	3	60	40	3
PI24PC140ME	Research Methodology and IPR	2	-	-	-	60	40	2
PI24AC110EH	Audit Course I – English for Research Paper Writing	2	-	-	3	60	40	0
PRACTICALS								
PI24PC111ME	Computer Aided Modelling and Assembly Lab	-	-	3	-	-	50	2
PI24PC121ME	Advanced Manufacturing Lab	-	-	3	-	-	50	2
	TOTAL	**16**	**-**	**8**	**-**	**360**	**340**	**18**
	GRAND TOTAL	**24**				**700**		**18**

1) One hour allotted for sports

PE: Professional Electives			
Sl. No.	**Course Code**	**Course Title**	**SEM.**
Professional Elective-I(Design Group)			**ME I-Sem.**
1	PI24PE100ME	Mechanical Vibrations	
2	PI24PE110ME	Advanced Kinematics	
3	PI24PE120ME	Robotic Engineering	
Professional Elective-II(Manufacturing Group)			
1	PI24PE130ME	Flexible Manufacturing Systems	
2	PI24PE140ME	Quality and Reliability Engineering	
3	PI24PE150ME	Nano Science and Technology	
Professional Elective-III(Analysis Group)			**ME II-Sem.**
1	PI24PE200ME	Finite Element Method	
2	PI24PE210ME	Experimental Techniques and Data Analysis	
3	PI24PE220ME	Fracture Mechanics	
Professional Elective-IV(Design Group)			**ME III-Sem.**
1	PI24PE300ME	Advanced Finite Element Analysis	
2	PI24PE310ME	Computer Aided Mechanical Design and Analysis	
3	PI24PE320ME	Mechanics of Composite Materials	
Professional Elective-V(Manufacturing Group)			
1	PI24PE330ME	Advanced Non Destructive Evaluation Techniques	
2	PI24PE340ME	Additive Manufacturing	
3	PI24PE350ME	Mechatronics	

AC: Audit Courses		
Sl. No.	**Course Code**	**Course Title**
1	PI24AC110EH	English for Research Paper Writing
2	PI24AC210EH	Pedagogy Studies
3	PI24ACX20XX	Disaster Management
4	PI24ACX30XX	Sanskrit for Technical Knowledge
5	PI24ACX40XX	Value Education
6	PI24ACX50XX	Constitution of India
7	PI24ACX70XX	Stress Management by Yoga
8	PI24ACX80XX	Personality Development through Life Enlightenment Skills

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

METAL CUTTING AND FORMING

SYLLABUS FOR M.E.I-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: PI24PC100ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of this course are to: 1. Explain the principles of metal cutting 2. Discuss various shear angle relations 3. Discuss effects of temperature and forces in metal cutting 4. Describe various plastic deformation theories 5. Identify and differentiate various non conventional forming methods	On completion of the course, the student will be able to: 1. analyse various metal cutting processes. 2. formulate equations of temperature distribution and forces in metal cutting. 3. appreciate methods of improving cutting efficiency and economics. 4. evaluate different metal forming methods. 5. analyze various non conventional forming methods.

UNIT-I: TOOL MATERIALS

Tool material properties – HSS, Carbides, coated carbides, ceramic and CBN and diamonds, sialons, powder coatings – Relative advantages. Tool Geometry: Various methods of tool nomenclature and their inter relationship. Theoretical Determination of shear angle and cutting forces: Shear plane theory–Merchants models, Lee and Shofers model. Velocity relations. Estimation of shear angle experimentally. Metal cutting friction. Real area of contact-Rules of dry sliding, stress distribution of tool face-variation of co-efficient of tool face friction with the rake angle.

UNIT-II: DYNAMOMETRY

Theoretical and empirical estimation of force and power in turning, drilling, milling and grinding processes optimization in cutting forces – Dynamometer requirements – Force measurements – Electric transducers. Lathe, drilling and milling dynamometers. Cutting Temperatures: Shear Plane temperature – Average chip-tool interface temperature-interface temperature by dimensional analysis – Distribution of shear plane temperature-Measurement of temperature by radiation pyrometer – Moving thermo couple – Photo cell – Photographic method.

UNIT-III: TOOL WEAR, TOOL LIFE AND MACHINABILITY

Mechanism of tool wear – Adhesive, Abrasive, Diffusive and Chemical wear – Taylor"s tool life equation. Cutting Fluids – Carbon tetrachloride – Direction of fluid application – Chip curl-economics of machining – Comparison of machinability of different metals. Recent development in metal cutting: Hot machining. Rotary machining – High speed machining, rapid proto typing.

UNIT-IV: PLASTIC DEFORMATION

Mechanism of plastic deformation, Factors affecting plastic deformation, Strain hardening behavior. Recovery, Recrystallization and grain growth. Variables affecting stress-strain curves, Ideal & Practical stress-strain curves. Cold working, warm working and hot working. Plasticity cycle. Plane stress & Plane strain condition. Rolling: Principle of rolling, process parameters. Estimation of rolling loads. Principles of roll pass design for various product shapes. Principles of ring rolling.

UNIT-V: UNCONVENTIONAL METHODS IN METAL FORMING

High energy rate forming. Merits and limitations of HERF Processes. Principle, merits, limitations and applications of pneumatic-mechanical systems. Explosive forming, electro-magnetic forming, electro-hydraulic forming and water hammer forming. Forming with rubber pads – Guerin, Marform&Wheelon forming techniques.

Learning Resources:

1. M.C. Shaw. Metal cutting principles – CBS Publications, New Delhi, 1992.
2. Bhattacharya, Metal cutting – Central book publishers, Calcutta – 1996.
3. Heinrich Makelt, Mechanical presses, Edward Arnold (Pvt) Ltd., London, 1968.
4. Bary. Donald.F and Reads. Edward A., Techniques of press working sheet metal, Prentice Hall Publ., 1974.
5. Kameschikov, Forming Practice, Mir Publishers, Moscow, 1970.
6. High Velocity Forming methods, ASTME, Michigan, 1968.

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

COMPUTER INTEGRATED DESIGN AND MANUFACTURING

SYLLABUS FOR M.E.I-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: PI24PC110ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of this course are to: 1. understand the present trends of the product cycle. 2. learn the modern manufacturing methods and its programming part. 3. introduce the concepts of modern prototype manufacturing RPT 4. introduce the present shop floor control methods 5. Learn the network methods of the digital devices.	On completion of the course, the student will be able to: 1. understand the modern methods of design and manufacturing 2. Distinguish production planning and control methods in shop floor 3. Classify the different additive manufacturing methods 4. Describe the modern machining processes 5. Integrate the CAD/CAM operations

UNIT-I

Product Design and CAD/CAM in the Production Systems - Product development through CAD and CAE: Geometric modeling techniques using wireframe, surface and solid modeling-graphic standards, Advanced modeling for curves, surfaces, NURBS- Advanced assembly – assembly constraints – subassembly – modification.

UNIT-II

Advanced Manufacturing Technology – Design drafting interface, Computer aided manufacturing technologies using Numerical Control, CNC and DNC, process interface hardware, programming languages, direct digital control, supervisory compiler controls and optical control, adoptive control – Agile and lean manufacturing.

UNIT-III

Rapid proto typing: Various techniques & mathematical background. Automated inspection & RE-engineering techniques: Point cloud data acquisition & analysis.

UNIT-IV

Concepts of Production Planning, Material Requirement Planning, up to down planning and bottom up replanning – Master production scheduling, PPC, Material Handling Requirements, Technology Planning.

UNIT-V

Communication aspects in CIM – Issues in Implementation of Advanced Manufacturing Technology – configuration management, database systems, networking concepts, LAN, MAN, SQL, CIM Models, Economics of CIM.

Learning Resources:

1. MP Groover,"Automation, Production Systems and Computer Integrated Manufacturing", - Pearson Education, 2nd Edition, 2001.
2. Ibrahim Zeid, "CAD/CAM Theory and Practice", - Tata McGraw Hill, 1991.
3. FH Mitchell, "CIM Systems - An Introduction", - Prentice Hall, 1986.
4. Eric Teicholz& JN, "CIM Handbook", - McGraw Hill, 1986.
5. P.N. Rao, "CAD/CAM Principles and Applications", Tata McGraw Hill, 3rd Ed, 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**

PROFESSIONAL ELECTIVES
DESIGN GROUP

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

MECHANICAL VIBRATIONS (PROFESSIONAL ELECTIVE-I)

SYLLABUS FOR M.E. (ADM) I-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: PI24PE100ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

Course Objectives	Course Outcomes
The objectives of this course are to: to understand vibration concepts in multi degree of freedom system, continuous system, random vibrations, non-linear vibrations and the importance of vibration control and testing devises.	On completion of the course, the student will be able to: 1. analyse the multi degree of freedom systems vibrations. 2. explain vibration behavior of continuous systems. 3. explain theoretical and experimental modal analysis. 4. apply various methods for vibration control. 5. interpret the concept of the Random and non-linear vibrations.

Unit-I

(A) Multi Degree Freedom System: Free Vibration equation of motion. Influence Coefficients i) Stiffness Coefficients. (ii) Flexibility Coefficients. Generalized co ordinates and Coordinate couplings. Lagrange's Equations. Eigen Values Eigen Vector problems. Modal Analysis of free andforced Vibrations of systems with and without damping.

(B) Study of Multi Degree Systems using Numerical Methods: (i) Holzer`s Method (ii)Methods of Matrix iterations (ii) Transfer Matrix Method.

Unit-II

Free Vibration of Continuous Systems: String, Bars, Shafts and Beams.

Energy methods: Rayleigh`s Method, Rayleigh-Ritz Method.

Unit-III

Modal parameter extraction methods: Introduction , Frequency response functions.

Preliminary checks of FRF Data , SDOF Modal Analysis : Peak-amplitude and Circle Fit Method.

Experimental modal analysis, Machine Condition Monitoring, fault diagnosis.

Unit-IV:

Vibration Control: Balancing of rotating machine, In-situ balancing of rotors, control of natural frequency. introduction of damping, vibration isolation & vibration absorbers.

Vibration Measurement: FFT analyzer, vibration exciters, signal analysis. Time domain & Frequency domain analysis of signals.

Unit-V

Random Vibrations: Expected values, Auto and Cross correlation function, Spectral density, response of linear systems, analysis of narrow band systems.

Non Linear Vibrations: Systems with non-linear elastic properties, free vibrations of system with non-linear elasticity and damping, phase-plane technique, Duffing's equation. jump phenomenon.

Learning Resources:

1. W T Thomson, Marie Dillon Dahleh, Chandramouli Padmanabhan "Theory of Vibrations with Applications", 5th Edition, Pearson Education India, 2008.
2. Singiresu S. Rao, "Mechanical Vibrations", 5th Edition in SI Units, Prentice Hall, 2011.
3. Leonard Meirovitch, "Fundamentals of Vibration", Waveland Press, 2010.
4. J P Den Hartog, "Mechanical Vibrations", Courier Corporation, 2013.
5. Srinivasan, "Mechanical Vibration Analysis", Tata McGraw-Hill, 1982.
6. Nuno Manuel Mendes Maia et al," Theoretical and Experimental Modal Analysis", Wiley John & Sons, 1999.

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

ADVANCED KINEMATICS (PROFESSIONAL ELECTIVE-I)

SYLLABUS FOR M.E. (ADM) I-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: PI24PE110ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of this course are to: 1. study the graphical and analytical methods to perform kinematic analysis 2. asses number and dimensional synthesis of different linkages 3. learn D-H convention and transformations to do kinematic analysis of RGGR spatial mechanism 4. evaluate the cam and follower mechanism for different motion requirements and their design. 5. analyze the methods for kinematic analysis of Two degree of freedom Robot.	On completion of the course, the student will be able to: 1. perform kinematic analysis of complex mechanisms 2. demonstrate principles of kinematic synthe sis 3. analyze spatial mechanism 4. design the cam profile for given required motion of the follower. 5. perform kinematic analysis for two degree of freedom Robot manipulator.

Unit-I: KINEMATIC ANALYSIS OF PLANE MECHANISM

Analytical method of kinematic analysis of four bar mechanisms. Acceleration analysis of complex mechanisms by auxiliary point method. Good man's indirect method.

Unit-II: KINEMATIC SYNTHESIS OF LINKAGES

Number synthesis, associated linkage or equivalent linkage concept, dimensional synthesis by analytical and graphical methods.

Unit-III

Kinematic analysis of four link RGGR spatial mechanism, D-H parameters, Transformations matrix method for position velocity and acceleration analysis of special mechanisms.

Unit-IV

Cams: Forces in rigid systems, Mathematical models, Response of a uniform - Motion undamped cam mechanism - Analytical method, Follower response by phase - Plane method - Position error, Jump, Crossover shock - Johnson's numerical analysis

Unit-V

Kinematic analysis of two-degree freedom of Robot, introduction to compliant mechanisms.

Learning Resources:

1. Amitabh Gosh and Ashok Kumar Mallik, 'Theory of Mechanisms and Machines', Affiliated East-West Press Pvt. Ltd., New Delhi, 1998.
2. Artur, G.Erdman and George.N.Sandor, 'Mechanism Design', Volume-I and -II, Prentice Hall of India, 1984.
3. Joseph Edward. Shigley and J.JosephUicker, 'Theory of Mechanisms and Machines', McGraw-Hill Company, 1995.
4. RL Norton 'Kinematics and Dynamics of Machines' by McGraw-Hill Company, 1st Ed., 2012.
5. Charles E Wilson "Kinematics and Dynamics of Machinery", Pearson, 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

ROBOTIC ENGINEERING (PROFESSIONAL ELECTIVE-I)

SYLLABUS FOR M.E. (ADM) I-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code:PI24PE120ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of this course are to: 1. laws of robotics terms related with robotics, manipulator configurations, types of actuators, applications of robots. 2. kinematics of robotics and its homogenous transformation matrix. 3. inverse kinematics and jacobian with singularities and about bug algorithms, trajectory. 4. dynamics of a robotics and programming methods. 5. types of sensors including vision.	On completion of the course, the student will be able to: 1. understand basic concepts of industrial robotics and application of robotics with different manipulator configurations. 2. model the motion of robotic systems in terms of kinematics using Denavit-Hartenberg algorithm. 3. derive inverse kinematics and jacobian using forward kinematics, trajectory path planning and also sensor based motion planning. 4. evaluate dynamics using Largrange_Euler and Newton-Euler methods, controls and robotic programming. 5. identify the sensors used for displacement, velocity, acceleration, force and Machine vision

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

UNIT-I

Brief History, Types of robots, Overview of robot subsystems, resolution, repeatability and accuracy, Degrees of freedom of robots, Robot configurations and concept of workspace, End effectors and Different types of grippers, vacuum and other methods of gripping. Pneumatic, hydraulic and

electrical actuators, applications of robots, specifications of different industrial robots.

UNIT-II

Homogeneous transformation matrices, Denavit-Hartenberg notation, representation of absolute position and orientation in terms of joint parameters, Forward kinematics, Inverse kinematics of 2-DOF, 3-DOF manipulators.

UNIT-III

Singularities, Jacobian, Inverse Jacobian Trajectory Planning: joint interpolation, task space interpolation, executing user specified tasks, sensor based motion planning: The Bug Algorithm, The Tangent Bug Algorithm, The Incremental Voronoi Graph.

UNIT-IV

Static force analysis of RR type planar robots, Dynamic analysis using Lagrangean and Newton-Euler formulations of RR and RP type planar robots, Introduction to independent joint control, PD and PID feedback, actuator models, nonlinearity of manipulator models, force feedback, hybrid control.

UNIT-V: SENSORS AND CONTROLLERS

Internal and external sensors, position, velocity and acceleration sensors, proximity sensors, force sensors, laser range finder. Robot vision: image processing fundamentals for robotic applications, image acquisition and preprocessing. Segmentation and region characterization object recognition by image matching and based on features

Learning Resources:

1. Nagrath and Mittal, "Robotics and Control", Tata McGraw-Hill, 2003.
2. Spong and Vidhyasagar, "Robot Dynamics and Control", John Wiley and sons, 2008.
3. Fu. K.S, Gonzalez, R.C., Lee, C.S.G, Robotics, control, sensing, Vision and Intelligence, McGraw Hill International, 1987
4. Steve LaValle, "Planning Algorithms", Cambridge Univ. Press, New York, 2006.
5. Howie Choset, Kevin Lynch, Seth Hutchinson, George Kantor, Wolfram Burgard, Lydia Kavraki and Sebastian Thurn, "Principles of Robot Motion: Theory, Algorithms, and Implementations", Prentice Hall of India, 2005.

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**

PROFESSIONAL ELECTIVES
MANUFACTURING GROUP

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

FLEXIBLE MANUFACTURING SYSTEMS
(PROFESSIONAL ELECTIVE-II)

SYLLABUS FOR M.E. (ADM) I-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code:PI24PE130ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

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

Unit-I: EVOLUTION OF MANUFACTURING SYSTEMS

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

Unit-II: MANUFACTURING'S DRIVING FORCE

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

benefits and relationship to FMS, design of group technology using rank order clustering technique.

Unit-III: FMS DESIGN – Using Bottleneck, Extended bottleneck models, Processing and Quality Assurance

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

Unit-IV: AUTOMATED MOVEMENT AND STORAGE SYSTEMS

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

Unit-V: FMS

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

Learning Resources:

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

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

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

QUALITY AND RELIABILITY ENGINEERING
(PROFESSIONAL ELECTIVE-II)

SYLLABUS FOR M.E. (ADM) I-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code:PI24PE140ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of this course are to: 1. understand the process capability and control charts 2. Analysis the importance of tolerance design 3. Relate QFD and house of quality and its use in product design 4. Apply various techniques to improve reliability systems 5. Selective maintainability and availability of equipment	On completion of the course, the students will be able to: 1. understand importance of quality applications of various control charts and acceptance sampling in quality engineering 2. estimate the loss function, and consequence of tolerance design for a product and checking of online quality control 3. prepare a house of quality for a product and QFD matrix, importance of ISO and quality circles. 4. analyze Various methods to estimate system reliability and how to improve it. Usage of weibull distribution in quality control and reliability 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.BalaGuruswamy, `*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

NANO SCIENCE AND TECHNOLOGY (PROFESSIONAL ELECTIVE-II)

SYLLABUS FOR M.E. (ADM) I-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code:PI24PE150ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of this course are to: learn the basic fundamentals, classifications, synthesis and processing of nano materials along with corresponding nano and micro fabrication techniques.	On completion of the course, the student will be able to: 1. identify basic fundamentals of nanotechnology and differentiate it from nano science 2. classify nano materials and identify their applications 3. explain various synthesis and processing steps for nano materials 4. describe and use nano, micro fabrication techniques

Unit-I: INTRODUCTION

Evolution of science and technology, Introduction to Nanotechnology, Nanotechnology – Definition – Difference between Nanoscience and Nanotechnology, Feynman predictions on Nanotechnology, Moores law, Role of Bottom up and top down approaches in nanotechnology, challenges in Nanotechnology.

Unit-II: NANO MATERIALS

History of materials, Nanomaterials – Definition, Classification of Nanostructured materials, cause of interest in nanomaterials, some present and future applications of nanomaterials.

Unit-III:SYNTHESIS AND PROCESSING OF NANO POWDERS

Processes for producing ultrafine powders – mechanical milling, wet chemical synthesis, gas condensation process, chemical vapour condensation, laser ablation.

Design and Synthesis of self assembled nano structured materials.

Unit-IV

Special nanomaterials, characterization and tools: Carbon nanotubes, nano composites

Carbon fullerenes: An overview of preparation, properties applications.
Electron Microscopy Techniques: Scanning Electron Microscopy, Transmission Electron Microscopy, Scanning Probe Microscopy – X ray methods.

Unit-V
Nanoelectronics: Introduction to micro, nano fabrication: Optical lithography, Electron beam lithography, Atomic lithography, Molecular beam epitaxy.
MEMS: Introduction, Principles, Types of MEMS:- Mechanical, Thermal, Magnetic MEMS; Fabrication of MEMS.

Learning Resources:
1. Dieter Vollath, Nanomaterials: An Introduction to Synthesis, Properties and Applications, Second Edition, Wiley, 2013
2. Guozhong Cao, Ying Wang, Nanostructures and Nanomaterials: Synthesis, Properties, and Applications, World Scientific, 2011
3. Nitaigour P. Mahalik, Micromanufacturing and Nanotechnology, Springer Science & Business Media, 2006.
4. Mark A. Ratner, Daniel Ratner, Nanotechnology: A Gentle Introduction to the Next Big Idea, Prentice Hall Professional, 2003
5. A.S Edelstein, R.C Cammaratra, Nanomaterials: Synthesis, Properties and Applications, Second Edition, CRC Press, 1998.

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

RESEARCH METHODOLOGY AND IPR

SYLLABUS FOR M.E.I-SEMESTER

L:T:P(Hrs/week):2:0:0	SEE Marks:60	Course Code: PI24PC140ME
Credits :02	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of this course are to: 1. Learn the research methodology and formulation. 2. Know the sources of literature, method for collection of research data and report writing. 3. Understand IPR laws and Acts.	On completion of the course, the student will be able to: 1. List various types of research and explain its significance in the relevant field. 2. review the relevant literature and summarize information for formulating the research problem. 3. generate, analyze and organize the data for the preparation of research report. 4. explain different types of intellectual property rights and its related laws. 5. discuss the patent administration system and patenting procedure.

Unit-I

Research Methodology: Meaning of research, Objectives and motivation of research, types of research, research approaches, significance of research, research methods versus methodology, criteria of good research, Research problem formulation.

Unit-II

Literature survey: Importance of literature survey, sources of information, Literature review: Need of Literature review, Plagiarism, research ethics, errors in research, Assessment of quality of journals.

Unit-III

Data collection & report preparation: Collection of primary data, secondary data, data organization, methods of data grouping, diagrammatic representation of data, graphic representation of data. Effective technical writing and how to write report, format of a research proposal, contents of a standard technical journal/conference paper, contents of dissertation.

Unit-IV

Introduction to Intellectual property law: Basics and types of intellectual property, international organizations, agencies and treaties.

Law of Trademarks: Purpose and functions of trademarks, types of Marks, acquisition of trade mark rights, protectable matter and trade mark registration process, Trade Mark Act.

Unit-V

Law of copyrights: Introduction, common law rights. Rights of reproduction, rights to display work publicly, other limitations of exclusive rights, copyright ownership issues, copy right registration and Berne convention.

Law of Patents: Administration of Indian patent system, Introduction, rights under patent law. Design patents, Plant patents. Patenting process. Patent ownership and transfer, new developments in IPR and international patent laws, Geographical Indications.

Learning Resources:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'.
2. C. R. Kothari-Research Methodology Methods and Techniques, Second revised edition, New Age International (P) limited Publishers, New Delhi.2013.
3. Ranjitkumar, Research methodology, A step-by-step Guide for Beginners, second Edition, Sage Publications India Pvt Ltd, New Delhi.2017.
4. PanneerSelvam, Research Methodology, Second Edition, PHI Learning Pvt Ltd, New Delhi.
5. Deborah E. Bouchoux -Intellectual Property, the law of trademarks, Copyrights, Patents and Trade Secrets. Fourth Edition, CENGAGE Learning India private Limited, New Delhi.2013.
6. P.Narayana, Intellectual property law, Third Edition, Eastern Law House, New Delhi.

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

Audit Course-I : English for Research Paper Writing

SYLLABUS FOR M.E. (ADM) I-SEMESTER

L:T:P(Hrs./week):2:0:0	SEE Marks: 60	CourseCode:PI24AC110EH
Credits:- 0	CIE Marks: 40	DurationofSEE:3 Hours

COURSEOBJECTIVES	COURSEOUTCOMES
This will enable the students should be able to: 1. Understand, how to improve your writing skills and level of readability 2. Learn about what to write in each section 3. Understand the skills needed When writing a Title 4. Ensure the good quality of paper at very first-time submission	On completion of the course, students will be able to 1. write research papers 2. write citations as per the MLA style sheet and APA format 3. write concisely and clearly following the rules of simple grammar, diction And coherence.

UNIT-1

Planning and Preparation, Word Order, Breaking up long sentences. Structuring Paragraphs and Sentences, Being concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT-2

Clarifying Who Did What, Highlighting your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction

UNIT-3

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT-4

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, useful phrases, how to ensure paper is as good as it could possibly be the first-time submission.

UNIT-5

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions.

METHODOLOGY	ASSESSMENTS
- Case Studies - Demonstration - Presentations - Expert lectures - Writing and Audio-visual lessons	- Online assignments - Individual and Group

Learning resources:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM Highman's book.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

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

COMPUTER AIDED MODELLING AND ASSEMBLY LAB

SYLLABUS FOR M.E. (ADM) I-SEMESTER

L:T:P(Hrs./week):0:0:3	SEE Marks: 0	Course Code: PI24PC111ME
Credits : 2	CIE Marks:50	Duration of SEE: ---

Course Objectives	Course Outcomes
The objectives of this course are to: 1. practice 2D and 3D modelling 2. design and assemble the parts to create mechanical products.	On completion of the course, the Students will be able to: 1. aware the geometric entities and edit for developing 2D drawings. 2. practice the geometric entities to create 3D model. 3. develop assembly of mechanical products by using assembly constraints.

List of Experiments

1. To draw 2D sketches using basic geometric entities.
2. To draw 2D sketches using different line types with dimensions and text.
3. To draw 2D sketches using dimensions and geometric constraints.
4. To draw 2D sketches using mirror, pattern operations.
5. To model components in 3D using linear Extrusion and Boolean operations.
6. To model components in 3D using datum planes and feature instance operations.
7. To model components in 3D using revolve and Boolean operations.
8. To model typical 3-D components (gear, hexagonal headed bolt and Nut, Helical spring.)
9. To develop simple Assembly using 3D part models with the application of Assembly constraints.
10. To model 3D part models of Journal bearing and developing the assembly of it.
11. To model 3D part models of Universal coupling and developing the assembly of it.
12. To model 3D part models of Flange coupling and developing the assembly of it.
13. To model 3D part models of Connecting rod and developing the assembly of it.

No. of Internal Tests:	02	Max. Marks for Internal Test:	12
Marks for assessment of each experiment			18
Duration of Internal Test: **3 Hours**			

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

ADVANCED MANUFACTURING LAB

SYLLABUS FOR M.E. (ADM) I-SEMESTER

L:T:P(Hrs./week):0:0:3	SEE Marks: 0	Course Code: PI24PC121ME
Credits : 2	CIE Marks:50	Duration of SEE: ---

Course Objectives	Course Outcomes
The objectives of this course are to: 1. understands the CNC programming. 2. utilize advanced manufacturing technology like additive manufacturing and EDM.	On completion of the course, the Students will be able to: 1. develop the part program for operating CNC lathe and CNC mill for machining. 2. Manufacture the components using 3D printer. 3. Study the characteristics of EDM machining. 4. performance evaluation of drilling operation & Lathe tool dynamometer.

List of Experiments

1. Manual part program on CNC lathe for Plain turning.
2. Manual part program on CNC lathe for Step turning.
3. Manual part program on CNC lathe for Taper turning.
4. Manual part program on CNC Mill for linear and circular interpolation.
5. Manual part program on CNC Mill for Contouring operation.
6. Manual part program on CNC Mill for Pocketing operation.
7. Development of CNC code using CAM software for turning and milling.
8. Additive manufacturing of simple components using 3D printer.
9. Additive manufacturing of complex components using 3D printer.
10. Generation of characteristic curves on an EDM machine.
11. Study of drilling characteristics using drill tool dynamometer.
12. Feed Force measurement using Lathe tool dynamometer.
13. Normal force measurement using lathe tool dynamometer.
14. Demonstration on Plastic injection moulding machine.

No. of Internal Tests:	02	Max. Marks for Internal Test:	12
Marks for assessment of each experiment			18
Duration of Internal Test: **3 Hours**			

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

Scheme of instruction and examination (R-24)
M.E. (ADM) : SECOND SEMESTER 2024-25

M.E (ADM) II 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								
PI24PC210ME	Design for Manufacture and Assembly	3	-	-	3	60	40	3
PI24PC220ME	Metallurgy of Casting and Welding	3	-	-	3	60	40	3
PI24PEXXXME	Professional Elective-III	3	-	-	3	60	40	3
PI24OEXXXME	Open Elective	3	-	-	3	60	40	3
PI24AC210EH	Audit Course 2: Pedagogy Studies	2	-	-	3	60	40	0
PRACTICALS								
PI24PC231ME	Vibration Analysis Lab	-	-	3	-	-	50	2
PI24PC241ME	Computer Aided Simulation Lab	-	-	3	-	-	50	2
PI24PW219ME	Mini Project	-	-	2	-	-	50	2
	TOTAL	**14**	**-**	**12**	**-**	**300**	**350**	**18**
	GRAND TOTAL	**26**				**650**		**18**

M.E. / M.Tech. II SEM (OPEN ELECTIVE COURSES)		
Dept.	**Course Code**	**Course Title**
Mech.	PI24OE210ME	Advanced Operations Research
	PI24OE220ME	Introduction to Composite Materials
IT	PI24OE210IT	Fundamentals of Python Programming

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
Department of Mechanical Engineering
DESIGN FOR MANUFACTURE AND ASSEMBLY
SYLLABUS FOR M.E.II-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: PI24PC210ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of this course are to: Learn design principles, mechanical behavior of materials, selection of engineering materials and their shape. Design of components made by metallic, non-metallic materials and also design of assembled parts.	On completion of the course, the student will be able to: 1. select materials for design based on shape factor and their suitability for various processes. 2. study the process characteristics and design recommendations of metallic parts made by vamfg methods like extrusion, stamping etc. 3. study the process characteristics and design recommendations of metallic parts made by mfg methods like grinding and casting etc. 4. study the process characteristics and design recommendations of non-metallic parts made with plastics, rubber, ceramics etc. 5. Study the process characteristics and design recommendations of assembled parts to increase productivity.

Unit-I: INTRODUCTION

General design principles for manufacturability: Basic Principles of designing for economical production, General design rules.

Materials selection: Materials in Design, the evolution of engineering materials, material selection based on property profile, Selection of material and shape, Shape factor in elastic bending, Limits to shape efficiency.

Characteristics, Grades for processing, Design recommendations of:

Ferrous Metal: hot rolled steel, cold finished steel, stainless steel
Non-ferrous materials: aluminium, copper, brass
Non-metallic materials: plastics, rubber and composites.

Unit-II:

METALLIC COMPONENTS DESIGN: Process Characteristics and Design recommendations of parts made by Metal extrusion, metal stamping, fine

blanking, spun metal parts, cold headed parts, roll formed parts, specialized forming methods, turned parts, drilled parts, milledparts.

Unit-III: METALLIC COMPONENTS DESIGN: Process Characteristics and Design recommendations of parts made by Planned and shaped parts, internal ground parts, center less ground, electrical discharged, electro chemical parts, Sand cast, die cast and investment cast parts.

Unit-IV:

NON-METALLIC COMPONENTS DESIGN:

Process Characteristics and Design recommendations of parts made by Thermosetting plastic, injection moulded and rotational moulded parts, blow moulded, ceramics. Thermoformed plastic parts, plastic welding, rubber parts, design for ergonomics.
Design for X concepts

Unit-V:
DESIGN FOR ASSEMBLY
Design for assembly: Minimizing the number of parts, guidelines for assembly improvement, Design rules for Rivets, screw fasteners, gaskets and seals, Press-fits, Snap-fits, Automatic assembly.
Assembled Parts Design: Arc and Resistance welded parts, Soldered and brazed parts, Design for heat treating. Gear box assembly, Bearing assembly.

Learning Resources:

1. James G. Bralla, "Hand book of product design for manufacturing"McGrawHillCo.,1999
2. K.G.Swift "Knowledge based design for Manufacture", Koganpage Limited, 1987.
3. Ashby.MaterialsselectioninMechanicalDesignfourtheditionElsevier,2011
4. Boothroyd, Geoffrey, Peter Dewhurst, and Winston A. Knight. "Product DesignforManufactureandAssembly",3rdedition,Fl:Standardsmedia,2010
5. Swift,K.G.,andJ.D.Booker.ManufacturingProcessSelectionHandbook,Butter worth-Heinemann,2013.

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

METALLURGY OF CASTING AND WELDING

SYLLABUS FOR M.E.II-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: PI24PC220ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of this course are to: 1. familiarize the concepts of Fe-Fe_3C equilibrium diagram. 2. impart knowledge about metallurgy of ferrous and no ferrous castings. 3. familiarize the concepts of various heat treatment processes. 4. study the welding aspects of various ferrous and non-ferrous alloys. 5. study about the defects in welding process.	On completion of the course, the student will be able to: 1. interpret metallurgy of casting for ferrous and non ferrous alloys and their heat treatment process. 2. distinguish various processes in Welding and related heat treatment processes. 3. demonstrate various aspects of welding of alloys of iron, aluminium, magnesium and titanium. 4. Predict stresses in welding and their relief. 5. analyse the defects in welding processes

UNIT-I

Solidification of pure metals and alloys, phase diagrams.

Metallurgy of Steel and Cast Iron: Iron-Carbon constitutional equilibrium diagram, Solidification microstructure, effect of cooling rate, carbon content. Types of cast irons.

Solidification of Castings: solidification rate and directional solidification, microstructure of cast metals, shrinkage, gases in cast metals, degasification methods.

UNIT-II

Foundry Refractories, malleabilisation. Heat treatment of cast steel, cast iron, age hardening of castings.

Metallurgy of non-ferrous cast alloys: copper base alloys, Aluminium alloys, Magnesium alloys

Zinc based die casting alloys, Nickel chromium high temperature alloys.

UNIT-III

Welding metallurgy – Weld zone, Fusion boundary zone, Heat affected Zone. Heat treatment and related processes in Fusion welding – Annealing, Normalizing, Austempering, martempering stress relieving, Solution treatment.

UNIT-IV

Micro structural products in weldments – Schaeffer diagram, Delta Ferrite, Austenite, pearlite, Martensite. Effect of Alloying elements on weldments. Welding stresses – Residual stresses, effects, methods of relieving.

UNIT-V

Weldability aspects of low alloy steels, stainless steels, aluminium alloys, Magnesium and Titanium alloys.

Weld cracks – cold and hot cracks; Liquation cracks, Hydrogen Induced cracks, Lamellar cracks.

Learning Resources:

1. Taylor, Flemings & Wulff, "Foundry Engineering", N.Y,Wiley & Song Inc, 1993
2. Heine, Richard.W, and others, "Principles of metal casting", Tata McHill, New York, 1983.
3. Udin Funk &Wulff, "Welding for Engineers", N.Y.John Wiley,1954.
4. J.F. Lancaster, "Metallurgy of welding", London, George Allen &Unwio, 1999.
5. R.S. Parmar, "Welding Engineering & Technology", Delhi, Khanna Publishers, 2007.

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**

PROFESSIONAL ELECTIVES
ANALYSIS GROUP

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

FINITE ELEMENT METHODS (PROFESSIONAL ELECTIVE-III)

SYLLABUS FOR M.E. (ADM) II-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code:PI24PE200ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of this course are to: analyze the Mechanical Engineering problems by using Finite Element Method.	On completion of the course, the student will be able to: 1. formulate F.E. Models using 1-d bar element and compute the deflections and stresses . 2. formulate 1-d F.E. Model for truss, beam and frame members and compute the deflections and stresses. 3. formulate F.E. Model for two dimensional problems and compute the deflections and stresses. 4. formulate 1-d and 2-d F.E. Models for heat transfer problems and compute the temperature distribution. 5. formulate 1-d F.E. Models for eigen value problems and compute the natural frequencies and mode shapes.

UNIT-I: INTRODUCTION

Finite Element Method of solving field problems. Stress and Equilibrium. Boundary conditions. Strain-Displacement relations. Stress-strain relations. One Dimensional Bar Element: Finite element modeling. Local, natural and global coordinates and shape functions. Potential Energy approach : Assembly of Global stiffness matrix and load vector. Finite element equations, treatment of boundary conditions. Introduction to quadratic shape functions.

UNIT-II: ANALYSIS OF TRUSSES AND BEAMS

Analysis of plane truss. Analysis of Beams: Element stiffness matrix for two noded, two degrees of freedom per node for beam element.

UNIT-III

Finite element modeling of two dimensional stress analysis problems with constant strain triangles and treatment of boundary conditions. Introduction to two dimensional four nodedisoparametric elements. Numerical integration by using two point formula. Convergence requirements and geometric isotropy.

UNIT-IV: STEADY STATE HEAT TRANSFER ANALYSIS

One dimensional analysis of slab and fin, two dimensional conduction analysis of thin plate.

UNIT-V: DYNAMIC ANALYSIS

Formulation of finite element modeling of Eigen value problem for a stepped bar and beam. Evaluation of Eigen values and Eigen vectors.
Introduction to Finite Element analysis software.

Learning Resources:

1. Tirupathi R. Chandrupatla and Ashok D. Belegundu, "Introduction to Finite Elements in Engineering",4th edition, Pearson Education, 2011.
2. SingiresuS.Rao , " The Finite Element Method in Engineering",4th edition, Elsevier Science & Technology Books,2004
3. Larry J. Segerlind , " Applied Finite Element Analysis" , 2nd edition,Wiley India ,2010
4. J.N. Reddy, "An Introduction to the Finite Element Method",3rd edition ,McGraw-Hill Education, 2005
5. K J Bathe, " Finite element procedures", 1st edition, Prentice Hall, 1996.

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

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

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

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

EXPERIMENTAL TECHNIQUES AND DATA ANALYSIS ((PROFESSIONAL ELECTIVE-III)

SYLLABUS FOR M.E. (ADM) II-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code:PI24PE210ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of this course are to: 1. understanding measurement of force, temperature, flow measurement 2. applying the above techniques in experimental setup. 3. recognise micro-structure & surface measurement techniques 4. design various experiments and validate using testing method. 5. introduce Taguchi method and conclude quality loss function	On completion of the course, the Students will be able to: 1. estimating force using strain gauges, transducers and strain by photo elasticity, holography, interferometer. 2. estimating temperature by electrical resistance, pyrometers thermo couples, biometalic etc and flow measurement by laser dopler, hot wire anemometer, ultrasonic, shadow graphs. 3. recognise various microstructure of metals and alloys under different working conditions. Measurement of surface finish. 4. describe various hypothesis using t-, F & chi-square test, selection of process parameters and factorial design for experiments, ANOVA to estimate contribution of each parameter. 5. Applying orthogonally array for experimental design and optimization of response function, estimating loss function and its applications.

Unit-I

Measurement of cutting forces

Strain gauge and piezoelectric transducers and their characteristics. Dynamometer construction, Bridge circuits. Instrumentation and calibration. Displacement and Strain measurements by photoelasticity, Holography, interferometer, Moir techniques, strain gauge rosettes.

Unit-II

Temperature Measurement: Circuits and instrumentation for different transducers viz., bimetallic, expanding fluid, electrical resistance, thermister, thermocouples, pyrometers.

Flow Measurement: Transducers for flow measurements of Non-compressible fluids, Obstruction and drag methods. Vortex shredding flow meters. Ultrasonic, Laser Dopler and Hotwire anemometer. Flow visualization techniques, Shadow graphs, Schilieren photography. Interferometer.

Unit-III

Metallurgical Studies: Optical and electron microscopy, X-ray diffraction, Bragg's Law and its application for studying crystal structure and residual stresses. Electron spectroscopy, electron microprobe.

Surface Measurement: Micro hardness, roughness, accuracy of dimensions and forms. 3-D Co-ordinate measuring machines.

Unit-IV

Experiment design & data analysis: Statistical methods, Randomised block design, Latin and orthogonal squares, factorial design. Replication and randomization.

Data Analysis: Deterministic and random data, uncertainty analysis, test of significance: Chi-square, student's 't' test. Regression modeling, direct and interaction effects. ANOVA, F-test. Time Series analysis, Autocorrelation and autoregressive modeling.

Unit-V: TAGUCHI METHODS

Experimental design and planning with Orthogonal arrays and linear graphs. Additive cause-effect model, Optimization of response level. Identification of Design and noise factors. Performance evaluation and Optimization by signal to noise ratios. Concepts of loss function and its application.

Learning Resources:

1. Jack Philip Holman, Experimental Methods for Engineers, 7th edition, McGraw-Hill, 2001
2. V. C. Venkatesh, H. Chandrasekaran, Experimental Techniques in Metal Cutting, Eastern economy edition, Prentice-Hall of India, 1987
3. George E. P. Box, Gwilym M. Jenkins, Gregory C. Reinsel, Greta M. Ljung, Time Series Analysis: Forecasting and Control, 5th Edition, John Wiley & Sons, 2015
4. Richard C. Dove, Paul H. Adams, Experimental stress analysis and motion measurement: theory, instruments and circuits, techniques, C. E. Merrill Books, 1964
5. BagchiTapan P, Taguchi Methods Explained: Practical Steps to Robust Design, Prentice-Hall (India), 1993.

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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

FRACTURE MECHANICS (PROFESSIONAL ELECTIVE-III)

SYLLABUS FOR M.E. (ADM) II-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code:PI24PE220ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of this course are to: 1. study different types of fractures 2. study the stress field of elastic crack and its solution. 3. study about the crack growth and crack arrest 4. study about the elastic-plastic fracture mechanics 5. study about the application of fracture mechanics	On completion of the course, the student will be able to: 1. understand the crack and its effect on the service. 2. solve the elastic crack problems 3. analyse factors effecting crack growth and its arrest 4. solve crack problems using FEM 5. derive relationship between fracture design and selection of materials.

Unit-I: INTRODUCTION

Crack in a Structure – Griffth Criterion – Cleavage fracture – Ductile fracture – Fatigue Cracking. Service failure analysis.

Unit-II: ELASTIC CRACK

Elastic Crack tip stress field – Solution to crack problems. Effect of finite size stress intensity factor – Special cases – Irwin plastic zone correction. Actual shape of plastic zone – Plane stress – Plane strain.

Unit-III

Energy Principle: Energy release rate – Criterion for crack growth – Crack resistance curve – Principles of crack arrest – Crack arrest in practice.

Fatigue Crack Growth: Fatigue crack growth test, stress intensity factor, factors affecting stress intensity factor – Variable amplitude service loading, retardation model.

Unit-IV: ELASTIC PLASTIC FRACTURE MECHANICS

Elastic plastic fracture concept – Crack tip opening displacement – J-integral technique; Determination of J-using FEM.

Unit-V

Application of Fracture Mechanics: Fracture design – Selection of materials – fatigue crack growth rate curve – Stress intensity factor range – Use of crack growth law.

Learning Resources:

1. David Broek – Elementary Engineering Fracture Mechanics: Sifth off anNoordhoff Internal Publishers – 1978.
2. John M. Barson and Stanely T. Rolfe: Fracture and Fatigue Control in Structures – Prentice Hall, Inc. USA 1987.
3. Jean Cemative and Jean Louis Chboche Mechanics of Solid Materials, Cambridge University Press, Cambridge, 1987.
4. Prashant Kumar, "Elements of Fracture Mechanics", Wheeler Publications, 1999.

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

ADVANCED OPERATIONS RESEARCH (OPEN ELECTIVE)

SYLLABUS FOR M.E. (ADM) II-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code:PI24OE210ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVE	COURSE OUT COMES
The objective of this course is to: understand Linear & non-linear programming, transportation modelling , CPM & PERT for project scheduling and control, replacement, game theory and sequencing	On completion of the course, the student will be able to: 1. understand simplex, dual simplex, Sensitivity and transportation and their applications for shop floor problems. 2. understand the importance of Sensitivity analysis and various advanced LPP techniques 3. apply the techniques like CPM and PERT for project management. 4. apply various replacement techniques to find optimum replacement time period for equipment. 5. identify the best strategy to win the game and optimum sequence for minimum elapsed time.

Unit-I: OPERATIONS RESEARCH-AN OVERVIEW

Meaning and Origin of Operations research, Introduction to Linear programming problems (LPP) -Formulation of LPP- Solution to LPP by Graphical method and simplex method.

Unit-II: ADVANCED TOPICS IN LINEAR PROGRAMMING

Dual simplex method, special cases in LPP, Duality in LPP, Differences between primal and dual, shadow prices, sensitivity analysis. Non linear programming Khun Tucker conditions.

Unit-III

Transportation Model: Definition of the transportation model-matrix of Transportation model-Formulation and solution of transportation models-Methods for calculating Initial basic feasible solution, optimal solution by Stepping stone method and MODI method.

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

Unit-IV: PROJECT SCHEDULING

Introduction to network analysis, Rules to draw network diagram, Fulkerson rule for numbering events, Critical path method, Summarisation of CPM calculations. PERT, Estimation of probability and its corresponding duration in PERT, Crashing of project and finding of optimal project duration in crashing.

Unit-V

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

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

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

Learning Resources:

1. S. D.Sharma, "Operations Research", 10th edition, Newage India Pvt Ltd, New Delhi
2. Hamady.A.Taha An Introduction to Operations Research, "8th edition, TMH
3. Prem Kumar Gupta and Dr. DS Hira, "Operations Research ", S.Chand& Company Pvt. Ltd., 2014.
4. R. Paneerselvam, "Operations Research", PHI Learning Pvt Ltd., 2009.
5. NVS Raju, "Optimization methods for Engineers ", PHI Learning Pvt. Ltd. ., 2014
6. Col D.S. Cheema, "Operations Research", University science press, 2nd edition, India

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

INTRODUCTION TO COMPOSITE MATERIALS (OPEN ELECTIVE)

SYLLABUS FOR M.E. (ADM) II-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code:PI24OE220ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVE	COURSE OUT COMES
The objective of this course is to: discuss the basic structure of composites, elastic constants and Hygro-thermal stresses. Identify stress-strain relations in composites, design with composites.	On completion of the course, the student will be able to: 1. demonstrate knowledge of composites and their structure 2. predict the Elastic constants and Hygrothermal stresses 3. analyse the stress - strain relationship in composites 4. summarise apply the Design procedure and the failure criteria. 5. apply the Design procedure and the failure criteria..

Unit-I: INTRODUCTION

Fibres, Matrix materials, interfaces, polymer matrix composites, metal matrix composites, ceramic matrix composite, carbon fibre composites.

Unit-II: MICROMECHANICS OF COMPOSITES

Mechanical Properties: Prediction of Elastic constant, micromechanical approach, Halpin-Tsai equations, Transverse stresses.

Thermal properties: Hygrothermal stresses, mechanics of load transfer from matrix to fibre.

Unit-III: MACRO-MECHANICS OF COMPOSITES

Elastic constants of a lamina, relations between engineering constants and reduced stiffness and compliances, variation of lamina properties with orientation, analysis of laminated composites, stresses and strains with orientation, inter-laminar stresses and edge effects. Simplified composite beam solutions. Bending of laminated beams.

Unit-IV: STRENGTH, FRACTURE, FATIGUE AND DESIGN

Tensile and compressive strength of unidirectional fibre composites, fracture modes in composites: Single and multiple fracture, de-bonding, fibre pullout

and de-lamination failure, fatigue of liminate composites, Effect of variability of fibre strength.

Unit-V

Strength of an orthotropic lamina: Max stress theory, max strain criteria, maximum work (Tsai-Hill) criterion, quadratic interaction criteria. Designing with composite materials.

Learning Resources:

1. Jones, R.M., 'Mechanics of Composite Materials', Mc-Graw Hill Co., 1967.
2. Calcote, L.R., 'The Analysis of Laminated Composite Structures', Van Nostrand, 1969.
3. Whitney. I.M., Daniel, R.B. Pipes, 'Experimental Mechanics of Fibre Reinforced Composite Materials', Prentice Hall, 1984.
4. Hyer. M.W., 'Stress Analysis of Fibre-Reinforced Composite Materials', McGraw Hill Co., 1998.
5. Carl. T.Herakovich, 'Mechanics of Fibrous Composites', John Wiley Sons Inc., 1998.

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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 INFORMATION TECHNOLOGY

FUNDAMENTALS OF PYTHON PROGRAMMING (OPEN ELECTIVE)
SYLLABUS FOR M.E (ADM) II-SEMESTER
(Common to all Branches)

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code: PI24OE210IT
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES On completion of the course, students will be able to
1 Acquire problem solving skills 2 Write programs using Python language and use Python Libraries	1. Develop Python programs with conditional statements and loops. 2. Write programs using functions, strings and lists. 3. Construct Python data structures programs using tuples, dictionaries and set. 4. Write programs using Files and Class Concept. 5. Try simple example using Python libraries NumPy, SciPy and Matplotlib

UNIT-I:

Basics of Python Programming: Features of Python**,** variables and identifiers, operators and expressions.

Decision control Statements: Selection/Conditional branching statements, basic loop structures/iterative Statements, nested loops, break, continue, and pass Statements.

Functions and Modules: function definition, function call, more on defining functions, recursive functions, modules.

UNIT-II:

Data Structures: Strings: Introduction, built-in string methods and functions, slice operation, String Module. Regular Expressions.

Lists : Introduction, nested list, cloning lists, basic list operations, list methods. Functional programming-filter(),map(),reduce() function.

UNIT –III:

Tuples : Introduction, basic tuple operations, tuple assignment, tuples for returning multiple values, nested tuples, tuple methods and functions.

Set: Introduction, Set operations.

Dictionaries : Basic operations, sorting items, looping over dictionary, nested dictionaries, built-in dictionary functions.

UNIT-IV:

Files and Exceptions: reading and writing files, pickling, handling exceptions. Built-in and user-defined exceptions.

OOPS Concepts: Introduction, classes and object, class method and self argument, theinit()method, class variables and object variables, public and private data members, Inheritance, Operator Overloading.

UNIT-V:

Python Libraries: NumPy – Introduction, Arrays – creation, operations, **SciPy**– Introduction, linalg, special, **Matplotlib –** Introduction, types of Plots, using pyplot.

Learning Resources:

1. ReemaThareja ,"Python programming using problem solving approach ", Oxford universitypress.
2. Allen Downey," Think Python: How to Think Like a Computer Scientist", O'Reilly publications,2ndEdition.
3. Mark Lutz , "Learning Python", O'Reilly Publications.
4. Wesley. J.Chun, "Core Python Programming"", Prentice Hall, 2nd Edition.
5. http://www.python.org

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

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2	No. of Assignments:	03	Max. Marks for each Assignment:	5
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	5

Duration of Internal Test: 1 Hour 30 Minutes

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

Audit Course-II : Pedagogy Studies
SYLLABUS FOR M.E. (ADM) II-SEMESTER

L:T:P(Hrs./week):2:0:0	SEEMarks:60	CourseCode:PI24AC210EH
Credits:- 0	CIEMarks:40	DurationofSEE:3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the students to	At the end of the course the students will be able to
1. Understand and identify different behavioral styles and adapt training as necessary. 2. Identify the characteristics of an exceptional facilitator 3. Understand and identify different behavioral styles and adapt training as necessary. 4. Understand how to make lecture-based programs active. 5. Make effective trainer aids such as power points and learn to identify all the dependencies	1. Do a Learning Style inventory and understand theirs, and their students 'learning style 2. Demonstrate successful understanding of key concepts during a practice presentation. 3. Do a need analysis and why it is a necessary step in any training program. 4. Develop strategies for different types of learners, handling hecklers, bullies, and other disruptive participants 5. Present information in a clear, concise, engaging manner.

From Fabulous to Fantastic -The Art and Science of Teaching the Digital Generation

Keeping information fresh and reinforcing new learning is a constant challenge for an instructor imparting knowledge to an adult. How do you choose activities that are fun but meaningful? How do you assess the level of knowledge already in the room? Is there a formula for creating a successful learning session?

This course is designed to nurture the process of learning, to facilitate sharing of field level experience and giving constructive feedback on training style and delivery. This Audit Course will teach participants how to determine the needs

of an audience, improve classroom charisma, handle difficult participants, use activities effectively, and more.

Course Outline

Unit 1 - Astounding Adults: How they learn

Teaching adults calls for trustworthiness and neutrality while keeping the discussion focused. The first two sessions are about how adults learn how to help in retention and recall.

- How do adults learn
- Pedagogy and Andrago
- Malcolm Knowles theory of Andragogy
- Neuro Linguistic programming
- Kolb's learning styles
- Helping adults learn

Unit 2 - Classic Course/Class Design

This section's focus is on creating a classic course design that is tailor made for the trainee's learning style. This section also focuses on assessing the trainees' needs in class and customizes activities/direct discussions to address these needs. This section is delivered in two sessions.

- Six thinking hats and the classic course design
- Creating a beautiful body
- Opening
- Main body
- Grand finale

Unit 3 -Beating Murphy's Law

This section is designed to help trainers make effective trainer aids such as power points and learn to identify all the dependencies in advance and have sufficient back up plans, in case there are technical issues. This section is spread over four sessions.

- Power Point
- The Rule of Three
- Anecdotes and Metaphors

- Beat Murphy's Law
- Awesome audiovisuals

Unit 4 - Dazzling Deliveries

Keeping trainees focused so they can get their desired results takes skill. Group dynamics and motivations can vary on many levels. Participants will learn how those factors affect facilitation. They will use tips shared in this session to practice re-engaging the audience through dialogue, feedback, and testing for consensus and understanding.

Training vs. facilitating vs. presenting

- Icebreakers
- Training Rainbow
- Teaching Style Tips
- Presenting and Demonstrating
- Teaching/Socratic Direction
- Facilitating discussion/brainstorming/increasing participation
- Process Monitoring

Unit 5 - Fruitful Feedback

This Unit finishes with an important but sometimes forgotten skill of how to give and receive feedback. During an activity called What Would You Say? Participants evaluate their presentations and also do a peer evaluation and create an action plan on the following areas.

- Relevance of Content
- Level of Content
- Rating of the Presenters
- Knowledge Transfer
- Most Useful Aspect of the Course
- Least Useful Aspect of the Course
- Action plan to go from Fabulous to Fantastic

METHODOLOGY	ASSESSMENTS
- Case Studies	-Online assignments
- Demonstration	-Individual and Group
- Presentations	
- Expert lectures	
- Writing and Audio-visual lessons	

LEARNING RESOURCES:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare,31(2):245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana-does it count? Multi-site teacher education research project (MUSTER) country report London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33(3):272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: Amass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

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

VIBRATION ANALYSIS LAB

SYLLABUS FOR M.E. (ADM) II-SEMESTER

L:T:P(Hrs./week):0:0:3	SEE Marks: 0	Course Code: PI24PC231ME
Credits : 2	CIE Marks:50	Duration of SEE: ---

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of this course are to: 1. understand motion characteristics in rotating mass system. 2. Analyze the damped, undamped vibration system. 3. understand vibration response characteristics and stability of dynamic systems. 4. data acquisition and analysis of the vibration signals.	On completion of the course, the Students will be able to: 1. evaluate the static and dynamic balancing of masses. 2. analyze the response of dynamic systems under dynamic loading. 3. analyze the spring mass system with and without damping. 4. Analyze the vibration data through data acquisition system. 5. analysis of mechanical systems using simulation software.

List of Experiments

1. To find the static and dynamic balancing masses in a rotating mass system.
2. To determine the vibration characteristics for the damped and un damped Longitudinal Vibrations of spring mass system.
3. To determine the vibration characteristics for the damped and un damped Torsional Vibrations of single rotor system.
4. Determination of Critical Speed of the given shaft with the given end conditions. (Whirling of Shafts)
5. To determine the vibration characteristics for the Free Vibrations of Beams.
6. To determine the vibration characteristics for the Forced vibrations of Beams.
7. To analyze a 1- DOF system subjected to un damped and damped Free Vibrations using MATLAB / Simulink
8. To analyze a 1- DOF system subjected to un damped and damped Forced Vibrations using MATLAB / Simulink

9. To analyze a Multi DOF system subjected to un damped and damped Free Vibrations using MATLAB / Simulink
10. To analyze a Multi DOF system subjected to un damped and damped Forced Vibrations using MATLAB / Simulink
11. Impact test on cantilever beam using FFT analyser and Lab VIEW Software.
12. Vibration Analysis of various beams and it's data acquisition using FFT analyser and Lab VIEW Software.
13. Analyzing vibrational behaviour of a real time application of a mechanical engineering component composite leaf spring.
14. Analyzing vibrational behaviour a real time application of electric motor.

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

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for assessment of each experiment			18
Duration of Internal Test: **3 Hours**			

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

COMPUTER AIDED SIMULATION LAB

SYLLABUS FOR M.E. (ADM) II-SEMESTER

L:T:P(Hrs./week):0:0:3	SEE Marks: 0	Course Code: PI24PC241ME
Credits : 2	CIE Marks:50	Duration of SEE: ---

COURSE OBJECTIVES	COURSE OUT COMES
The objectives of this course are to: 1. understand the CAE software applicability for analyzing structural problems. 2. Analyze non linear behaviour of structural members. 3. kinematic analysis of mechanical systems.	*On completion of the course, the student will be able to:* 1. select appropriate finite element for solving structural problems. 2. Analyze non linear behaviour of mechanical components and metal forming operation. 3. analysis of mechanisms like 4 bar mechanism, spring damper and projectile motion.

List of Experiments

1. Introduction to FEA software - Analysis using 1-d bar elements.
2. Analysis of Trusses.
3. Analysis of Beams.
4. Analysis of Plane stress.
5. Analysis of Plane strain.
6. Modal and Harmonic Analysis of Beams.
7. Transient Analysis of Beams.
8. Non Linear small displacement analysis of a Beam.
9. Non linear large displacement analysis of a Hose Clamp.
10. Plastic deformation Analysis in metal forming operation.
11. Analysis of a 4 bar mechanism using simulation software.
12. Analysis of Spring damper.
13. Analysis of projectile motion using multi body dynamics software.
14. Analysis of simple mechanisms using multi body dynamics software.
15. Non linear analysis of spring damper system.

Note: The above experiments are to be conducted using all the available softwares in the Department.

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

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for assessment of each experiment			18
Duration of Internal Test: **3 Hours**			

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

MINI PROJECT

SYLLABUS FOR M.E. (ADM) II-SEMESTER

L:T:P(Hrs./week):0:0:2	SEE Marks: 0	Course Code: PI24PW219ME
Credits : 2	CIE Marks:50	Duration of SEE: ---

COURSE OBJECTIVE	COURSE OUTCOMES
The objective of this course is to: enable the student to take up investigative study in the field of design, analysis and manufacturing engineering.	On completion of the course, the student will be able to: 1. Choose appropriate problem in design, analysis and manufacturing areas. 2. Develop the capability to conduct investigations on the chosen problem using the mechanical engineering tools. 3. Submit report and present the work carried out for evaluation.

The mini project can be assigned on individual basis which is the basis for their main project work in III semester.

The students are required to identify the topic of their interest and collect data / literature in core areas of design, analysis and manufacturing engineering. The students need to identify a problem and work in that area in consultation with the project guide. The output may be in terms of a small prototype or conducting investigations through experiments or evaluate theoretically using modern tools of mechanical engineering using modelling and analysis tools.

The students are required to submit a project report containing the abstract and the summary of the work in terms of plots or fabricated models and submit for evaluation.

The students are required to give a oral presentation/ demo of prototype before the departmental committee for evaluation.

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

Scheme of instruction and examination (R-24)
M.E. (ADM) : THIRD SEMESTER 2025-26

M.E. (ADM) III-SEMESTER										
S. No	Course Code	Course Title	Scheme of Examination			Scheme of Examination			
			Hours per Week			Duration in Hrs	Maximum Marks		Credits
			L	T	P		SEE	CIE	
Theory									
1	PI24PEXXXME	Professional Elective-IV	3	-	-	3	60	40	3
2	PI24PEXXXME	Professional Elective-V	3	-	-	3	60	40	3
LABS									
3	PI24PW319ME	Dissertation – Phase I / Internship	0	0	20	-	-	100	10
		Total	6	-	20		120	180	16
		Grand Total	26				300		16

PE: Professional Electives		
Professional Elective-IV (Design Group)		
1	PI24PE300ME	Advanced Finite Element Analysis
2	PI24PE310ME	Computer Aided Mechanical Design and Analysis
3	PI24PE320ME	Mechanics of Composite Materials
Professional Elective-V (Manufacturing Group)		
1	PI24PE330ME	Advanced Non-Destructive Evaluation Techniques
2	PI24PE340ME	Additive Manufacturing
3	PI24PE350ME	Mechatronics

PROFESSIONAL ELECTIVES
DESIGN GROUP

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

ADVANCED FINITE ELEMENT ANALYSIS

(PROFESSIONAL ELECTIVE-IV)

SYLLABUS FOR M.E. (ADM) III-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code:PI24PE300ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of this course is to: 1. understand basic theory of plates and shells 2. interpret the concept of non-linearity 3. familiarize with the numerical methods in dynamic analysis 4. understand fluid flow and heat transfer analysis 5. familiarize with adaptive meshing and error estimates	On completion of the course, the Students will be able to: 1. identify the FE formulations for plates and shells 2. formulate the non-linear problems. 3. calculate dynamic characteristics using numerical methods 4. formulate the fluid flow and heat transfer analysis. 5. estimate the errors and convergence rates

Unit-I: BENDING OF PLATES AND SHELLS

Review of Elasticity Equations – Bending of Plates and Shells – Finite Element Formulation of Plate and Shell Elements - Conforming and Non Conforming Elements – C0 and C1 Continuity Elements –Degenerated shell elements-Application and Examples.

Unit-II: NON-LINEAR PROBLEMS

Introduction – Iterative Techniques – Material non-linearity – Elasto Plasticity – Plasticity – Visco Plasticity – Geometric Non linearity – large displacement Formulation –Solution procedure- Application in Metal Forming Process and Contact Problems.

Unit-III: DYNAMIC PROBLEM

Direct Formulation – Free, Transient and Forced Response – Solution Procedures – Eigen solution-Subspace Iterative Technique – Response analysis-Houbolt, Wilson, Newmark – Methods – Explicit &Implict Methods-Lanchzos, Reduced method for large size system equations.

Unit-IV: FLUID MECHANICS AND HEAT TRANSFER

Governing Equations of Fluid Mechanics – Solid structure interaction - Inviscid and Incompressible Flow – Potential Formulations – Slow Non-Newtonian Flow – Metal and Polymer Forming – Navier Stokes Equation – Steady and Transient Solution.

Unit-V: ERROR ESTIMATES AND ADAPTIVE REFINEMENT

Error norms and Convergence rates – h-refinement with adaptivity – Adaptive refinement.

Learning Resources:

1. Zienkiewicz, O.C. and Taylor, R.L., "The Finite Element Method", Fourth Edition, Volumes 1 & 2, McGraw Hill International Edition, Physics Services, 1991.
2. Cook R.D., "Concepts and Applications of Finite Element Analysis",John Wiley and Sons Inc., Newyork, 1989.
3. Bathe K.J., "Finite Element Procedures in Engineering Analysis", Prentice Hall, 1990
4. S.S.Rao, "Mechanical Vibrations" Addison-Wesley publishing co. 1998
5. V. Rammurti "computer aided mechanical design and analysis" Tata Mc-Grawhill 1992

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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

COMPUTER AIDED MECHANICAL DESIGN AND ANALYSIS

(PROFESSIONAL ELECTIVE-IV)

SYLLABUS FOR M.E. (ADM) III-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: PI24PE310ME
Credits :04	CIE Marks:40	Duration of SEE:03Hours

Course Objectives	Course Outcomes
The objectives of this course are to: understand the design of pressure vessels, plate bending theory, fracture mechanics concepts, analyze Eigen value problems and perform dynamic analysis.	On completion of the course, the student will be able to: 1. analyse the pressure vessels 2. formulate the plate bending equations 3. interpret the behaviour of crack and crack propagation 4. formulate an Eigen value problem and develop its solution 5. apply various methods to obtain solutions in Dynamic analysis

UNIT-I

Design of pressure Vessels: Introduction and constructional features of pressure vessels, stresses in pressure vessels, shrink fit stresses in built up cylinders, autofrettage of thick cylinders, thermal stresses and their significance.

UNIT-II

Stresses in flat plates: Introduction, Bending of plate in one direction, Bending of plate in two perpendicular directions, Thermal stresses in plates, Bending of circular plates of constant thickness, Bending of uniformly loaded plates of constant thickness.

UNIT-III

Fracture Mechanics: Introduction, Modes of fracture failure Griffith Analysis, Energy release rate, Energy release rate of DCB specimen; Stress Intensity Factor: SIF"s for edge and centre line crack, Fracture toughness, Elastic plastic analysis through J-integral method: Relevance and scope, Definition of J-integral, Path independence, stress strain relation, Strain Energy Release Rate Vs J-integral.

UNIT-IV

Eigen Value Problems: Properties of Eigen values and Eigen Vectors, Torsional, Longitudinal vibration, lateral vibration, Sturm sequence. Subspace iteration and Lanczo"s method, Component mode synthesis, Eigen value problems applied to stepped beams and bars.

UNIT-V

Dynamic Analysis: Direct integration method, Central difference method, Wilson- method, Newmark method, Mode superposition, Single degree of freedom system response, Multi degree of freedom system response, Rayleigh damping, Condition for stability.

Learning Resources:

1. John, V. Harvey, "Pressure Vessel Design: Nuclear and Chemical Applications", Affiliated East West Press Pvt. Ltd., 1969.
2. Prasanth Kumar, "Elements of Fracture Mechanics", Wheeler Publishing, New Delhi-1999.
3. V. Rammurti, "Computer Aided Mechanical Design and Analysis", Tata Mc Graw Hill-1992.
4. Bathe, J., " Finite Element Procedures", Prentice Hall of India-1996.

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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

MECHANICS OF COMPOSITE MATERIALS (PROFESSIONAL ELECTIVE-IV)

SYLLABUS FOR M.E. (ADM) III-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code:PI24PE320ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVE	COURSE OUTCOMES
The objective of this course are to: discuss the basic structure of composites, elastic constants and Hygro-thermal stresses. Identify stress-strain relations in composites, design with composites and demonstrate the basic equations of plate bending	On completion of the course, the student will be able to: 1. demonstrate knowledge of composites and their structure 2. predict the Elastic constants and Hygrothermal stresses 3. analyse the stress - strain relationship in composites 4. summarise and apply the Design procedure and the failure criteria. 5. formulate Plate bending equations for various Boundary conditions of composite plates.

Unit-I: INTRODUCTION

Fibres, Matrix materials, interfaces, polymer matrix composites, metal matrix composites, ceramic matrix composite, carbon fibre composites.

Unit-II:

Micromechanics of Composites: Mechanical Properties: Prediction of Elastic constant, micromechanical approach, Halpin-Tsai equations, Transverse stresses.

Hygrothermal stresses, mechanics of load transfer from matrix to fibre.

Unit-III: MACRO-MECHANICS OF COMPOSITES

Elastic constants of a lamina, relations between engineering constants and reduced stiffness and compliances, variation of lamina properties with orientation, analysis of laminated composites, stresses and strains with orientation, inter-laminar stresses and edge effects. Simplified composite beam solutions. Bending of laminated beams.

Unit-IV:

Strength, fracture, fatigue and design: Tensile and compressive strength of unidirectional fibre composites, fracture modes in composites: Single and

multiple fracture, de-bonding, fibre pullout and de-lamination failure, fatigue of liminate composites, Effect of variability of fibre strength.

Strength of an orthotropic lamina: Max stress theory, max strain criteria, maximum work (Tsai-Hill) criterion, T Sai – Wu criteria. Designing with composite materials.

Unit-V: ANALYSIS OF PLATES

Plate equilibrium equations, Bending of composite plates, Levy and Navier solution for plates of composite material. Analysis of composite cylindrical shells under axially symmetric loads.

Learning Resources:

1. Jones, R.M., 'Mechanics of Composite Materials', Mc-Graw Hill Co., 1967.
2. Calcote, L.R., 'The Analysis of Laminated Composite Structures', Van Nostrand, 1969.
3. Whitney. I.M., Daniel, R.B. Pipes, 'Experimental Mechanics of Fibre Reinforced Composite Materials', Prentice Hall, 1984.
4. Hyer. M.W., 'Stress Analysis of Fibre-Reinforced Composite Materials', McGraw Hill Co., 1998.
5. Carl. T.Herakovich, 'Mechanics of Fibrous Composites', John Wiley Sons Inc., 1998.

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**

PROFESSIONAL ELECTIVES
MANUFACTURING GROUP

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

ADVANCED NON-DESTRUCTIVE EVALUATION TECHNIQUES (PROFESSIONAL ELECTIVE-V)

SYLLABUS FOR M.E. (ADM) III-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code:PI24PE330ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of this course are to: 1. study the importance of various non-destructive testing method. 2. study different methods to find the surface and subsurface defects in the components 3. study different methods of finding surface, internal defects and properties of the components. 4. study computer aided inspection processes to find defects in components used in medical field 5. study inspection method using light source.	On completion of the course, the student will be able to: 1. Understand the importance and practical applications of various non-destructive methods in industry 2. Evaluate the surface and sub surface defects of the components produced in industry. 3. Apply the methods for inspecting surface, internal defects and to find mechanical properties of the components. 4. Select appropriate computer aided method of inspection of the components and methods based on light as source of inspection. 5. Apply computer aided advanced method for sorting of components produced in industry.

Unit-I

Types of defects and characteristics, Quantification aspects relevant for NDE including fracture aspects and stress intensity factors - NDT overview – quality assurance–visual inspection–comparative features of conventional Non destructive Testing and Evaluation Methods including Optical, Radiography, Ultrasonic Testing, Dye penetrate testing, Eddy current testing etc.

Unit-II

Leak testing – liquid penetrant testing – penetrant used – equipment – penetration, emulsification, solvent removal. Eddy current testing – material conductivity – coil impedance–coils and instruments–testing in non-ferromagnetic conducting materials and Ferro magnetic materials – skin effect – frequency used – inspection probes – phase analysis.

Unit-III

Radiography–sources of radiation–shadow formation, enlargement and distortion – recording media – exposures, markers.

Infrared and thermal testing – imaging systems – detectors – analysis methods.

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

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

Unit-IV

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

Optical techniques of nondestructive evaluation: Principles of Photo elasticity, holographic Interferometry and Laser speckle techniques; use of fibre optics, non-invasive techniques in medical field and NDT.

Unit-V

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

Grid and Moire NDT, acoustic, shearography, Principles of Microwave, acoustic emission techniques.

Learning Resources:

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

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

ADDITIVE MANUFACTURING (PROFESSIONAL ELECTIVE-V)

SYLLABUS FOR M.E. (ADM) III-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code:PI24PE340ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of this course are to: 1. understand the importance of RPT 2. Apply various liquid and solid based RPT Systems 3. Apply various powder based RPT systems and rapid tooling 4. Recognize various STL formats and slicing methods and tessellation 5. Application of RPT in Engineering, Jewelry and Bio medical etc.	On completion of the course the student will be able to: 1. understand the developments of RPT and its terminology, Advantages and limitations of RPT 2. understand mechanism involved in stereo lithography apparatus system, and terminated object manufacturing, fused deposition modeling and their applications. 3. understand mechanism in selective laser interims and its application. Understand the importance of Rapid tooling 4. recognize various types of file format and slicing methods in RP and various software available to convert 3D models. 5. apply RPT in various fields like Engineering, Jewelry, medical and Bio – Medical Engineering

Unit-I: INTRODUCTION

Prototyping fundamentals, Historical development, fundamentals of Rapid Prototyping, Advantages and Limitations of Rapid Prototyping, Commonly used terms, classification of RP process, Rapid prototyping process chain: Fundamental Automated processes, process chain.

Unit-II

Liquid based rapid prototyping systems: Stereo lithography apparatus (SLA): Models and specifications, process, working principle, photopolymers, photo polymerization, 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.

Solid based rapid prototyping 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-III

Powder Based Rapid Prototyping Systems: Selective laser sintering (SLS): Models and specifications, process, working principle, applications, advantages and disadvantages, case studies. Three dimensional printing (3DP): Models and specification, process, working principle, applications, advantages and disadvantages, case studies.

Relative comparison between the processes.

Rapid Tooling: Introduction to Rapid Tooling (RT), Conventional Tooling Vs Rt, Need for RT. Rapid Tooling Classification: Indirect Rapid Tooling Methods: Spray Metal Deposition, RTV Epoxy Tools, Ceramic tools, investment casting, spin casting, die csting, sand casting, 3D Keltool process. Direct Rapid Tooling: Direct AIM, LOM Tools, DTM Rapid Tool Process, EOS Direct Tool Process and Direct Metal Tooling using 3DP

Unit-IV

Rapid Prototyping Data Formats: STL Format, STL File Problems, Consequence of Building Valid and invalid tressellated models, STL file Repairs: Generic Solution, Other Translators, Newly Proposed Formats.

Rapid Prototyping Software's: Features of various RP software's like Magics, Mimics, Solid View, view expert, 3 D view, velocity 2, Rhino, STL view 3 data expert and 3 D doctor

Unit-V

RP Applications: Application – Material Relationship, application in design, application in engineering, Analysis and planning, aerospace industry, automatic industry, Jewelry industry, coin industry, GIS application, Arts and Architecture.

RP Medical and Bioengineering Application: Planning and simulation of complex surgery, customized implant and prosthesis, design and production of medical devices, forensic science and anthropology, visualization of biomolecules.

Learning Resources:

1. Chua C.K., Leong K.F. and LIM C.S Rapid prototyping: Principles an Applications, World Scientific publications, 3rd Ed., 2010
2. D.T. Pham and S.S. Dimov, "Rapid Manufacturing", Springer, 2001
3. Terry Wohlers, " Wholers Report 2000", Wohlers Associates, 2000
4. Paul F. Jacobs, " Rapid Prototyping and Manufacturing"–, ASME Press, 1996
5. Ian Gibson, Davin Rosen, Brent Stucker "Additive Manufacturing Technologies, Springer, 2nded, 2014

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

MECHATRONICS (PROFESSIONAL ELECTIVE-V)

SYLLABUS FOR M.E. (ADM) III-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code:PI24PE350ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

Course Objectives	Course Outcomes
The objectives of this course are to: 1. Understand key elements of Mechatronics system, representation into block diagram 2. understand concept of transfer function, reduction and analysis 3. understand principles of sensors, its characteristics, interfacing with DAQ microcontroller 4. understand the concept of PLC system and its ladder programming, and significance of PLC systems in industrial application 5. understand the system modeling and analysis in time domain and frequency domain	On completion of the course, the students will be able to: 1. Identification of key elements of mechatronics system and its representation in terms of block diagram 2. Understand the concept of signal processing and use of interfacing systems such as ADC, DAC, digital I/O 3. Interface the Sensors, Actuators using appropriate DAQ micro-controller 4. study time and Frequency domain analysis of system model (for control application) 5. Develop PLC ladder programming and implementation of real life system

Unit-I

Introduction to Sensors & Actuators: Introduction to Mechatronics, **Measurement characteristics:** Static and Dynamic Sensors: Position Sensors: - Potentiometer, LVDT, Encoders; Proximity sensors:- Optical, Inductive, Capacitive; **Motion Sensors:** Variable Reluctance; Temperature Sensor: RTD, Thermocouples; **Force / Pressure Sensors:** Strain gauges; Flow sensors: - Electromagnetic Actuators: Stepper motor, Servo motor, Solenoids

Unit-II: BLOCK DIAGRAM REPRESENTATION

Open and Closed loop control system, identification of key elements of mechatronics systems and represent into block diagram (Electro-Mechanical Systems), Concept of transfer function, Block diagram reduction principles,

Applications of mechatronics systems:- Household, Automotive, Shop floor (industrial).

Unit-III: DATA ACQUISITION & MICROCONTROLLER SYSTEM
Interfacing of Sensors / Actuators to DAQ system, Bit width, Sampling theorem, Aliasing, Sample and hold circuit, Sampling frequency, ADC (Successive Approximation), DAC (R-2R), Current and Voltage Amplifier.

Unit-IV: PLC Programming
Introduction, Architecture, Ladder Logic programming for different types of logic gates, Latching, Timers, Counter, Practical Examples of Ladder Programming, Introduction to SCADA system

Unit-V
Modelling and Analysis of Mechatronics System: System modeling (Mechanical, Thermal and Fluid), Stability Analysis via identification of poles and zeros, Time Domain Analysis of System and estimation of Transient characteristics: % Overshoot, damping factor, damping frequency, Rise time, Frequency Domain Analysis of System and Estimation of frequency domain parameters such as Natural Frequency, Damping Frequency and Damping Factor

Learning Resources:
1. K.P. Ramchandran, G.K. Vijyaraghavan, M.S. Balasundaram, Mechatronics: Integrated Mechanical Electronic Systems, Willey Publication, 2008
2. Bolton, Mechatronics - A Multidisciplinary approach, 4th Edition, Prentice Hall, 2009
3. Alciatore&Histand, Introduction to Mechatronics and Measurement system, 4th Edition, Mc-Graw Hill publication, 2011.
4. Bishop (Editor), Mechatronics – An Introduction, CRC Press, 2006.
5. Mahalik, Mechatronics – Principles, concepts and applications, Tata Mc-Graw Hill publication, New Delhi.

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

DISSERTATION - PHASE I / INTERNSHIP
SYLLABUS FOR M.E. (ADM) III-SEMESTER

L:T:P(Hrs./week):0:0:20	SEE Marks: 0	Course Code: PI24PW319ME
Credits : 10	CIE Marks: 100	Duration of SEE: ---

COURSE OBJECTIVE	COURSE OUTCOMES
The objective of this course is to: start with a suitable Dissertation work in consultation with the supervisor in the areas of his/her specialization either in the Institute or Industry.	On completion of the course, the students will be able to: 1. apply and Solve the problems in the relevant field of specialization from the knowledge gained from theoretical and practical courses pursued during the course. 2. develop the capability to conduct investigations on the chosen problem. 3. develop flair for R&D work.

- A research project topic may be selected either from published lists or from the creative ideas of the students themselves in consultation with their project supervisor.
- To improve the student research and development activities.

The CIE marks will be awarded to the students by at least 2 faculty members and the supervisor on the basis of an oral presentation and submission of a progress report.

No. of Presentations for CIE marks	2	Max. Marks for each CIE presentation:	50
Marks are awarded based on synopsis, presentation and write-up using rubrics.			
Duration of Presentation: **20 min**			

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

Scheme of instruction and examination (R-24)

M.E. (ADM) : FOURTH SEMESTER 2025-26

M.E. (ADM) IV-SEMESTER									
S. No	Course Code	Course Title	Scheme of Instruction			Scheme of Examination			
			Hours per Week			Duration in Hrs	Maximum Marks		Credits
			L	T	P		SEE	CIE	
1	PI24PW419ME	Dissertation - Phase II / Internship	-	-	32	-	Viva-Voce (Grade)		16
		Total	-	-	32				16
		Grand Total	32						16
Students are awarded with two credits for completion of online course.									

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Department of Mechanical Engineering

DISSERTATION - PHASE II / INTERNSHIP
SYLLABUS FOR M.E. (ADM) IV-SEMESTER

L:T:P(Hrs./week):0:0:32	SEE Marks: Viva-voce grade	Course Code: PI24PW419ME
Credits : 16	CIE Marks: Viva-voce grade	Duration of SEE: ---

COURSE OBJECTIVE	COURSE OUTCOMES
The objective of this course is to: complete the Dissertation work in line with the chosen field in the areas of his/her specialization.	On completion of the course, the students will be able to: 1. prepare a thesis with all the findings in the chosen area. 2. present a seminar with all the results during the Viva-voce examination.

The final assessment involves presentation of the dissertation work by the student and the award of the grade by an expert of relevant specialization.

The CIE marks will be awarded to the students by at least 2 faculty members and the supervisor on the basis of an oral presentation and submission of a progress report.

No. of Presentations for CIE marks	2	Max. Marks for each CIE presentation:	50
Marks are awarded based on synopsis, presentation and write-up using rubrics.			
Duration of Presentation: **20 min**			