SHRI SHANKARACHARYA TECHNICAL CAMPUS, BHILAI

(An Autonomous Institute affiliated to CSVTU, Bhilai)

SCHEME OF TEACHING AND EXAMINATION (EFFECTIVE FROM 2020-2021 BATCH)

M. Tech. (Production Engineering)

1st Semester

S. No.	Board of Study	Subject Code	Subject	Periods per Week			Scheme of Examination Theory / Practical			Total Marks	Credit L+(T+P)/2
				L	T	P	ESE	CT	TA		
1	Mech. Engg.	ME225101	Advanced Foundry Technology	3	2	-	100	20	20	140	4
2	Mech. Engg	ME225102	Non-Traditional Machining Process	3	2	-	100	20	20	140	4
3	Mech. Engg	ME225103	Theory of Metal Forming	3	2	-	100	20	20	140	4
4	Mech. Engg	ME225104	Maintenance Engineering	3	2	-	100	20	20	140	4
5	Refer Table –I		Professional Elective-I	3	2	-	100	20	20	140	4
6	Mech. Engg	ME225191	Non-Traditional Machining Process Lab	-	-	4	75	-	75	150	2
7	Mech. Engg	ME225192	Maintenance Engineering Lab	-	-	4	75	-	75	150	2
Total				15	10	8	650	100	250	1000	24

L- Lecture T- Tutorial

P- Practical, ESE- End Semester Exam

CT- Class Test TA- Teacher's Assessment

Table-I

PROFESSIONAL ELECTIVE I			
S.No.	Board of Study	Subject Code	Subject
1	Mech. Engg.	ME2250121	Agile Manufacturing
2	Mech. Engg.	ME2250122	Composite Material
3	Mech. Engg.	ME2250123	Non-Destructive Testing
4	Mech. Engg.	ME2250124	Finite Element Method

Note (1) – 1/4th of total strength of students subject to minimum of twenty students is required to offer an elective in the college in a Particular academic session.

Note (2) – Choice of elective course once made for an examination cannot be changed in future examinations.

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SCHEME OF EXAMINATION AND SYLLABUS

1st Semester M. Tech. (Production Engineering)

Subject Code ME2250101	Advanced Foundry Technology	L = 2	T = 0	P = 0	Credits = 2
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1. To develop problem solving skills in students in solidification process. 2. To develop problem skills in casting process with gates, risers and its design processes. 3. To expose the students to different processes used in foundry technology, foundry furnaces and their applications. 4. To developed the skill and knowledge of Ferrous and Aluminum metals and alloys. 5. To developed the knowledge of general characteristics of common cast copper alloys.	On successful completion of the course, the student will be able to: 1. Understand the Solidification process and design. 2. Understand the casting process with gates, risers and its design processes. 3. Understand constructional features and working of different foundry technology, foundry furnaces and their applications. 4. Understand Ferrous and Aluminum metals and alloys. 5. Understand general characteristics of common cast copper alloys.

Unit-I **CO1**

Solidification of Casting: Concept of solidification of metals. Homogenous and heterogeneous nucleation. Growth mechanism. Solidification of pure metals and alloys. Mechanism of columnar and dendritic growth. Coring or Segregation. Solidification time and Chvorinov's rule. Concept of progressive and directional solidifications.

Unit-II **CO2**

Principles of Casting and Risering: Purpose of the gating system. Components of the gating System and its functions. Design of the gating System. Different types of gates. Gating ratio and its functions. Definition and functions of the riser. Types of risers and their application. Design of the riser - its shape. Size and location. Use of insulating material and exothermic compounds in risers.

Design of Casting: Factors to be considered in casting design. Design consideration in pattern making, moulding techniques and core making and assembly. Cooling stresses and hot spots in casting and modification in casting geometry to overcome them.

Casting Quality Control: Casting defects and factors responsible for them. Different inspection and testing methods to evaluate the casting. Quality control activities in a foundry. Salvaging methods of defective casting.

Unit-III **CO3**

Furnace Technology: Study of various furnaces used in foundry, construction and operation of crucible and hearth furnaces. Resistance, Arc and Induction furnaces-their construction. Operation and application. Heat treatment furnaces and drying ovens used in foundry.

Gray Cast - Iron Foundry Practice: Chemical Composition and structure of gray cast iron. Moulding, gating and risering techniques. Melting of gray cast iron in Cupola and induction furnace. Inoculation of gray cast iron. Application of gray cast iron castings.

Malleable Cast Iron: Chemical composition and structure of White- heart and black-heart malleable cast iron. Melting malleableization heat treatment and application of malleable cast iron.

Ductile Cast Iron: Chemical composition and structure of ductile cast iron. Melting and spheroidization treatment. Inoculation of ductile iron Properties and application of ductile iron casting.

Unit- IV **CO4**

Steel Casting Practice: Common steel casting, their composition, structure and properties. Melting and refining of steel. Gating and risering of steel castings cleaning of steel castings.

Aluminium Foundry Practice: Composition, properties and application of common aluminium alloy casting. Melting and casting of AI-alloys. Gating and risering of AI-alloy casting.

Unit- V **CO5**

Copper alloy Foundry Practice: General characteristics of common cast copper alloys. Melting and casting of copper alloys. Gating and risering of cu-alloy castings.

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Principle of Metal Casting	Heine, et. al	---	Tata-McGraw-Hill Publication - 2003
2	A Test Book of Foundry Technology	Lal, M Khanna	---	Dhanpat Rai & Sons

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Foundry Technology	P.R. Beelely		Butterworth
2	Principles of Foundry Technology	P. Jain	5 Edition	McGraw Hill Education

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SCHEME OF EXAMINATION AND SYLLABUS

1st Semester M. Tech. (Production Engineering)

Subject Code ME2250102	Non-Traditional Machining Process	L = 2	T = 0	P = 0	Credits = 2
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1. To develop the need and better understanding of conventional and non-conventional manufacturing process. 2. To develop skills in fundamental principle of Abrasive jet machining and thermal metal removing process. 3. To expose the students to different processes used in Electro Chemical and Chemical Processes. 4. To developed the skill and knowledge the generation of plasma, electron beam, laser and their machining characteristics. 5. To developed the knowledge of formation of ion beam and this application and various high velocity forming process.	On successful completion of the course, the student will be able to: 1. To understand and compared conventional and non-conventional manufacturing process. 2. Understand AJM and EDM concept and operating characteristic. 3. Distinguish ECM with other operations and various application and understand the usage of various chemical and maskants in CHM. 4. Understand the generation of plasma, electron beam, laser and their machining characteristics. 5. Understand the formation of ion beam and this application and various high velocity forming process.

Unit-I **CO1**

Introduction: Need for non-traditional machining processes. Processes selection c1assification on – comparative study of different processes.

Mechanical Process: Ultrasonic Machining-Definition-Mechanism of metal elements of the process- Tool feed mechanism. Theories of mechanics of causing effect of parameter applications.

Unit-II **CO2**

Abrasive Jet Machining: Principles - parameters of the process applications-advantages and advantages.

Thermal Metal Removal Process: Electric discharge machining Principle of operation – mechanism of meta removal basic EDM circuitry-spark erosion Analysis of relaxation type of circuit material removal rate in relaxation circuits. Applications.

Unit-III **CO3**

Electro Chemical and Chemical Processes: Electro chemical machining (ECM) Classification ECM process-principle of ECM Chemistry of the ECM parameters of the processes-determination of the metal

removal rate - dynamics of ECM process, Electro Chemical Grinding-Electro Chemical holding Electrochemical deburring.

Unit- IV **CO4**

Plasma arc Machining: Introduction-Plasma-Generation of Plasma and equipment Mechanism of metals removal, PAN parameters- process characteristics - type of torches applications. Electron Beam.

Machining (EBM): Introduction-Equipment for production of Electron beam - Theory of electron beam machining, applications.

Laser Beam Machining (LBM): Introduction-principle of generation of lasers Equipment and Machining Procedure-Types of Lasers-Process characteristics-advantages and limitations-applications.

Ion Beam Machining: Introduction-Mechanism of metal removal and associated equipment process characteristics applications.

Unit- V **CO5**

High Velocity Forming Process: Introduction - development of specific process selection comparison of conventional and high velocity forming methods - Types of high velocity forming methods- explosion forming process-elector hydraulics forming magnetic pulse forming.

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	New Technology Institution of Engineers	Bhattacharya		
2	Non-Traditional Machining Processes	T Jagadeesha		I K International Publishing House Pvt. Ltd

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Production Technology	HMT		McGraw Hill Education
2	Modern Machining Process	P.C Pandy & H.S. Shan		Tata McGraw Hill

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SCHEME OF EXAMINATION AND SYLLABUS

1st Semester M. Tech. (Production Engineering)

Subject Code ME2250103	Theory of Metal Forming	L = 2	T = 0	P = 0	Credits = 2
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1. To develop the basic fundamentals if the metal forming process. 2. To develop skills in fundamental of forging process and defects. 3. To developed the concept of rolling, types of rolling mills and processes and its defects. 4. To developed the skill and knowledge of the extrusion and drawing and their applications. 5. To developed the knowledge of formation types of sheet metal forming processes and HERF.	On successful completion of the course, the student will be able to: 1. Understand the basics of metal forming. 2. Recognize the importance of metal forging using different geometrical shapes and various defects. 3. Understanding the concept of rolling, types of rolling mills and processes and its defects. 4. To understand the concepts of extrusion and drawing and their applications. 5. To understand the types of sheet metal forming processes and HERF.

Unit-I **CO1**

Introduction to Forming process: Introduction to metal forming, Effect of temperature on forming process-hot working, cold working. Effect of Metallurgical structure, Effect of speed of deformation work of Plastic deformation, Friction in forming operation.

Unit-II **CO2**

Forging: Classification, various stages during forging, forging equipment, brief description, deformation in compression, forging defects. Residual stresses in forging.

Unit-III **CO3**

Rolling of Metals: Classification, forces and geometrical relationships in rolling.

Variables in Rolling: Deformation in rolling, Defects in rolled products, Residual stresses in rolled products. Torque and Horsepower.

Unit- IV **CO4**

Extrusion: Classification, Extrusion equipment, variables in extrusion, Deformation in extrusion, Extrusion defects, Work done in extrusion.

Drawing: Principles of Rod and wire drawing, variables in wire drawing, Residual stresses in rod, wire and tube drawing, Defects in Rod and wire drawing**.**

		October 2020	1.00	Applicable for AY 2020-21 Onwards
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Unit- V **CO5**

Sheet Metal Forming: Introduction, forming methods, shearing and Blanking, Bending, stretch forming, Deep drawing, redrawing operations, Defects in formed products.

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Mechanical Metallurgy	Dieter G.E.		Mc Graw Hill Publications
2	Principles of Metal Working	R. Rowe		Amold London
3	Metals Handbook	ASM		Volume II -.ASM

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Theory of Metal Forming Plasticity: Classical and Advanced Topics	A. Sluzalec Metallurgy	2003	Springer Edition
2	Theory of Plasticity & Metal Forming Process	S. Singh		Khanna Publishers

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SCHEME OF EXAMINATION AND SYLLABUS

1st Semester M. Tech. (Production Engineering)

Subject Code ME2250104	Maintenance Engineering	L = 2	T = 0	P = 0	Credits = 2
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1. To develop the basic fundamentals Maintenance, Reliability, Maintainability and failure analysis. 2. To develop skills in maintenance systems and condition monitoring. 3. To developed the concept of various condition monitoring techniques. 4. To developed the skill and knowledge of the total productive maintenance and concept of maintenance. 5. To developed the knowledge of repair methods of material handling equipment.	On successful completion of the course, the student will be able to: 1. Understand the principles and objectives of Maintenance Engineering. 2. Describe the various categories of maintenance. 3. Understand the various condition monitoring techniques. 4. Understand the Total Productive Maintenance & Concept of Maintenance 5. Explain the repair methods of material handling equipment.

Unit-I **CO1**

Maintenance, Reliability and Maintainability: Objectives, Productivity, reliability, redundancy maintainability, quality circle in maintenance, maintenance job and technologies.

Defect/Failure Analysis: Defect Generation, failure types, failure analysis, detect reporting and recording and breakdown analysis.

Unit-II **CO2**

Maintenance Systems and Condition Monitoring: Planned, & Unplanned, Corrective opportunistic, Preventive, Predictive, Condition Based Maintenance, Design-out Maintenance, On-line & Off-line Monitoring, Visual, Temperature & Leakage Monitoring, Crack & Thickness Monitoring, Vibration Monitoring – selection of condition monitoring techniques, benefits.

Unit-III **CO3**

Maintenance Planning and Scheduling and CMMS: Job Planning & Scheduling, Short-term & long term plans, Capital Repair, Renovation, Codification Cataloguing; Maintenance Operation Liasons work permit job monitoring, maintenance records and documentation, selection and scope of computerization. Equipment classification, Material Management Module, Standardization Rationalization, Process planning.

Unit- IV **CO4**

Total Productive Maintenance & Concept of Maintenance: Terotechnology, scope and Concept of TPM, Basic System of TPM, Productivity Circle, TPM vis-a-vis TQM; 5-Zero Concept, Reliability Based Maintenance, Evaluation of RBM programmes; Value Engineering in Maintenance, Productivity Measurement, Maintenance Audit**.**

Maintenance Organization: Formal & Informal Organization, Line & Staff Organization; Centralized. & Decentralized Organization, External Maintenance Services; Captive Shop facilities.

Unit- V **CO5**

Maintenance Budget and Cost-Control: Maintenance cost behaviour, cost factors influencing Maintenance, Budgeting of Maintenance Cost, Cost Controls, Budgetary Control.

Training of Maintenance Personnel: Profile and need of Maintenance, Objectives & Ten Commandments of training, Categories of training; Modes of training and developments, training sources, agencies, institutions, Planning & designing of training programmes.

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Industrial Maintenance Management	S.K. Shrivastava		S. Chand & Company
2	Integrated Maintenance Management concept to computerization	B. N. Saha		. B. A. Publication

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Maintenance Planning, Control and Documentation	E.N. White		
2	Industrial Maintenance	H.P. Garg		S. Chand Publication
3	Maintenance Planning & Control	A. Kelly		Affiliated East West Press
4	Reliability Engineer	LS. Srinath		Affiliated East West Press

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SCHEME OF EXAMINATION AND SYLLABUS

1st Semester M. Tech. (Production Engineering)

Subject Code ME2250121	Agile Manufacturing	L = 2	T = 0	P = 0	Credits = 2
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1. To develop the Lean, Flexibility, and Agility as applied in automotive manufacturing and supply chain management. 2. To develop skills in strategies/methodologies concepts. 3. To developed the skill and knowledge of the automotive manufacturing and change management. 4. To developed the concepts and skill in agile manufacturing enterprise design. 5. To developed the skill and knowledge enhancing technologies for agile manufacturing.	On successful completion of the course, the student will be able to: 1. Understand the concepts of Lean, Flexibility, and Agility as applied in automotive manufacturing and supply chain management. 2. Learn Strategies/Methodologies relating to such topics as Production Planning and Control, Factory Dynamics. 3. Learn best business practices in automotive manufacturing and change management. 4. To understand of the concepts and skill in agile manufacturing enterprise design. 5. Acquire the ability to apply tools to enhanced the technologies for agile manufacturing.

Unit-I **CO1**

Introduction: What is agile Manufacturing - Competitive environment of the future the business case for agile manufacturing conceptual frame work for agile manufacturing.

Unit-II **CO2**

Four Core Concepts: Strategy driven approach - integrating organization, people technology interdisciplinary design methodology.

Unit-III **CO3**

Agile Manufacturing and Change Management: The change implications. Post failures in advanced manufacturing, changes on the way, traditional management accounting, paradigm, investment appraisal, product costing - performance, measurement and control systems, Traditiosal organization, control technological and design paradigms traditional problems in workplace- organizational issues - role of technology.

Unit- IV **CO4**

Agile Manufacturing Enterprise Design: Agile manufacturing - enterprise design. system concepts as the basic manufacturing theory - joint technical & organizational design and a model for the design of agile

manufacturing enterprise, enterprise design process insights into design processes, what is interdisciplinary design, Main issues - simple design example.

Unit- V **CO5**

Skill & Knowledge Enhancing Technologies for Agile Manufacturing: Skill and Knowledge enhancing Technologies - scheduling - technology design strategic-Design Concepts. Design and Skill of Knowledge enhancing Technologies for machine tool systems - Historical overview, Lessons, problems and Future development.

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Agile Manufacturing	Forging New Frontiers - Paul T. Kidd		Addison Wesley Publication
2	Agile Manufacturing	Proceedings of International Conference - h		Tata McGraw Hill Publications
3	On Agile Manufacturing	M.P Chowdia		Tata McGraw Hill Publications

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Agile Manufacturing: The 21st Century Competitive Strategy	A. Gunasekaran		Elsevier; Illustrated Edition
2	Agile Manufacturing Systems	K Hans Raj		Alpha Science International Limited

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SCHEME OF EXAMINATION AND SYLLABUS

1st Semester M. Tech. (Production Engineering)

Subject Code ME2250122	Composite Material	L = 2	T = 0	P = 0	Credits = 2
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1. To developed the skill and knowledge of composite materials. 2. To develop and evaluate the properties of fibre reinforcements, polymer matrix materials and commercial composites. 3. To develop skills in manufacturing of composite. 4. To developed the skill and knowledge of the fabrication of composite and design of fibre reinforced composite structures. 5. To developed the skill and knowledge about application of composite and introduction about MMC composites.	On successful completion of the course, the student will be able to: 1. To understand the basic fundamentals of the composite materials. 2. To understand and evaluation of the properties of fibre reinforcements, polymer matrix materials and commercial composites. 3. Understand the competency in one or more common composite manufacturing techniques, and be able to select the appropriate technique for manufacture of fibre-reinforced composite products. 4. Understand the fabrication of composite and design of fibre reinforced composite structures 5. Understand the application of composite and fundamental of MMC composites.

Unit-I **CO51**

Introduction to Composite Materials: Definition, Classification, Types of matrices & reinforcements, characteristics & selection, Fiber composites, laminated composites, particulate composites, prepregs, sandwich construction.

Unit-II **CO2**

Micro Mechanical Analysis of a Lamina: Introduction, Evaluation of the four elastic moduli – Rule of mixture, Macro mechanics of a lamina: Hooke's law for different types of materials, number of elastic constants, Laminate code, Failure criterion.

Unit-III **CO3**

Manufacturing: Lay Up and Curing – open and closed mould processing – Hand layup techniques Bag moulding and filament winding. Pultrusion, Pulforming, Thermoforming, Injection moulding, Cutting, Machining and joining, tooling, Quality assurance Introduction, material qualification, types of defects, NDT methods.

Unit-IV **CO4**

Fabrication of Composites: Cutting, machining, drilling, mechanical fasteners & adhesive bonding joining computer aided design manufacturing tooling fabrication equipment.

Design of Fibre Reinforced Composite Structures: Introduction, Composite structural design, Design criteria, Laminate design, Mathematical analysis of the laminate, Design of composite stiffeners.

Unit- V **CO5**

Application Developments: Aircrafts, missiles, space hardware, automobile, electrical and electronics, marine, recreational and sports equipment-future potential of composites.

Metal Matrix Composites: Reinforcement materials, types, Characteristics & Selection, base metals-selection, applications. Powder metallurgy technique, liquid metallurgy technique.

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Composite Materials Handbook	Mein Schwartz		Mc Graw Hill Book Company
2	Mechanics of Composite Materials	Autar K. Kaw		CRC Press New York

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Composite Materials: Science and Engineering	K. K. Chawla		Springer Science & Business
2	Handbook of Composites	S. T. Peters	2nd Edition	Springer US

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SCHEME OF EXAMINATION AND SYLLABUS

1st Semester M. Tech. (Production Engineering)

Subject Code ME2250123	Non-Destructive Testing	L = 2	T = 0	P = 0	Credits = 2
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1. To developed the skill and knowledge of non-destructive testing. 2. To develop skill and knowledge in methods of generating magnetic field and eddy current inspection. 3. To develop skills and knowledge of basic equipment characteristics of ultrasonic. 4. To developed the skill and knowledge of the radiography inspection and their types. 5. To developed the skill and knowledge about optical holography and microwave inspection techniques.	On successful completion of the course, the student will be able to: 1. Understand the basic fundamentals of the non-destructive testing. 2. Understand the generation of magnetic field, their types and eddy current inspection. 3. Understand the basic equipment characteristics of ultrasonic. 4. Understand of the radiography inspection and their types. 5. Understand the process of optical holography and microwave inspection techniques.

Unit-I **CO51**

Introduction to ND Testing: Selection of ND methods, visual inspection, leak testing, Liquid penetration inspection, its advantages and limitation.

Unit-II **CO2**

Magnetic Particle Inspection: Methods of generating magnetic field, types of magnetic particles and suspension liquids steps in inspection – application and limitations.

Eddy Current Inspection: Principles, operation variables, procedure, inspection coils, and detectable discounts by the method.

Unit-III **CO3**

Ultrasonic inspection: Basic equipment characteristics of ultrasonic waves, variables inspection, inspection methods pulse echo A,B,C scans transmission, resonance techniques, transducer elements couplets, search units, contact types and immersion types inspection standards-standard reference blocks.

Unit- IV **CO4**

Radiography Inspection: Principles, radiation source X-rays and gamma rays, X-ray-tube, radio graphic films, neutron radiography, Thermal inspection principles, equipment inspection methods applications.

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Unit- V **CO5**

Optical Holography: Basics of Holography, recording and reconstruction - Acoustical Holography: systems and techniques applications. Indian standards for NDT.

Microwave Inspection: Microwave holography, applications and limitations.

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Non-Destructive Testing	Mc Gonnagle JJ		Garden and reach New York
2	Non-Destructive Evolution and Quality Control		9th	Volume 17 of metals hand book
3	The Testing instruction of Engineering materials	Davis H.E Troxel G.E Wiskovil C. T.		McGraw hill

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Practical Non-Destructive Testing	Baldev Raj Narosa		
2	Non-Destructive Testing of Materials	. Jayakumar and K. Elangovan		V– Laxmi Publications

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SCHEME OF EXAMINATION AND SYLLABUS

1st Semester M. Tech. (Production Engineering)

Subject Code ME2250124	Finite Element Methods	L = 2	T = 0	P = 0	Credits = 2
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	20	140	3 Hours

Course Objective	Course Outcomes
1. To understand various elementary methods of formulation of finite elements. 2. To understand shape function and able to solve one dimensional problem based on truss. 3. To understand two-dimensional problems, Constant strain triangles, iso parametric elements. 4. Be able to formulate Finite element for Beams and frames. 5. To understand three-dimensional problems in stress analysis.	On successful completion of the course, the student will be able to: 1. Understand the basic fundamentals finite element methods. 2. Understand shape function and able to solve one dimensional problem based on truss. 3. Understand two-dimensional problems, Constant strain triangles, iso parametric elements. 4. Able to formulate Finite element for Beams and frames. 5. Able to solve three-dimensional problems in stress analysis.

Unit-I **CO1**

Basic steps in FEM formulation, Rayleigh Ritz method, Galerkins method, Von mises stress of generalization of the finite element concepts weighted reordal and variational approaches.

Unit-II **CO2**

a) 1-D Problems, basic functions and shape functions, Convergence Criteria h & p approximations, Natural Coordinates.

b) Application of 1-D problems –plane trusses Three dimensional trusses

Unit-III **CO3**

Two-dimensional problems, Constant strain triangles, isoparametric elements, sub-parametric super parametric numerical integration and others elements, Axis symmetric solids, single variable problems.

Unit- IV **CO4**

Beams and frames: Finite element formulation, boundary consideration, plane frames, three dimensional frames, Eigen value and time dependent problems, plane elasticity.

		October 2020	1.00	Applicable for AY 2020-21 Onwards
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Unit- V **CO5**

Three-dimensional problems in stress analysis, bending of plates non-linear material problems, direct solution technique creep, Computer implementation solution technique of FEM.

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Introduction to finite elements	T.R.Chandrupatla & A.D.Belegundu		PHI
2	Introduction to the finite element method	C.S.Desai and J.F.Abdel		
3	Finite Element Analysis	P.Seshu		PHI

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	The finite element method in Engineering	S.S.Rao		Peragamon
2	An Introduction to the finite Element method	J.N.Reddy		TMH

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SCHEME OF EXAMINATION AND SYLLABUS

1st Semester M. Tech. (Production Engineering)

Subject Code ME2250191	Non-Traditional Machining Process Lab	L = 2	T = 0	P = 0	Credits = 2
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	75	-	75	150	3 Hours

Course Objective	Course Outcomes
1. To developed the skill and knowledge of EDM. 2. To developed the skill and knowledge of Electrolytic Machining. 3. To developed the skill and knowledge of Laser Machining. 4. To developed the skill and knowledge of Electron Beam Machining. 5. To developed the skill and knowledge of Ion Beam Machining.	On successful completion of the course, the student will be able to: 1. Understand the procedure, working and use of EDM. 2. Understand the procedure, working and use of Electrolytic Machining. 3. Understand the procedure, working and use of Laser Machining. 4. Understand the procedure, working and use of Electron Beam Machining. 5. Understand the procedure, working and use of Ion Beam Machining.

List of Experiments

- Electrical Discharge Machining
- Electrolytic Machining
- Laser Machining
- Electron Beam Machining
- Ion Beam Machining
- Plasma Arc Machining
- Ultrasonic Machining
- Chemical Machining

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Shri Shankaracharya Group of Institutions

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SCHEME OF EXAMINATION AND SYLLABUS

1st Semester M. Tech. (Production Engineering)

Subject Code ME2250192	Maintenance Engineering Lab	L = 2	T = 0	P = 0	Credits = 2
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	75	-	75	150	3 Hours

Course Objective	Course Outcomes
1. To developed the skill and knowledge of Planned preventive and running maintenance. 2. To developed the skill and knowledge of Maintenance defect monitoring. 3. To developed the skill and knowledge of Maintenance stores spare part monitoring. 4. To developed the skill and knowledge of statutory inspection monitoring. 5. To developed the skill and knowledge of Maintenance vibration analysis.	On successful completion of the course, the student will be able to: 1. Understand the procedure, working and use of Planned preventive and running maintenance. 2. Understand the procedure, working and use of Maintenance defect monitoring. 3. Understand the procedure, working and use of Maintenance stores spare part monitoring. 4. Understand the procedure, working and use of statutory inspection monitoring. 5. Understand the procedure, working and use of Maintenance vibration analysis.

List of Experiments

- Planned preventive and running maintenance
- Maintenance defect monitoring
- Maintenance stores spare part monitoring
- Statutory inspection monitoring
- Maintenance vibration analysis