

R22

M.Tech. (CAD/CAM)

M.Tech. R22 CBCS Curriculum



VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY
An Autonomous, ISO 9001:2015 & QS I-Gauge Diamond Rated Institute, Accredited by NAAC with 'A++' Grade
NBA Accreditation for B.Tech. CE, EEE, ME, ECE, CSE, EIE, IT Programmes
Approved by AICTE, New Delhi, Affiliated to JNTUH, NIRF 113 Rank in Engineering Category
Recognized as "College with Potential for Excellence" by UGC
Vignana Jyothi Nagar, Pragathi Nagar, Nizampet (S.O), Hyderabad – 500 090, TS, India.
Telephone No: 040-2304 2758/59/60, Fax: 040-23042761
E-mail: postbox@vnrvjiet.ac.in, Website: www.vnrvjiet.ac.in

DEPARTMENT OF

MECHANICAL

ENGINEERING

VISION OF THE DEPARTMENT

To develop into a Centre of Excellence in Education and interdisciplinary research with cutting edge technologies in the field of Mechanical Engineering, consistent with the contemporary and future societal needs of the country

MISSION OF THE DEPARTMENT

- To impart high quality education by using modern pedagogical tools so as to make the students technically competent in their chosen fields.
- To inculcate quality research by developing linkages with Industry and R & D organizations in India & abroad for developing technically competent and socially responsible engineers, managers and entrepreneurs.

**M.TECH.
(CAD/CAM)**

M.TECH. (CAD/CAM)

PROGRAM EDUCATIONAL OBJECTIVES

PEO-I: To empower the students by providing necessary knowledge base, critical thinking and problem-solving capabilities in the field of Computer Aided Design & Computer Aided Manufacturing (CAD/CAM) and allied fields so that they can excel in their profession, in industry, higher studies and Research & Development.

PEO-II: To develop core competencies in the field of CAD/CAM, so as to conduct experiments, comprehend, analyze, design and use appropriate techniques and tools to provide optimal solutions for the industry related problems.

PEO-III: To inculcate the responsibility to the society at large by sensitizing regulatory and Intellectual Property related issues along with communication skills and to promote entrepreneurship with sufficient knowledge of project/ finance management techniques for ensuring their career success.

PEO-IV: To motivate the students not only to be excellent in academics, professional ethics, team work, leadership skills but also to be lifelong learners in upcoming technologies for successful professional career

M.TECH. (CAD/CAM)

PROGRAM OUTCOMES

PO-1: Post graduates will demonstrate their ability to acquire the state-of-the-art knowledge and to expand frontiers in the field of CAD/CAM Engineering.

PO-2: Post graduates will demonstrate their abilities to analyze and evaluate complex engineering problems to make intellectual in CAD/CAM Engineering.

PO-3: Post graduates will demonstrate the ability of problem-solving skills to find optimal solutions in the area of CAD /CAM Technologies including the considerations of public health, safety, cultural society and environmental problems.

PO-4: Post graduates will demonstrate the ability to carry out literature survey, design, conduct of experiments and to analyze the results using appropriate research methodologies. They should also contribute scientific knowledge in CAD/ CAM areas either individually or in groups.

PO-5: Post graduates will demonstrate ability to learn latest developments independently and continuously in the field of CAD/CAM Technology.

PO-6: Post graduates shall acquire professional ethics and intellectual integrity in the consideration of impact of research outcomes for sustainable development of the society.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY, HYDERABAD
M.TECH. I YEAR COURSE STRUCTURE AND SYLLABUS

(CAD/CAM)

I SEMESTER

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Course Type	Course Code	Name of the Course	L	T	P	Credits
Professional Core-I	22PC1CD01	Advanced CAD	3	0	0	3
Professional Core-II	22PC1CD02	CNC Technologies and Programming	3	0	0	3
Professional Core-III	22PC1CD03	Flexible Manufacturing Systems	3	0	0	3
Professional Elective-I	22PE1CD01	Condition Monitoring of Machinery	3	0	0	3
	22PE1AM04	Design for Manufacturing and Assembly				
	22PE1AM03	Micro Electromechanical Systems				
	22PE1CD04	IIOT and Industry 4.0				
	22PE1CD02	Mechanisms: Design Synthesis and Analysis				
Professional Elective-II	22PE1AM02	Supply Chain Management	3	0	0	3
	22PE1CD03	Product Life Cycle Management				
	22PE1AM05	Mechatronics				
	22PE1AM12	Intelligent Manufacturing Systems				
	22PC1AM01	Automation in Manufacturing				
Professional Core Lab-I	22PC2CD01	CAD Laboratory	0	0	2	1
Professional Core Lab-II	22PC2CD02	CAM Laboratory	0	0	2	1
Communication Skills	22SD5HS01	Communication Skills for Academic and Research Writing	0	0	2	1
Project	22PC2CD04	Technical Seminar	0	0	4	2
Mandatory	22MN6HS01	Research Methodology and IPR	2	0	0	0
Total			17	0	10	20

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY, HYDERABAD
M.TECH. I YEAR COURSE STRUCTURE AND SYLLABUS

(CAD/CAM)

II SEMESTER

R22

Course Type	Course Code	Name of the Course	L	T	P	Credits
Professional Core-IV	22PC1CD04	Finite Element Analysis	3	0	0	3
Professional Core-V	22PC1CD05	Additive Manufacturing	3	0	0	3
Professional Core-VI	22PC1CD06	Industrial Robotics	3	0	0	3
Professional Elective-III	22PE1CD05	Experimental Stress Analysis	3	0	0	3
	22PE1CD06	Advanced Mechanics of Solids				
	22PE1AM09	Composite Materials				
	22PE1CD07	Optimization Techniques				
	22PE1AM11	Materials Technology				
Professional Elective-IV	22PE1CD08	Reverse Engineering	3	0	0	3
	22PE1CD09	Computer Integrated Manufacturing				
	22PE1CD10	Product Design and Development Strategies				
	22PE1CD11	Computer Aided Process Planning				
	22PE1AM07	Quality Engineering in Manufacturing				
Professional Core Lab-III	22PC2CD03	Additive Manufacturing Laboratory	0	0	2	1
Professional Core Lab-IV	22PC2CD04	Computer Aided Engineering Laboratory	0	0	2	1
Industry Engagement	22SD5CD01	Industry Engagement	0	0	2	1
Project	22PW4CD02	Mini-Project	0	0	4	2
Mandatory	22MN6HS02	Ancient Wisdom	2	0	0	0
Total			17	0	10	20

**VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY, HYDERABAD
M.TECH. II YEAR COURSE STRUCTURE AND SYLLABUS**

(CAD/CAM)

III SEMESTER

R22

Course Type	Course Code	Name of the Course	L	T	P	Credits
Professional Elective-V	22PE1AM14	Introduction to Machine Learning	3	0	0	3
	22PE1CD12	Concurrent Engineering				
	22PE1CD13	Product Data Management				
	22PE1AM13	Design for Hydraulic and Pneumatic Systems				
	22PE1CD14	Fuzzy Logics and Neural Networks				
Open Elective	22OE1CN01	Business Analytics	3	0	0	3
	22OE1AM01	Industrial Safety				
	22OE1AM02	Operations Research				
	22OE1AM03	Entrepreneurship and Start-ups				
	22OE1PS01	Waste to Energy				
Project	22PW4CD03	Project Part – I	0	0	16	8
Total			6	0	16	14

IV SEMESTER

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Course Type	Course Code	Name of the Course	L	T	P	Credits
Project	22PW4CD04	Project Part - II	0	0	28	14
Total			0	0	28	14

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PC1CD01) ADVANCED CAD

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Basic knowledge of CAD/CAM

COURSE OBJECTIVES:

- To understand CAD tools and its applications
- To apply the parametric representation and analysis of curves and surfaces
- To compare and understand the representation schemes and modeling methods used in solid modeling
- To comprehend the CAD data exchange formats & transformations

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Identify the types of CAD tools and modeling techniques and illustrate applications of CAD

CO-2: Evaluate the parametric representation of synthetic curves and surfaces

CO-3: Validate the solid models through Boolean operations and representation schemes

CO-4: Asses the various data exchange formats and perform CAD transformations

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	3	1	-	-	-
CO-2	3	3	1	-	-	-
CO-3	3	3	1	-	-	-
CO-4	3	3	1	-	-	-

UNIT I:

CAD Tools: Design and CAD process, Definition of CAD Tools, CAD/CAM system evaluation criteria, Functional areas of CAD, Efficient use of CAD software.

Overview of Applications: Mass property calculations, Finite Element Analysis and Mechanical Assembly, Reverse Engineering, Additive Manufacturing, Working with point cloud data and .STL files

UNIT II:

Geometric Modelling – 2D: Wireframe modeling – advantages, limitations and applications, Wire frame entities, Curve representation

Parametric Representation of Synthetic Curves: Hermite Cubic Spline, Bezier curve, B-Spline curve.

UNIT III:

Surface Modeling: Surface modeling – advantages, limitations and applications, Surface entities, Surface representation, Analytics Surfaces - Plane surface, Ruled surface, Surface of revolution, Tabulated Cylinder.

Parametric Representation of Synthetic Surfaces: Parametric representation of Hermite Bi-cubic surface, Bezier surface, B- Spline surface, COONs surface, Blending surface, Sculptured surface

UNIT IV:

Geometric Modelling – 3D: Solid modeling – advantages, limitations and applications, Solid entities, Solid representation, Boolean operations

Representation Schemes: Boundary Representation (B-Rep), Constructive Solid Geometry (CSG), Sweeps

UNIT V:

2-D & 3-D Transformations: 2D and 3D transformations on Translation, Rotation, Scaling, Reflection, Shear; Homogenous and Concatenated transformations.

Product Data Exchange: Graphics standard, Need of product data exchange, Types of translators, IGES and STEP data exchange formats – structure and implementation

TEXT BOOK:

1. CAD/CAM Theory and Practice, Ibrahim Zeid, McGraw Hill international

REFERENCES:

1. Mastering CAD-CAM, Ibrahim Zeid, McGraw Hill international
2. CAD/CAM, P. N. Rao, Tata McGraw Hill
3. Computer Aided Engineering Design, Anupam Saxena, Springer, 2005
4. Geometric Modeling, Michael Martenson, 3rd Edition, Industrial Press Inc., 2006

ONLINE RESOURCES:

1. <https://nptel.ac.in/courses/112102102>

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PC1CD02) CNC TECHNOLOGIES AND PROGRAMMING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the NC Systems, NC part programming fundamentals
- To understand the CNC systems, DNC systems APT programming language for 2D geometric shapes
- To understand the concepts of Tooling for CNC, Adaptive control, CAD/CAM software implementation, post processor
- To understand the concept of Computer Aided Process Planning and Computer aided inspection & quality control

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Apply knowledge and work the NC systems & CNC systems and able to program

CO-2: Develop an optimal APT program for a given component (2D- milling & drilling)

CO-3: Understand Adoptive control systems, CNC Tooling systems, CAD/ CAM software, post processor

CO-4: Understand the concepts of CAPP and CAI & QC

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	3	2	1	2	-
CO-2	2	3	2	1	2	-
CO-3	1	3	1	1	2	-
CO-4	1	3	1	1	2	-

UNIT-I:

Introduction to Numerical Control: Numerical Control: Introduction, Applications of NC/CNC, Benefits of NC/CNC, Limitations of CNC. Classification of NC/CNC systems: Based on type of Control.

Components of CNC System: Basic components of CNC system, Design considerations, structure, Antifriction LM guideways, spindles, balls crews.

UNIT-II:

DNC Systems: DNC Concepts, Objectives of DNC, Components of DNC, Types of DNC, advantages and disadvantages of DNC

CNC Programming: Part programming: Introduction, Part Program and its elements,

Methods of Programming: Manual and Computer Assisted Part programming, APT Language & programming (statements & Programming), Examples of APT programming problems (2D machining- Milling & Drilling only)

UNIT-III:

Adaptive Control: Sample Text, Sample Text Adaptive control with optimization, Adaptive control with constraints, Adaptive control of machining processes like turning, Grinding Tooling for CNC Machines: Types of CNC tooling for cutting³ (brief introduction of preset, qualified, Interchangeable, coolant fed, and modular tooling systems); Tool presetting⁴; Automatic tool changers⁴; Work holding (modular fixturing)⁴.

UNIT-IV:

Introduction to CAD/CAM Software: NC programming using CAD/CAM software, Tool path generation using CAD/CAM software, Technology of CAM, Computer assisted part programming

Post Processors for CNC: NC Introduction to Post Processors, necessity of a Post Processor, general structure of a Post Processor, functions of a Post Processor

UNIT-V:

Computer Aided Process Planning: Sample Text, Introduction, Manual process planning vs. Computer aided process planning, Basics of variant and generative process planning methods.

Computer Aided Inspection and Quality Control: CMM Construction, Limitations of CMM, Computer Aided Testing, Optical Inspection Methods.

TEXT BOOKS:

1. Computer Aided Design Manufacturing, K. Lalit Narayan, K. Mallikarjuna Rao and M. M. M. Sarcar, PHI
2. CAD/CAM: Principles and Applications, P. N. Rao, McGraw-Hill Publications
3. Computer Control of Manufacturing Systems, Yoram Koren, McGraw Hill

REFERENCES:

1. Mastering CAD/CAM, Ibrahim Zeid, McGraw Hill
2. Numerical Control Machine Programming and Software Design, C. H. Chang, M. A. Melkanoff, Prentice Hall
3. Computer Aided Manufacturing, Shanmuga Sundar, T. Selwyn, C. Elanchezhian

ONLINE RESOURCES:

1. www.nptel.com, IIT Khargapur, Manufacturing Processes
2. www.nptel.com, IIT Madras, CNC Machines

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PC1CD03) FLEXIBLE MANUFACTURING SYSTEMS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Knowledge of Manufacturing, Supply Chain Management

COURSE OBJECTIVES:

- To understand the knowledge about the design, operation, and selection of Flexible Manufacturing Systems and their integration in today's production environments
- To understand the integration of components of FMS under different production management approaches
- To learn about simulation software and database of FMS
- To calculation of performance measures, including throughput, in-process inventory, and meeting production commitments

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Apply the concepts of Sensor Technology Probability & Statistics to develop the manufacturing systems

CO-2: Plan, schedule and control a developed FMS

CO-3: Select suitable database and software required for FMS

CO-4: Apply preventive maintenance, Kanban system effectively

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	-	-	2	3	-
CO-2	2	3	3	3	3	1
CO-3	2	3	-	-	-	-
CO-4	2	3	1	-	-	-

UNIT-I:

Flexible Manufacturing Systems: Introduction to flexible manufacturing systems. Planning and scheduling and control of FMS, Knowledge based scheduling, Types of Productions, Types of FMS, Types of FMS Layouts, advantages and disadvantages of FMS.

UNIT-II:

Computer Control and Functions: Hierarchy of computer control. Supervisory computer. Components of FMS, Types of flexibility, trade off, computer control and functions, coordinate measuring machines, types, working and capabilities.

UNIT-III:

Computer Software, Simulation and Database of FMS: Software for simulation and database of FMS, Specification and selection, Trends, Application of simulation software.

UNIT-IV:

Manufacturing Data Systems Data Flow: Manufacturing data systems data flow, CAD/CAM considerations. Planning FMS database, Just in time characteristics, Pull method, Quality small lot sizes, Work station loads, Close supplier ties, Flexible workforce – Line flow strategy, types of FMS software's.

UNIT-V:

Just In Time: Preventive maintenance, Kanban system, Implementation issues, value engineering, MRP, JIT, lean manufacture, quality concepts, and Management.

TEXT BOOKS:

1. Hand Book of Flexible Manufacturing Systems, Jha N. K., Academic Press

REFERENCES:

1. Production System beyond Large Scale Production, Taiichi Ohno, Toyota, Productivity Press India Pvt. Ltd.
2. Flexible Manufacturing Systems, Shivanad H. K., Benal M. M., Koti V., Newage International (P) Limited, New Delhi, 2006

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PE1CD01) CONDITION MONITORING OF MACHINERY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Basic knowledge of Mechanical Engineering

COURSE OBJECTIVES:

- To understand advanced concepts of various condition monitoring methods
- To enable them to identify the selection of NDT techniques for various applications
- To provide a basic understanding with case studies on different fault diagnosis method
- To apply specific Code, Standard, or Specification related to each testing method

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Identify effective maintenance schemes in industries

CO-2: Apply vibration monitoring techniques for system diagnoses

CO-3: Apply oil analysis technique to diagnose the wear debris

CO-4: Identify nonconventional methods for machine diagnoses

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	1	2	-	-	2	-
CO-2	-	2	3	1	-	2
CO-3	2	-	1	-	3	-
CO-4	-	1	-	2	-	3

UNIT-I:

Introduction: Failures – System, component and services failures – classification and its causes, Maintenance Schemes – objectives – types and economic benefits, break down, preventive and predictive monitoring.

UNIT-II:

Vibration Monitoring: causes and effects of vibration, review of mechanical vibration concepts – free and forced vibrations, vibration signature of active systems – measurement of amplitude, frequency and phase.

UNIT-III:

Vibration Monitoring Equipment: vibration sensors (contact and non-contact type) – factors affecting the choice of sensors, signal conditioners, recording and display elements, vibration meter and analyzers, measurement of overall vibration levels.

UNIT-IV:

Contaminant Analysis: Contaminants in used lubricating oils – monitoring techniques (wear debris) – SOAP technique, Ferrography, X-ray spectrometry, Particle classification.

UNIT-V:

Special Techniques: Ultrasonic measurement method, shock pulse measurement, Kurtosis, Acoustic Emission mentoring, critical speed analysis, shaft orbit analysis, Cepstrum analysis. Non-destructive techniques, Structural health monitoring weldments for surface and subsurface cracks.

TEXT BOOKS:

1. Vibration Condition Monitoring, Rao J. S., 2nd Edition, Narosa Publishing House, 2000
2. Fault Diagnosis Application, Isermann R., Springer-Verlag Berlin, 2011
3. Hand book of Condition Monitoring, Allan Davis, Chapman and Hall, 2000

REFERENCES:

1. ISTE Summer School on Machinery Diagnostics and Preventive Maintenance, Dr. K. Balaveera Reddy, KREC, Surathkal, June 19-25, 1995
2. ISTE-STTP on Maintenance of Machinery, Dr. A. Ramachandra, SJCE, Mysore, June 18-31, 2000
3. Introduction to Machinery Analysis and Monitoring, John S. Mitchell, Penn Well Books, 1993
4. Instrumentation, Measurement and Analysis, Choudary K. K., Tata McGraw Hill
5. Mechanical Faults Diagnosis, Collacott, R. A., Chapman and Hall, London, 1990

ONLINE RESOURCES:

1. www.iitnoise.com
2. <https://promo.parker.com/promotionsite/kittiwake/us/en/home>

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PE1AM04) DESIGN FOR MANUFACTURING AND ASSEMBLY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Production Technology, Machine Tools, Material Technology

COURSE OBJECTIVES:

- To impart the knowledge on steps involved in design process and material selection
- To understand about the design rules involved in machining and casting
- To understand about the design rules involved in metal joining, extrusion and sheet metal work
- To understand about the design principles involved in manual and automatic assembly transfer systems

COURSE OUTCOMES: After completion of the course, the the student should be able to

CO-1: Apply the knowledge on steps involved in design process and material selection

CO-2: Apply the knowledge on design rules involved in machining and casting

CO-3: Analyze the design rules involved in metal joining, extrusion and sheet metal work

CO-4: Design and analyze the principles involved in manual and automatic assembly transfer systems

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	1	3	3	3	2
CO-2	3	1	3	3	3	2
CO-3	3	1	3	3	3	2
CO-4	3	1	3	3	3	2

UNIT-I:

Introduction: Design philosophy, steps in design process, general design rules for manufacturability, basic principles of designing for economical production, creativity in design. **Materials:** Selection of materials for design, developments in material technology, criteria for material selection, interrelationship with process selection, process selection charts.

UNIT-II:

Machining Process: Overview of various machining processes, design rules for machining, redesigning of components for machining ease with suitable examples.

Metal Casting: Appraisal of various casting processes, general design considerations for casting, overview of solidification simulation in casting design, product design rules for sand casting, casting defects.

UNIT-III:

Metal Joining: Appraisal of various welding processes, factors in design of weldments, general design guidelines, pre and post treatment of welds, effects of thermal stresses in weld joints, welding defects, design of brazed joints.

Extrusion & Sheet Metal Work: Design guidelines for extruded sections, design principles for punching, blanking, bending, deep drawing, keeler goodman forming line diagram.

UNIT-IV:

Assembly Process: Development of the assembly process, choice of assembly method, assembly advantages, social effects of automation.

Automatic Assembly Transfer Systems: Continuous transfer, intermittent transfer, indexing mechanisms and operator paced free transfer machine.

UNIT-V:

Design of Manual Assembly: Design for assembly fits in the design process, general design guidelines for manual assembly, development of the systematic DFA methodology, assembly efficiency, classification system for manual handling, classification system for manual insertion and fastening, effect of part symmetry on handling time, effect of part thickness and size on handling time, effect of weight on handling time, parts requiring two hands for manipulation, effects of combinations of factors, effect of symmetry, effect of chamfer design on insertion operations, estimation of insertion time.

TEXT BOOKS:

1. Assembly Automation and Product Design, Geoffrey Boothroyd, Marcel Dekker Inc. NY, 1992
2. Engineering Design – Material & Processing Approach, George E. Dieter, 2nd Edition, McGraw Hill Intl., 2000

REFERENCES:

1. Handbook of Product Design, Geoffrey Boothroyd, Marcel and Dekker, 1990
2. Computer Aided Assembly Planning, A. Delchambre, Springer, 1992

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PE1AM03) MICRO ELECTRO MECHANICAL SYSTEMS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand MEMS, microsystems and their applications
- To impart knowledge on fabrication processes, microsystem packaging and assembly of micro systems
- To analyze micro devices, science and synthesis of nano materials
- To comprehend characterization techniques of nano materials

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand MEMS and microsystems

CO-2: Comprehend fabrication processes and micro system packaging

CO-3: Apply micro devices for engineering applications

CO-4: Perform synthesis and characterization of nano materials

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	1	1	3	2	2	1
CO-2	1	1	1	3	2	2
CO-3	1	1	1	1	1	2
CO-4	1	1	1	1	2	2

UNIT-I:

Overview of MEMS and Microsystems: Definition, properties, design and fabrication micro-system, microelectronics, working principle, applications and advantages of micro system. Substrates and wafers, silicon as substrate material, mechanical properties of Si, Silicon Compounds - silicon piezo resistors, Gallium arsenide, quartz, polymers for MEMS, conductive polymers.

UNIT-II:

Fabrication Processes and Micro System Packaging: Photolithography, photo resist applications, light sources, ion implantation, diffusion, Oxidation - thermal oxidation, silicon dioxide, chemical vapour deposition, sputtering - deposition by epitaxy, etching bulk and surface machining, LIGA process, LASER, Electron beam, Ion beam processes, Mask less lithography. Micro system packaging, packaging design, levels of micro system packaging -die level, device level and system level, interfaces in packaging, packaging technologies- Assembly of Microsystems.

UNIT-III:

Micro Devices: Sensors, classification, signal conversion ideal characterization of sensors micro actuators, mechanical sensors, measurands - displacement sensors, pressure sensor, flow sensors, Accelerometer, chemical and bio sensor - sensitivity, reliability and response of micro-sensor - micro actuators, applications.

Science and Synthesis of Nano Materials: Classification of nano structures, Effects of nano scale dimensions on various properties, structural, thermal, chemical, magnetic, optical and electronic properties fluid dynamics, Effect of nano scale dimensions on mechanical properties - vibration, bending, fracture Nanoparticles.

UNIT-IV:

Synthesis of Nano Materials: Sol-Gel Synthesis, Inert Gas Condensation, High energy Ball Milling, Plasma Synthesis, Electro deposition and other techniques. Synthesis of Carbon nanotubes, Solid carbon source based production techniques, Gaseous carbon source based production techniques, Diamond like carbon coating. Top down and bottom up processes.

UNIT-V:

Characterization of Nano Materials: Nano-processing systems, Nano measuring systems, characterization, analytical imaging techniques, microscopy techniques, electron microscopy scanning electron microscopy, confocal LASER scanning microscopy - transmission electron microscopy, transmission electron microscopy, scanning tunneling microscopy, atomic force microscopy, diffraction techniques, spectroscopy techniques, Raman spectroscopy, 3D surface analysis, Mechanical, Magnetic and thermal properties, Nano positioning systems.

TEXT BOOKS:

1. Introduction to Micro fabrication, Sami Franssila, John Wiley & Sons Ltd., 2004
2. Nano Technology, Norio Taniguchi, Oxford University Press, New York, 2003
3. Introduction to Nano technology, Charles P. Poole, Frank J. Owens, John Wiley and Sons, 2003

REFERENCES:

1. Foundations of MEMS, C. Liu
2. An Introduction to Microelectromechanical Systems Engineering, N. Maluf
3. Modeling MEMS and NEMS, J. Pelesko & D. Bernstein
4. MEMS & Microsystems Design & Manufacture, Tai – Ran Hsu, Tata-McGraw Hill, New Delhi, 2002
5. Emerging Nanotechnologies for Manufacturing, Waqar Ahmed and Mark J. Jackson, Elsevier Inc., 2013

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PE1CD04) IIOT AND INDUSTRY 4.0

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the basics of Industry 4.0
- To understand the business model and impact of IIoT
- To understand the concepts of virtual reality, lean manufacturing
- To gain knowledge of various sensors and actuators
- To understand various data transmission technologies

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

CO-1: Explain smart business perspective, cyber security, impacts of Industry 4.0

CO-2: Understand the basics of the Industrial Internet of Things

CO-3: Understand various key technologies

CO-4: Implement various sensors and actuators

CO-5: Understand different industrial transmission technologies and IIOT applications in real life

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	2	2	2	3	1
CO-2	2	1	2	2	3	1
CO-3	2	1	2	2	3	1
CO-4	2	1	2	2	3	1
CO-5	1	1	2	2	2	1

UNIT – I:

Industry 4.0 Basics: Industrial revolution: Phases, Evolution of Industry4.0, Environmental impacts of industrial revolution, Applications, Design requirements, Drivers of Industry 4.0, Sustainability Assessment of industries, Smart Business Perspective, Cyber security, Impacts of Industry 4.0.

UNIT – II:

Industrial Internet of Things- Basics: IIoT and Industry 4.0, IIC, Industrial Internet Systems, Design of industrial internet systems, Impact of industrial internet, Benefits of industrial internet, Industrial sensing, Industrial Processes, Features of IIoT for industrial processes, Industrial plant–The future architecture, Digital Enterprise
Business Models and Reference Architecture of IIoT: Definition of a business model, Business models of IIoT, Industrial Internet Reference Architecture

UNIT –III:

Key Technologies-Off-Site Technologies: Cloud Computing, Fog Computing
Key Technologies - On-site Technologies: Augmented Reality, Virtual Reality, Smart factories, Lean manufacturing system, Big Data and Advanced Analytics

UNIT –IV:

Sensors: Various sensor types and their underlying working principles, Characteristics of Sensors – Resolution, calibration, accuracy and others, Sensor Categories – Thermal, Mechanical, Electrical, Optical and Acoustic sensors.

Actuators: Thermal, Hydraulic, Pneumatic, Electro mechanical Actuator

UNIT – V:

Industrial Data Transmission and Acquisition: Architecture of various data transmission technologies like Foundation Fieldbus, Profibus, Highway Addressable Remote Transducer (HART), Interbus, Bitbus, DigitalSTROM, Controller Area Network, and other recent and upcoming Technologies. Distributed Control System, SCADA and PLC System.

IOT Applications: IoT Applications on Industrial automation, Factories and Assembly line, Plant Security and Safety, Transportation, Agriculture, Healthcare, Home Automation, Oil, Chemical and Pharmaceutical Industry and others.

TEXT BOOKS:

1. Introduction to Industrial Internet of Things and Industry 4.0, Sudip Misra, Chandana Roy, Anandarup Mukherjee, CRC Press
2. Internet of Things - A Hands on Approach, Vijay Madiseti, Arshdeep Bahga, University Press
3. Introduction to Internet of Things: A practical Approach, Dr. S. R. N. Reddy, Rachit Thukral and Manasi Mishra, ETI Labs

REFERENCES:

1. The Internet of Things: Enabling Technologies, Platforms, and Use Cases, Pethuru Raj and Anupama C. Raman, CRC Press
2. Designing the Internet of Things, Adrian McEwen, Wiley
3. Internet of Things: Architecture and Design, Raj Kamal, McGraw Hill.
4. Getting Started with the Internet of Things, Cuno Pfister, O Reilly Media

ONLINE RESOURCES:

1. <http://nptel.ac.in/moc20-cs69/preview>.
2. <http://coursera.org/learn/industrial-internet-of-things#syllabus>

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PE1CD02) MECHANISMS: DESIGN SYNTHESIS AND ANALYSIS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Knowledge of Kinematics of Machinery, Dynamics of Machinery and Engineering Graphics

COURSE OBJECTIVES:

- To understand the various type of motion & inflection circle for kinematics
- To apply the angular acceleration and momentum for four bar mechanism
- To analyze and synthesize mechanisms using graphical methods
- To analyze and synthesize mechanisms using Analytical methods

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Draw inflection circle for relative motion of two moving planes

CO-2: Evaluate the polode curvature for four bar mechanism

CO-3: Find function generation parameters by synthesizing mechanisms

CO-4: Synthesize mechanisms for path generation parameters

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	3	1	1	1	-
CO-2	2	3	1	1	1	-
CO-3	2	3	1	1	1	-
CO-4	2	3	1	1	1	-

UNIT-I:

Advanced Kinematics of Plane Motion - I: Introduction to plane motion. The Inflection circle, Euler – Savary Equation, Analytical and graphical determination of di Bobillier's Construction, Collineation axis, Hartmann's Construction, Inflection circle for the relative motion of two moving planes, Application of the Inflection circle to kinematic analysis.

UNIT-II:

Advanced Kinematics of Plane Motion - II: Polode curvature, Hall's Equation, Polode curvature in the four bar mechanism, coupler motion, relative motion of the output and input links, Determination of the output angular acceleration and its Rate of change, Freudenstein's collineation –axis theorem, Carter –Hall circle, The circling-point curve for the Coupler of a four bar mechanism.

UNIT-III:

Introduction to Synthesis-Graphical Methods - I: The Four bar linkage, Guiding a body through Two distinct positions, Guiding a body through Three distinct positions, The Roto center triangle, Guiding a body through Four distinct positions, Burmester's curve.

UNIT-IV:

Introduction to Synthesis-Graphical Methods - II: Function generation- General discussion, Function generation: Relative – Roto center method, Overlay's method, Function generation Velocity – pole method, Path generation: Hrones's and Nelson's motion Atlas, Roberts's theorem.

UNIT-V:

Introduction to Synthesis - Analytical Methods: Function Generation: Freudenstien's equation, Precision point approximation, Precision – derivative approximation, Path Generation. Synthesis of Four-bar Mechanisms for specified instantaneous conditions, Method of components.

TEXT BOOKS:

1. Kinematics and Dynamics of Plane Mechanisms, Jeremy Hirschhorn, McGraw-Hill, 1962
2. Theory of Mechanisms and Machines, Amitabh Ghosh and Ashok Kumar Mallik, E.W.P. Publishers
3. Theory of Machines and Mechanisms, J. E. Shigley and J. J. Uicker Jr., McGraw-Hill, 1995

REFERENCES:

1. Kinematics and Linkage Design, Allen S. Hall Jr., PHI, 1964
2. A Robot Engineering Text Book, Mohsen Shahinpoor, Harper & Row Publishers, 1987
3. Analysis of Mechanisms and Robot Manipulators, Joseph Duffy, Edward Arnold, 1980

ONLINE RESOURCES:

1. <https://nptel.ac.in/courses/112104121>

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PE1AM02) SUPPLY CHAIN MANAGEMENT

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To identify decision phases and apply competitive and supply chain strategies
- To derive driver
- To provide a basic understanding with case studies on different fault diagnosis method
- To apply specific Code, Standard, or Specification related to each testing method

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand the decision phases and apply competitive and supply chain strategies.

CO-2: Understand drivers of supply chain performance

CO-3: Analyze factors influencing network design

CO-4: Analyze the role of forecasting in a supply chain

CO-5: Understand the role of aggregate planning, inventory, IT and coordination in a supply chain

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	-	-	1	1	1	-
CO-2	-	-	1	1	1	-
CO-3	-	-	1	1	1	-
CO-4	-	-	1	1	1	-
CO-5	-	-	2	2	2	-

UNIT-I:

Strategic Framework: Introduction to Supply Chain Management, Decision phases in a supply chain, Process views of a supply chain: push/pull and cycle views, Achieving Strategic fit, Expanding strategic scope.

UNIT- II:

Supply Chain Drivers and Metrics: Drivers of supply chain performance, Framework for structuring Drivers, Obstacles to achieving strategic fit.

Coordination in SC: Modes of Transportation and their performance characteristics, Supply Chain IT framework, Coordination in a SC and Bullwhip Effect.

UNIT- III:

Designing Supply Chain Network: Factors influencing Distribution Network Design, Design options for a Distribution network, E-Business and Distribution network, Framework for Network Design Decisions, Models for Facility Location and Capacity Allocation.

UNIT-IV:

Forecasting in SC: Role of forecasting in a supply chain, Components of a forecast and forecasting methods, Risk management in forecasting.

UNIT-V:

Aggregate Planning and Inventories in SC: Aggregate planning problem in SC, Aggregate Planning Strategies, Planning Supply and Demand in a SC, Managing uncertainty in a SC: Safety Inventory.

TEXT BOOK:

1. Supply Chain Management - Strategy, Planning and Operation, Sunil Chopra and Peter Meindl, 4th Edition, Pearson Education Asia, 2010

REFERENCES:

1. Designing and Managing the Supply Chain - Concepts Strategies and Case Studies, David Simchi-Levi, Philip Kamnir and Edith Simchy Levy, 2nd Edition, Tata-McGraw Hill, 2000
2. Managing Supply Chains - A Logistics Approach, John J. Coyle, 9th Edition, Cengage Learning, 2013
3. Modeling the Supply Chain, Jeremy F. Shapiro, 2nd Edition, Cengage Learning, 2007

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PE1CD03) PRODUCT LIFE CYCLE MANAGEMENT

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Industrial Engineering and Management

COURSE OBJECTIVES:

- To understand product information, product lifecycle management concept, product structures and product pains
- To apply business processes in the PLM environment and learn engineering change management
- To create PLM service information models and different ways to integrate PLM systems with other applications
- To implement end to end business process management and PLM applications in process and product industries

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand product data, information, structures, and PLM concepts

CO-2: Apply PLM systems in organization verticals including production, after sales, marketing, subcontracting, PLM concepts for service industry, E-Business, tools, and standards in PLM

CO-3: Measure benefits of PLM implementation in daily operations, material costs, productivity of labour and quality costs

CO-4: Create and Implement methods to deploy a PLM system in a global company

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	-	-	2	1	2	1
CO-2	-	-	2	1	2	1
CO-3	-	-	1	2	2	1
CO-4	-	-	1	2	2	1

UNIT-I:

Fundamentals of PLM: Product data or Product information, Product lifecycle management concept, The P L and M of PLM –PLM Paradigm –The PLM Environment – Issues in traditional environment – Product Data Issues – Product Pains - Opportunities

UNIT-II:

Business Processes in the PLM Environment – Introduction – Process reality in a typical company – Business process activities in a PLM initiative -Business process improvement approaches - Configuration Management – Engineering Change Management

Product Structures: Standardized product data and materials data model, KPIs for product data – Generic issues with product data – Product data activities in the PLM initiative.

UNIT-III:

PLM Service Information Model: Categorizing services, Rational for building service products, how to make a service more like a tangible product? Making items out of product functions, PLM challenges in service business, An IT-service provider and a customer- specifically variable product.

UNIT-IV:

Integration of the PLM system with other Applications: Different ways to integrate PLM systems, Goal of integrating PLM, SCM and ERP – Digital Transformation of PLM -IoT in Manufacturing – Convergence of PLM with IIoT.

UNIT-V:

Implementing End to End Business Process Management: Product lifecycle management as a business strategy tool, Product lifecycle management as an enabler of cooperation between companies, Contents of collaboration, Successful cooperation, Tools of collaboration, From changes in the business environment to product strategy, Business Benefits of PLM.

TEXT BOOKS:

1. Product Lifecycle Management (Volume 1): 21st Century Paradigm for Product Realisation (Decision Engineering), John Stark, Springer, 2020
2. Product Lifecycle Management, Antti Saaksvuori, Anselmilmmonen, 3rd Edition, Springer, 2008
3. Product Life Cycle Management (PLM), A Digital Journey using Industrial Internet of Things, Udhayan Elongovan, CRC Press, 2020

REFERENCES:

1. Product Lifecycle Management (Volume 2): The Devil is in the Details, John Stark, Springer, 2016
2. Product Lifecycle Management (Volume 4): The Case Studies (Decision Engineering), John Stark, Springer, 2016
3. Management Accounting, Anthony A. Atkinson, 6th Edition, Prentice Hall, Inc., 2012
4. Introduction to Operations and Supply Chain Management, Cecil B. Bozarth, Robert B. Handfield, 5th Edition, Pearson, 2019

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PE1AM05) MECHATRONICS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the mechatronics systems
- To provide an in-depth understanding of components of knowledge-based systems
- To provide an understanding of artificial intelligence
- To design and develop automated process planning
- To develop group technology for intelligent manufacturing systems

COURSE OUTCOMES: After completing this course, the student will be able to

CO-1: Understand and describe different mechatronics systems

CO-2: Explain the principle of operation of various solid-state devices

CO-3: Describe the working of hydraulic and pneumatic actuating systems and use them appropriately

CO-4: Use program logic controls effectively

CO-5: Design mechatronic systems

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	1	1	3	2	2	1
CO-2	1	1	1	2	3	1
CO-3	1	1	3	2	2	1
CO-4	1	1	1	2	3	1
CO-5	1	1	1	3	2	1

UNIT – I:

Mechatronics systems, elements, levels of mechatronics system, Mechatronics design process, system, measurement systems, control systems, microprocessor-based controllers, advantages and disadvantages of mechatronics systems. Sensors and transducers, types, displacement, position, proximity, velocity, motion, force, acceleration, torque, fluid pressure, liquid flow, liquid level, temperature, and light sensors.

UNIT – II:

Solid state electronic devices, PN junction diode, BJT, FET, DIA and TRIAC. Analog signal conditioning, amplifiers, filtering. Introduction to MEMS & typical applications.

UNIT – III:

Hydraulic and pneumatic actuating systems, Fluid systems, Hydraulic and pneumatic systems, components, control valves, electro-pneumatic, hydro-pneumatic, electro-hydraulic servo systems: Mechanical actuating systems and electrical actuating systems.

UNIT – IV:

Digital electronics and systems, digital logic control, microprocessors and micro controllers, programming, process controllers, programmable logic controllers, PLCs versus computers, application of PLCs for control.

UNIT – V:

System and interfacing and data acquisition, DAQS, SCADA, A to D and D to a conversions; Dynamic models and analogies, System response. Design of mechatronics systems & future trends.

TEXT BOOKS:

1. Mechatronics Integrated Mechanical Electronics Systems, K. P. Ramachandran & G. K. Vijaya Raghavan, Wiley India, 2008
2. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering, W. Bolton, 3rd Edition, Pearson Education Press, 2005
3. Mechatronics System Design, Devdas Shetty, Richard, Thomson

REFERENCES:

1. Mechatronics Source Book, Newton C. Braga, Thomson Publications, Chennai
2. Mechatronics, N. Shanmugam, Anuradha Agencies Publishers
3. Mechatronics, M. D. Singh, J. G. Joshi, PHI
4. Mechatronics – Electronic Control Systems in Mechanical and Electrical Engineering, W. Bolton, 4th Edition, Pearson, 2012
5. Mechatronics – Principles and Application, Godfrey C. Onwubolu, Elsevier, 2006

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PE1AM12) INTELLIGENT MANUFACTURING SYSTEMS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the computer integrated manufacturing systems
- To provide an in-depth understanding of components of knowledge based systems
- To provide an understanding of artificial intelligence
- To design and develop automated process planning
- To develop group technology for intelligent manufacturing systems

COURSE OUTCOMES: After completing this course, the student should be able to

CO-1: Select the necessary tools for computer integrated manufacturing systems

CO-2: Use appropriate knowledge of components of knowledge based systems

CO-3: Use machine learning techniques for intelligent manufacturing systems

CO-4: Apply the concepts of automated process planning

CO-5: Apply the group technology for intelligent manufacturing systems

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	3	3	1	2	3
CO-2	2	3	3	1	2	3
CO-3	2	3	3	1	2	3
CO-4	2	3	3	1	2	3
CO-5	2	3	3	1	2	3

UNIT - I:

Computer Integrated Manufacturing Systems: Structure and functional areas of CIM system, - CAD, CAPP, CAM, CAQC, ASRS. Advantages of CIM. Manufacturing Communication Systems - MAP/TOP, OSI Model, Data Redundancy, Top-down and Bottom-up Approach, Volume of Information. Intelligent Manufacturing System Components, System Architecture and Data Flow, System Operation.

UNIT - II:

Components of Knowledge Based Systems: Basic Components of Knowledge Based Systems, Knowledge Representation, Comparison of Knowledge Representation Schemes, Inference Engine, Knowledge Acquisition.

UNIT - III:

Machine Learning: Concept of Artificial Intelligence, Conceptual Learning, Artificial Neural Networks - Biological Neuron, Artificial Neuron, Types of Neural Networks, Applications in Manufacturing.

UNIT - IV:

Automated Process Planning: Variant Approach, Generative Approach, Expert Systems for Process Planning, Feature Recognition, Phases of Process planning. Knowledge Based System for Equipment Selection (KBSES) - Manufacturing system design. Equipment Selection Problem, Modeling the Manufacturing Equipment Selection Problem, Problem Solving approach in KBSES, Structure of the KBSES.

UNIT - V:

Group Technology: Models and Algorithms Visual Method, Coding Method, Cluster Analysis Method, Matrix Formation - Similarity Coefficient Method, Sorting-based Algorithms, Bond Energy Algorithm, Cost Based method, Cluster Identification Method, Extended CI Method. Knowledge Based Group Technology - Group Technology in Automated Manufacturing System. Structure of Knowledge based system for group technology (KBSCIT) — Data Base, Knowledge Base, Clustering Algorithm.

TEXT BOOKS:

1. Intelligent Manufacturing Systems, Andrew Kusiak, Prentice Hall
2. Artificial Neural Networks, Yagna Narayana, PHI, 2006

REFERENCES:

1. Neural Networks: A Comprehensive Foundation, Simon Haykin, PHI
2. Neural Networks, James A. Freeman, David M. S., Pearson Education, 2004
3. Introduction to Artificial Neural Systems, Jacek M. Zurada, JAICO Publishing House, 2006

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PC1AM01) AUTOMATION IN MANUFACTURING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Production Technology, Machine Tools

COURSE OBJECTIVES:

- To comprehend the basic principles of automation and analyze automated flow lines
- To impart design and control aspects of automated flow lines
- To apply line balancing methods for assembly lines
- To analyze manufacturing cells and recognize applications of automated material handling systems

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Implement concepts of a productive system in automation

CO-2: Apply the concepts and design technologies of automated flow lines

CO-3: Analyze automated flow lines and apply line balancing for assembly lines

CO-4: Analyze automated cells and recognize the applications of automated material handling systems

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	1	1	1	-	1	-
CO-2	1	1	2	-	1	-
CO-3	1	1	2	-	1	-
CO-4	2	1	2	-	2	-

UNIT-I:

Fundamentals of Manufacturing Automation: Basic Principles of automation, Types of automated systems, Degrees of automation, Automation - reasons, Production operations and automation strategies, Plant Layout, Production concepts and mathematical models, Design the parts for automation, Automatic loading Systems, introduction to direction and flow control valves and PLC.

UNIT-II:

High Volume Production Systems: Automated flow lines, Methods of workflow, Work part transfer mechanisms, buffer storage, Control functions, Automation for machining operations, Design and fabrication considerations.

UNIT-III:

Analysis of Automated Flow Lines: Analysis of transfer lines without storage, Partial automation, Automated flow lines with storage buffers, Implementation of automatic flow lines, Considerations in assembly line design.

UNIT-IV:

Assembly Systems and Line Balance: Manual assembly lines, line balancing problem, Methods of line balancing, Ways to improve line balancing, Flexible manual assembly lines, automated assembly systems, Analysis of multi station assembly.

UNIT-V:

Manufacturing Cells and Automated Material Handling: Single station automated cells, Analysis of Single Station Cells and applications, Types of equipment and functions, Design and analysis of material handling system, Conveyor system, Automated guided vehicle system, Types and vehicle guidance technology Design of automated guided vehicles and applications, Automated storage and Retrieval systems - Types, Basic components and Applications, Design for Automated Assembly, Communication Systems in Manufacturing.

TEXT BOOKS:

1. Automation, Production Systems and CIM, Mikell P. Groover, PHI Pvt. Ltd., 1998
2. CAD/CAM/CIM, P. Radha Krishnan & S. Subrahmanyarn and Raju, New Age International Publishers, 2003
3. System Approach to Computer Integrated Design and Manufacturing, Singh, John Wiley, 1996

REFERENCES:

1. Pneumatic and Hydraulic Systems, W. Bolton, Newnes, 1997

ONLINE RESOURCES:

1. http://nptel.ac.in/noc21_me120/preview

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PC2CD01) CAD LABORATORY

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

COURSE PRE-REQUISITES: Advanced CAD

COURSE OBJECTIVES:

- To comprehend the tools used in CAD software
- To perform sketching, modeling and assembly of parts
- To know the surface modeling and sheet metal working tools
- To generate curves by developing codes

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Draw 2D sketches to obtain 3D parts and model curves by developing codes

CO-2: Utilize the part models in creating assemblies and obtain draftings

CO-3: Create surface models and sheet metal parts

CO-4: Covert CAD models to appropriate CAD data exchange formats and utilize them

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	1	1	-	3	-
CO-2	3	1	1	-	3	-
CO-3	3	1	1	-	3	-
CO-4	3	1	1	-	3	-

LIST OF EXERCISES:

➤ Modeling:

Introduction to CATIA software

- Sketching
- Modeling
- Assembly
- Drafting
- Surface modeling
- Sheet metal design
- CAD data exchange formats: IGES, STEP, STL etc.
- Curve modeling through codes

Note: Each topic shall consist of atleast one exercise on engineering components

➤ Demonstration of a simple team design project

Software: CATIA

REFERENCE:

1. CATIA V5 Help Manual

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22PC2CD02) CAM LABORATORY

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

COURSE PRE-REQUISITES: Automation and Robotics, Machine Tools

COURSE OBJECTIVES:

- To analyze features of CNC machines and machining centers
- To create steps and commands in part programming and tool selection
- To evaluate the use of various CAM software

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Demonstrate part programming for CNC lathe and execute the same for the part production

CO-2: Integrate CAD and CAM to manufacture components

CO-3: Develop the manufacturing of components through CAM software

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	-	1	-	2	2
CO-2	-	3	3	-	3	1
CO-3	1	3	3	1	3	-

LIST OF EXPERIMENTS:

1. Introduction to Manual part programming and features of CNC Turning and Milling Centers.
2. Preparation of manual part programme for Turning operations using point-to-point, Linear and circular interpolation Techniques.
 - a) Facing, Plain Turning, Step turning, Taper turning.
 - b) Chamfering, Grooving, Knurling and Thread cutting.
3. Preparation of manual part programme for Milling operations using point-to-point, Linear and circular interpolation Techniques.
 - a) Face Milling, Slot milling and End milling.
 - b) Pocket Milling and Mirroring.
4. Part programming using Fixed or Canned Cycles for Tapping and Thread cutting operations.
5. Generation of Tool path, NC code and its Simulation for Turning and Milling operations using CAM packages like EdgeCAM, MasterCAM and Off-line NC simulation softwares.
6. Computer Assisted Part Programme generation using APT language.

7. Machining of simple components on NC lathe machine by transferring NC Code from a CAM package through RS 232.
8. Machining of simple components on NC Milling machine by transferring NC Code from a CAM package through RS 232.

SOFTWARES: CNC Offline Simulation, EdgeCAM, MasterCAM

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22SD5HS01) COMMUNICATION SKILLS FOR ACADEMIC AND RESEARCH WRITING

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

COURSE OBJECTIVES:

- To equip the students with an understanding of the mechanics and conventions of academic and research writing including cohesion and coherence to produce texts that demonstrate precision and clarity
- To enable students to present focused, logical arguments that support a thesis
- To empower the students to find, analyze, evaluate, summarize and synthesize appropriate source material for literature review
- To enable students to use appropriate language to analyze and interpret the data, and prepare an outline
- To enable students to become adept in the requirements and specifications of standard writing to produce academic and research papers

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Apply knowledge of academic language features, and text structure and ensure cohesion and coherence as connected to various text types

CO-2: Demonstrate the use of writing process strategies through outlining, reviewing, composing, and revising

CO-3: Evaluate sources and use summary, analysis, synthesis, and integration to construct a literature review on a topic chosen by the student

CO-4: Prepare an outline for Research Articles and Thesis

CO-5: Apply standard documentation style to produce academic and research papers that meet the demands of specific genres, purposes, and audiences

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	3	1	3	1	1
CO-2	2	3	2	3	2	2
CO-3	3	3	2	3	2	2
CO-4	3	3	3	3	2	1
CO-5	2	3	2	3	2	1

UNIT-I:

- a) Factors Influencing Effective Writing: Mechanics of Writing, Purpose of Writing, Audience/reader, Organisation- Cohesion, and Coherence
- b) Features of Academic Writing: Introduction, Complexity, Formality, Precision, Objectivity, Explicitness, Accuracy and Appropriacy, Relevance, Hedging

UNIT-II:

1. Academic Writing Forms:
 - a) Analysing arguments; Building an argument
 - b) Making a Counter Argument- Managing tone, and tenor
2. Types of Research: Primary and Secondary Research;
3. Research Design: Statement of the Problem, Survey of relevant literature, Writing Hypotheses, Developing Objectives; Research Tools

UNIT-III:

- a) Criteria of Good Research- Avoiding Plagiarism
- b) Data Interpretation
- c) Preparing an outline for Research Articles & Research Reports

UNIT-IV:

- a) Reference Skills -Paraphrasing (Change of parts of speech, word order, synonyms, using the passive form), -Summarizing (Steps in summarising)
- b) Documentation Format: APA style
- c) Documentation Format: MLA style

UNIT-V:

- a) Writing Article Reviews
- b) Report Writing: a) Writing Technical Reports b) Writing Proposals

TEXT BOOKS:

1. A Course in Academic Writing, Gupta R., Orient Black Swan, 2010
2. Academic Writing: Exploring Processes and Strategies, Leki I., CUP, 1998
3. Writing-up Research: Experimental Research Report Writing for Students of English, Weissberg R., & Buker S., Englewood Cliffs, Prentice Hall, 1990

REFERENCES:

1. English Academic Writing for Students and Researchers. Yakhontova T., 2003
2. Inside Track: Successful Academic Writing, Gillett A., Hammond A., Martala M., Pearson Education, 2009
3. English for Academic Research: Writing Exercises, Wallwork, Springer, 2013
4. The MLA Handbook for Writers of Research Papers, 7th Edition, Modern Language Association
5. Academic Writing for Graduate Students: A Course for Non-native Speakers of English, Swales J. M., & Feak C. B., University of Michigan Press, 1994

ONLINE RESOURCES:

1. <https://www.coventry.ac.uk/study-at-coventry/student-support/academic-support/centre-for-academic-writing/support-for-students/academic-writing-resources/>
2. <https://www.biz-e-training.com/resources-for-learners/academic-writing-online-resources/>

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. I Semester

(22MN6HS01) RESEARCH METHODOLOGY AND IPR

TEACHING SCHEME

L	T/P	C
2	0	0

EVALUATION SCHEME

SE-I	SE-II	SEE	TOTAL
50	50	-	100

COURSE OBJECTIVES:

- To understand the research problem
- To know the literature studies, plagiarism and ethics
- To get the knowledge about technical writing
- To analyze the nature of intellectual property rights and new developments
- To know the patent rights

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand research problem formulation

CO-2: Analyze research related information & Follow research ethics

CO-3: Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity

CO-4: Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasize the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular

CO-5: Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	3	-	-	-	-
CO-2	-	2	3	-	-	-
CO-3	-	-	2	3	-	-
CO-4	-	-	-	2	3	-
CO-5	-	-	-	-	2	3

UNIT – I:

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.

Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT – II:

Effective literature studies approaches, analysis, Plagiarism, Research ethics

UNIT – III:

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT – IV:

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT – V:

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System.

New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs

TEXT BOOKS:

1. Research Methodology: An Introduction for Science & Engineering Students, Stuart Melville and Wayne Goddard
2. Research Methodology: An Introduction, Wayne Goddard and Stuart Melville
3. Research Methodology: A Step by Step Guide for beginners, Ranjit Kumar, 2nd Edition

REFERENCES:

1. Resisting Intellectual Property, Halbert, Taylor & Francis Ltd., 2007
2. Industrial Design, Mayall, McGraw Hill, 1992
3. Product Design, Niebel, McGraw Hill, 1974
4. Intellectual Property in New Technological Age, Robert P. Merges, Peter S. Menell, Mark A. Lemley, 2016
5. Intellectual Property Rights Under WTO, T. Ramappa, S. Chand, 2008

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PC1CD04) FINITE ELEMENT ANALYSIS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Numerical Methods, Engineering Mechanics, Solid Mechanics

COURSE OBJECTIVES:

- To understand the concept of Finite Element Method, Identify the areas of application of FEM and study the procedure
- To solve linear problems by numerical methods and differentiate them
- To apply the concept of FEM to solve basic non-linear problems

COURSE OUTCOMES: After completion of the course, the the student should be able to **CO-1:** Understand and Apply the concepts of FEM to one-dimensional structural systems

CO-2: Analyze two dimensional and three-dimensional cases

CO-3: Formulate scalar field variables

CO-4: Analyze time dependent systems to determine Eigen vectors

CO-5: Formulate flexural behavior of plates and material nonlinearity

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	3	-	2	-	-
CO-2	2	3	-	2	-	-
CO-3	-	3	-	2	-	-
CO-4	-	3	-	2	-	-
CO-5	2	3	-	2	-	-

UNIT-I:

Introduction to FEM: basic concepts, historical background, application of FEM, general description, comparison of FEM with other methods, variational approach, Galerkin Methods.

Co-ordinates, basic element shapes, interpolation function, Virtual energy principles, Rayleigh – Ritz method, properties of stiffness matrix, treatment of boundary conditions, solution of system of equations, Basic equations of elasticity, strain displacement relations and equilibrium equations.

One Dimensional Problems: Formulation of Stiffness Matrix for a Bar Element by the Principle of Minimum Potential Energy, Properties of Stiffness Matrix, Characteristics of Shape Functions, Quadratic shape functions.

UNIT-II:

Analysis of Trusses: Derivation of Stiffness Matrix for Trusses, Stress and strain Calculations, Calculation of reaction forces and displacements.

Analysis of Beams: Derivation of Stiffness matrix for linear beam element, Load Vector, Deflection, Stresses, Shear force and Bending moment, Problems on uniform and stepped beams for different types of loads applied on beams, Beam on elastic supports.

UNIT-III:

Finite Element – Formulation of 2D Problems: Derivation of Element stiffness matrix for two dimensional CST Element, Derivation of shape functions for CST Element, Elasticity Equations, constitutive matrix formulation, Formulation of Gradient matrix. Two dimensional Isoparametric Elements and Numerical integration.

Finite Element – Formulation of 3D Problems: Derivation of Element stiffness matrix for Tetrahedron Element, Properties of Shape functions for 3D Tetrahedral Element, Stress-Strain Analysis for 3D Element, Strain Displacement for Relationship Formulation. Problems on Axisymmetric analysis

UNIT-IV:

Steady State Heat Transfer Analysis: One Dimensional Finite Element analysis of fin and composite slabs. Two-dimensional steady state heat transfer problems: Derivation of Thermal Stiffness matrix for 2D heat transfer problems-CST, Derivation of thermal force vector for 2D heat transfer problems. Problems on Axisymmetric heat transfer analysis. Introduction to Torsional problems.

Dynamic Analysis: Formulation of mass matrices for uniform bar, beam and 2D triangular Elements using lumped and consistent mass methods, Evaluation of Eigen values and Eigen vectors for a stepped bar and beam Problems.

UNIT-V:

Plate Bending: Introduction – Plate behavior – C1 (Kirchoff) Plate elements – C0 (Mindlin) Plate elements – Mindlin beam – More devices for C0 Plate elements – Boundary conditions - Analytical problems.

Nonlinear Finite Element of Solids: Material Nonlinearities, objective rates, nonlinear elasticity, Plasticity, viscoplasticity, viscoelasticity

TEXT BOOKS:

1. Introduction to Finite Elements in Engineering, Chandrupatla and Belegundu, 4th Edition, Prentice Hall of India Pvt. Ltd.
2. A First Course in Finite Element Method, Logan Deryl L., 5th Edition, Thomson Brook/Cole
3. Concepts and Applications of Finite Element Analysis, Cook R. D, 4th Edition, Wiley

REFERENCES:

1. Finite Element Procedures in Engineering Analysis, Bathe K. J., Cliffs, N.J, Eastern Economy Edition, PHI Learning
2. The Finite Element Methods in Engineering, S. S. Rao, Pergamon
3. An Introduction to Finite Element Methods, J. N. Reddy, McGraw Hill
4. The Finite Element Method in Engineering Science, O. C. Zienkowitz, McGraw Hill
5. Fundamentals of Finite Element Analysis, Hutton D. V.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PC1CD05) ADDITIVE MANUFACTURING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PREREQUISITES: CAD

COURSE OBJECTIVES:

- To know the fundamentals and process chain involved in AM
- To understand the liquid based and solid based AM Systems
- To understand the powder based processes, rapid tooling & data formats involved in AM
- To know about the applications and post processing of AM

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Summarize the knowledge of fundamentals and process chain involved in AM

CO-2: Explain about the liquid and solid based AM Systems

CO-3: Explain the powder based processes, rapid tooling & data formats involved in AM

CO-4: Apply the knowledge of applications and plan the post processing methods involved in AM

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	1	3	-	3	3
CO-2	3	1	3	-	3	3
CO-3	3	1	3	-	3	3
CO-4	3	1	3	-	3	3
CO-5	3	1	3	-	3	3

UNIT – I:

Introduction: Prototyping fundamentals: Need for time compression in product development, Need for Additive Manufacturing, Historical development, AM Process Chain, Advantages and Limitations of AM, Classification of AM process, Distinction between AM and CNC.

UNIT – II:

Liquid-based AM Systems: Stereo lithography Apparatus (SLA): Principle, Process, Applications, Advantages and Disadvantages, Solid ground curing (SGC): Principles, Processes, Applications, Advantages and Disadvantages, Poly jet: Principle, Process, Applications, Advantages and Disadvantages.

Solid-based AM Systems: Laminated Object Manufacturing (LOM): Principle, Process, Applications, Advantages and Disadvantages, Fused Deposition Modeling (FDM): Principle, Process, working principle, Applications, Advantages and Disadvantages, Multi-Jet Modelling (MJM): Principle, Process, Applications, Advantages and Disadvantages.

UNIT – III:

Powder Based AM Systems: Selective laser sintering (SLS): Principle, Process, Applications, Advantages and Disadvantages, Three-dimensional Printing (3DP): Principle, Process, Applications, Advantages and Disadvantages

Laser Engineered Net Shaping (LENS): Principle, Process, Applications, Advantages and Disadvantages, Electron Beam Melting (EBM): Principle, Process, Applications, Advantages and Disadvantages

Rapid Tooling: Introduction to Rapid Tooling (RT), Indirect Methods of Rapid Tooling: Investment Cast Tooling, 3D Keltool, Spray Metal Tooling. Direct Methods of Rapid Tooling: SLS, EBM Tooling, Direct Metal Laser Sintering (DMLS) and Laminated Tooling

UNIT – IV:

AM Data Formats: Basic concept, CAD data formats, CAD model preparation, Part orientation and support generation, about STL File & its errors and Overview of Reverse Engineering.

AM Software: Overview of various AM software's like Materialise Magics and Mimics only.

UNIT – V:

Applications and Post Processing of AM

AM Applications: Applications in Engineering, Analysis and Planning, Applications in Aerospace & Defense Industry, Automotive Industry, Bio-Medical Applications, Applications in Jewelry, Coin & Tableware Industry.

Post Processing: Introduction, Post Processing Techniques like Support material removal, Cleaning, Sanding and Polishing for FDM Techniques and Overview of Post Processing involved in Metal Additive Manufacturing.

TEXT BOOKS:

1. Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Ian Gibson, David W. Rosen, Brent Stucker, Springer, 2010
2. Rapid prototyping, Gebhardt A., Hanser Gardener Publications, 2003

REFERENCES:

1. Rapid prototyping: Principles and applications, Chua C. K., Leong K. F., and Lim C. S., 3rd Edition, World Scientific Publishers, 2010
2. Rapid Prototyping and Engineering Applications: A Tool Box for Prototype Development, Liou L. W. and Liou F. W., CRC Press, 2007
3. Rapid Prototyping: Theory and Practice, Kamrani A. K. and Nasr E. A., Springer, 2006
4. Rapid Tooling: Technologies and Industrial Applications, Hilton P. D. and Jacobs P. F., CRC Press, 2000

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PC1CD06) INDUSTRIAL ROBOTICS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Mathematics and Logic Gates

COURSE OBJECTIVES:

- To understand the anatomy, classification, basic components, and motions of the robot
- To study various types of drive systems, end effectors and sensors
- To impart knowledge in robot kinematics and programming
- To study robot cell design and industrial applications of robots

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Apply the knowledge of robot anatomy to choose the robot

CO-2: Analyze robot drive systems and end effectors, kinematics, sensors and machine vision system

CO-3: Program the robot

CO-4: Build robot cell and choose robots for industrial applications

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	1	1	2	-	1	-
CO-2	2	2	2	-	1	-
CO-3	2	2	2	-	1	-
CO-4	2	2	2	-	1	-

UNIT-I:

Fundamentals of Robot: Definition, Anatomy, Coordinate Systems, Work Envelope, Types and Classification, Specifications-Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load, Robot Parts and their functions, Configuration of robot controller, Need for Robots, applications.

UNIT-II:

Robot Drive Systems and End Effectors: Pneumatic Drives-Hydraulic Drives-Mechanical Drives, Electrical Drives-D.C. Servo Motors, Stepper Motors, A.C. Servo Motors-Salient Features, Applications and Comparison of all these Drives, End Effectors-Grippers-Mechanical Grippers, Pneumatic and Hydraulic- Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations.

UNIT-III:

Robot Sensors and Machine Vision: Position sensors, velocity sensors, tactile sensors, proximity and range sensors, uses of sensors in robotics.

Machine Vision: Functions, Sensing and Digitizing-imaging, Devices, Lighting techniques, Analog to digital single conversion, image storage; Image processing and Analysis-image data reduction, Segmentation feature extraction.

UNIT-IV:

Robot Kinematics: Introduction to manipulator kinematics, Joint coordinates, and world coordinates, Forward and inverse Kinematics, Problems.

Robot Programming: Lead through Programming, Robot programming Languages-VAL Programming-Motion Commands, Sensor Commands, End Effector commands and simple Programs.

UNIT-V:

Robot Cell Design and Control: Robot cell layouts-Robot centered cell, In-line robot cell, Considerations in work cell design, Workcell control, Interlocks, Error detection, Work cell controller.

Robot Applications: Material transfer, Machine loading/unloading, Processing operation, assembly Inspection, Future Applications.

TEXT BOOKS:

1. Industrial Robotics - Technology Programming and Applications, Groover M. P., McGraw Hill, 2001
2. Robotic Engineering - An Integrated Approach, Klaffer R. D., Chmielewski T. A. and Negin M., Prentice Hall, 2003

REFERENCES:

1. Introduction to Robotics Mechanics and Control, Craig J. J., Pearson Education, 2008
2. Robotics Technology and Flexible Automation, Deb S. R., Tata McGraw Hill Book Co., 1994
3. Robotics for Engineers, Koren Y., McGraw Hill Book Co., 1992
4. Robotics Control, Sensing, Vision and Intelligence, Fu K. S., Gonzalz R. C. and Lee C. S., McGraw Hill Book Co., 1987
5. Robotics and Image Processing, Janakiraman P. A., Tata McGraw Hill, 1995

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PE1CD05) EXPERIMENTAL STRESS ANALYSIS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand theory of elasticity and thick cylinders
- To apply the shear stress concept to non-circular bars and plates
- To understand the single degree of freedom and two degrees of freedom systems
- To comprehend the multi degree freedom systems

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Evaluate the elasticity theory in cartesian and polar coordinates

CO-2: Assess shear stress in non-circular bars and plates

CO-3: Evaluate the single degree and two degree freedom systems

CO-4: Assess the multi degree freedom systems

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	1	3	3	-	-	-
CO-2	1	3	3	-	-	-
CO-3	1	3	3	-	-	-
CO-4	1	3	3	-	-	-

UNIT-I:

Two-dimensional elasticity theory in Cartesian coordinates, plane stress problem in polar coordinates

Thick cylinders, Rotating discs - stress concentration.

UNIT-II:

Torsion of non-circular prismatic sections, rectangular and axisymmetric, Circular plates, introduction to shell theory — contact stresses.

UNIT-III:

Single degree freedom, two-degree freedom system without and with damping - Free and forced vibrations, Transient vibrations.

UNIT-IV:

Transient vibrations of single- and two-degree freedom systems, multi-degree of freedom systems - applications of matrix methods, continuous systems.

UNIT-V:

Free and forced vibrations of strings bars and be CAD/CAM. Principle of orthogonality - classical and energy methods.

TEXT BOOKS:

1. Theory of Elasticity, Timoshenko S. P. and Goodier J. N., Koakusha Publishers
2. Advanced Strength of Materials, Den Hortog J. P., Torrent
3. Mechanical Vibrations, Den Ilartog J. P., Dover Publications

REFERENCES:

1. Theory of Vibrations with Applications, Thomson W. T., CBS Publishing
2. Mechanical Vibrations, Rao S. S., Addison Wesley Longman

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PE1CD06) ADVANCED MECHANICS OF SOLIDS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Basics of Mechanics of Solids, Engineering Mechanics and Mathematics

COURSE OBJECTIVES:

- To understand the concept of stress and strain in 3-D, Cauchy's formula, Mohr's circle, Drucker-Prager yield criteria, shear effect on inelastic bending etc.
- To understand the concept of torsion, buckling and stability, columns with eccentric axis loads
- To understand method of superposition, principal of work, power and energy and its importance

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Solve solid mechanics problems effectively using softwares

CO-2: Understand the concept of torsion, buckling and stability, columns with eccentric axis loads

CO-3: Analyze stresses build in various members in a given applications

CO-4: Apply the concepts of torsion, buckling and stability, columns with eccentric axis loads for real life situations

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	2	3	3	2	3
CO-2	3	3	1	3	2	2
CO-3	2	2	2	2	1	1
CO-4	2	3	1	2	1	1

UNIT – I:

Three Dimensional Stresses: Introduction, Stress and Strains in 3-D – Cauchy's formula, Principal Stress, hydrostatic stress, deviatoric stress, stress transformations, Mohr circle, octahedral shear stress, strain energy densities, etc.

Theories of Failure: Yield criteria: general concepts – maximum principal stress criterion, maximum principal strain criterion, and strain-energy density criterion; Yielding of ductile metals – maximum shear stress (Tresca) criterion, distortional energy density (von mises) criterion, and effect of hydrostatic stress and the π - plane; alternative yield criteria – mohr-coulomb yield criterion, Drucker-Prager yield criterion, and Hill's criterion for orthotropic materials; General yielding – elastic-plastic bending, fully plastic moment, shear effect on inelastic bending, modulus of rupture, comparison of failure criteria and interpretation of failure criteria for general yielding.

UNIT – II:

Unsymmetrical Bending: Introduction; Doubly symmetric beams with skew loads; Pure bending of unsymmetric beams; Generalized theory of pure bending; Bending of beams by lateral loads; Shear centre; Shear stresses in beams of thin-walled open cross sections; Shear centers of thin-walled open sections; General theory for shear stresses.

Bending of Curved Beams: Introduction; Circumferential stresses in a curved beam – location of neutral axis of cross section; Radial stresses in curved beams – curved beams made from anisotropic materials; Correction of circumferential stresses in curved beams having I, T, or similar cross sections – Bleich's correction factors; Deflections of curved beams – cross sections in the form of an I, T, etc.; Statically indeterminate curved beams – fully plastic versus maximum elastic loads for curved beams.

UNIT – III:

Torsion: Torsion of a cylindrical bar of Circular cross Section; Saint-Venant's semiinverse methods; Linear elastic solution; Prandtl elastic membrane (Soap-Film) Analogy; Narrow rectangular cross Section; Hollow thin wall torsion members, Multiply connected Cross section, Thin wall torsion members with restrained ends Axi-Symmetric Problems: Rotating Discs – Flat discs, Discs of uniform thickness, Discs of Uniform Strength, Rotating Cylinders.

UNIT – IV:

Columns: Buckling and stability; Columns with pinned ends; Columns with other support conditions; Columns with eccentric axis loads; Secant formula; Imperfections in columns; Elastic and inelastic column behavior; Inelastic buckling; Column design formulas.

UNIT – V:

Beam on Elastic Foundations: General theory; Infinite beam subjected to **Concentrated Load:** boundary conditions – method of superposition, and beam supported on equally spaced discrete elastic supports; Infinite beam subjected to a distributed load segment – uniformly distributed load; semi-infinite beam subjected to loads at its end; semi-infinite beam with concentrated load near its end; Short beams. **Energy Methods:** Introduction; Principle of virtual work; unit load method for calculating displacements; Reciprocal theorems; Strain-energy and complementary energy; Strain-energy methods; Complementary energy methods; Castigliano's second theorem; Shear deflections of beams. Introduction to Photoelasticity.

TEXT BOOKS:

1. Advanced Mechanics of Materials, Arthur P. Boresi and Richard J. Schmidt, 6th Edition, John Wiley
2. Mechanics of Materials, J. M. Gere and S. Timoshenko, CBS

REFERENCES:

1. Strength of Materials (Part 2): Advanced Theory and Problems, Stephen Timoshenko, CBS
2. Engineering Mechanics of Solids, E. P. Popov, Pearson Education
3. Strength of Materials, Schaum's Series

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PE1AM09) COMPOSITE MATERIALS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Maths, Physics, Chemistry, Engineering Mechanics, Mechanics of Solids

COURSE OBJECTIVES:

- To understand composite materials and their properties, relationship between them and manufacturing methods
- To understand the principles of material science applied to composite materials
- To study the equations to analyze problems by making good assumptions and learn systematic engineering methods to solve practical composite mechanics problems

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Apply fundamental knowledge of mathematics to modeling and analysis of composite materials

CO-2: Understand the manufacturing methods of various composite materials

CO-3: Analyze the Strength of composites for lamina and laminate level

CO-4: Analyze the failure modes of composites

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	-	2	-	1	3	-
CO-2	3	1	-	2	-	-
CO-3	-	2	3	-	1	-
CO-4	-	3	2	2	-	-

UNIT-I:

Introduction: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance. Nature made composites.

UNIT-II:

Reinforcements: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements.

Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

Mechanical Behavior of Composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT-III:

Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications.

Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications, Introduction to Machining of Composites.

UNIT-IV:

Macro-mechanical Analysis of a Lamina: Introduction, Definitions Stress, Strain, Elastic Moduli, Strain Energy. Hooke's Law for Different Types of Materials, Hooke's Law for a Two-Dimensional Unidirectional Lamina, Plane Stress Assumption, Reduction of Hooke's Law in Three Dimensions to Two Dimensions, Relationship of Compliance and Stiffness Matrix to Engineering Elastic Constants of a Lamina.

UNIT-V:

Macro-mechanical Analysis of Laminates: Introduction, Laminate Code, Stress–Strain Relations for a Laminate, In-Plane and Flexural Modulus of a Laminate, Hygrothermal Effects in a Laminate, Warpage of Laminates.

Strength: Lamina Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria. Laminate first ply failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

TEXT BOOKS:

1. Mechanics of Composite Materials, (Mechanical Engineering), Autar K. Kaw, 2nd Edition, CRC
2. Engineering Mechanics of Composite Materials, Isaac and M. Daniel, Oxford University Press, 1994
3. Material Science and Technology, Vol. 13–Composites, R. W. Cahn – VCH, West Germany

REFERENCES:

1. Mechanics of Composite Materials, Robert M. Jones, 2nd Edition, Scripta Book Company
2. Analysis and performance of Fibre Composites, B. D. Agarwal and L. J. Broutman, Wiley Interscience, 1980
3. Materials Science and Engineering-An Introduction, W. D. Callister Jr., Adapted by R. Bala Subramaniam, John Wiley & Sons, Indian Edition, 2007
4. Composite Materials, K. K. Chawla
5. Composite Materials Science and Applications, Deborah, D. L. Chung

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PE1CD07) OPTIMIZATION TECHNIQUES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the classification of optimization techniques and its practical use
- To understand about the optimization of one dimensional optimization methods
- To know about constrained minimization method
- To understand Geometric and dynamic programming

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Apply the different types of optimization techniques for different purposes

CO-2: Formulates and solve the problems by using one dimensional unconstrained minimization methods

CO-3: Formulates and solve the problems (industrial/research) by using the geometric programming

CO-4: Formulate and solve the industrial problems by using the dynamic programming methods and genetic algorithms

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	-	3	3	3	-	-
CO-2	-	3	3	3	-	-
CO-3	-	3	3	3	-	-
CO-4	-	3	3	3	-	-

UNIT-I:

Introduction to optimization, classification of optimization problems, classical optimization techniques.

UNIT-II:

One-Dimensional Minimization Methods: Uni-model Function; Elimination Methods – Dichotomous Search, Fibonacci and Golden Section Methods; Interpolation Methods – Quadratic and Cubic Interpolation Methods.

UNIT-III:

Unconstrained Minimization Methods: Univariate, Conjugate Directions, Gradient and Variable Metric Methods. **Constrained Minimization Methods:** Characteristics of a constrained problem; Direct Methods of feasible directions; Indirect Methods of interior and exterior penalty functions.

UNIT-IV:

Geometric Programming: Formulation and Solutions of Unconstrained and Constrained geometric programming problems.

UNIT-V:

Genetic Algorithms: Introduction to Genetic Algorithms, Operators, applications to engineering optimization, Problems.

TEXT BOOKS:

1. Operations Research, S. D. Sharma, Kedarnath Ramnath
2. Engineering Optimization, S. S. Rao, New Age International Publications, 2014
3. Introduction to Genetic Algorithms, S. N. Sivanandam, Springer

REFERENCES:

1. Operations Research-An Introduction, H. A. Taha, PHI, 2008
2. Principles of Operations Research, H. M. Wagner, PHI, Delhi, 1982
3. Introduction to Optimization: Operations Research, J. C. Pant, Jain Brothers, 2008

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PE1AM11) MATERIALS TECHNOLOGY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To comprehend the basic principles of elasticity and plasticity
- To impart design and development aspects of Fracture mechanics
- To understand selection process of relevant to properties of materials
- To evaluate the development of modern materials and applications

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Implement concepts of elasticity and plasticity for material analysis

CO-2: Apply the concepts and selection techniques for preventing materials failure

CO-3: Design materials using various failure theories for different applications

CO-4: Understand the development of modern materials and technological aspects

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	3	2	2	3	3
CO-2	3	2	2	3	2	3
CO-3	2	2	3	2	2	1
CO-4	1	1	1	3	2	2

UNIT – I:

Elasticity in metals and polymers, mechanism of plastic deformation, role of dislocations, yield stress, shear strength of perfect and real crystals, strengthening mechanism, work hardening, solid solution, grain boundary strengthening. Poly phase mixture, precipitation, particle, fiber and dispersion strengthening, effect of temperature, stress and strain rate of plastic behaviour, super plasticity, deformation of non crystalline material

UNIT – II:

Griffith's Theory, stress intensity factor and fracture Toughness, Toughening Mechanisms, Ductile and Brittle transition in steel, High Temperature Fracture, Creep, Larson – Miller parameter, Deformation and Fracture mechanism maps.

UNIT – III:

Fatigue, Low and High cycle fatigue test, Crack Initiation and Propagation mechanism and Paris Law, Effect of surface and metallurgical parameters on Fatigue, Fracture of non-metallic materials, fatigue analysis, Sources of failure, procedure of failure analysis.

UNIT – IV:

Motivation for selection, cost basis and service requirements, Selection for Mechanical Properties, Strength, Toughness, Fatigue and Creep. Selection for Surface durability, Corrosion and Wear resistance, Relationship between Materials Selection and Processing, Case studies in Materials Selection with relevance to Aero, Auto, Marine, Machinery and Nuclear Applications.

UNIT – V:

Modern Metallic Materials: Dual Steels, Micro alloyed, High Strength Low alloy (HSLA) Steel, Transformation induced plasticity (TRIP) Steel, Maraging Steel, Inter metallics, Ni and Ti Aluminides, Smart Materials, Shape Memory alloys, Metallic Glass Quasi Crystal and Nano Crystalline Materials. **Non-metallic Materials:** Polymeric materials and their molecular structures, Production Techniques for Fibers, Foams, Adhesives and Coatings, structure, Properties and Applications of Engineering Polymers, Advanced Structural Ceramics WC, TiC, TaC, Al₂O₃, SiC, Si₃N₄, CBN and Diamond – properties, Processing and applications.

TEXT BOOKS:

1. Mechanical Behavior of Materials, Thomas H. Courtney, 2nd Edition, McGraw Hill, 2000
2. Mechanical Metallurgy, George E. Dieter, McGraw Hill, 1998

REFERENCES:

1. Selection and Use of Engineering Materials, Charles J. A, 3rd Edition, Butterworth Heinemann
2. Engineering Materials Technology, James A. Jacob, Thomas F. Kilduff, Pearson
3. Material Science and Engineering, William D. Callister, John Wiley and Sons

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PE1CD08) REVERSE ENGINEERING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Additive Manufacturing

COURSE OBJECTIVES:

- To understand the reverse engineering and its methodologies
- To comprehend data acquisition techniques for reverse engineering
- To understand integration between reverse engineering and additive manufacturing
- To know the applications of reverse engineering

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Basic understanding of reverse engineering and its methodologies

CO-2: Understanding the data acquisition techniques for reverse engineering

CO-3: Understanding of amalgamation between reverse engineering and additive manufacturing

CO-4: Adapt the knowledge gained in reverse engineering for various applications

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	1	2	-	-	1	-
CO-2	-	1	-	2	-	1
CO-3	-	-	3	-	2	-
CO-4	1	-	-	1	-	2

UNIT-I:

Introduction to Reverse Engineering: Need, Definition, The Generic Process, History of Reverse Engineering, Overview of Applications

UNIT-II:

Methodologies and Techniques: Potential for Automation with 3-D Laser Scanners, Computer-aided (Forward) Engineering, Computer-aided Reverse Engineering, Computer Vision and Reverse Engineering

UNIT-III:

Data Acquisition Techniques: Contact Methods: Coordinate Measurement Machine and Robotic Arms, Noncontact Methods: Triangulation, Structured Light and Destructive Method

UNIT-IV:

Integration Between Reverse Engineering and Additive Manufacturing: Modeling Cloud Data, Integration of RE and AM for Layer-based Model Generation, Adaptive Slicing Approach for Cloud Data Modeling.

UNIT-V:**Applications:**

Automotive: Workflow for Automotive Body Design, Reverse Engineering for Better Quality

Aerospace: RE in Aerospace–A Work in Progress, Reducing Costs of Hard Tooling

Medical: Orthodontics, Hearing Instruments, Knee Replacement

TEXT BOOKS:

1. Reverse Engineering: An Industrial Perspective, V. Raja and K. Fernandes, Springer-Verlag
2. Reverse Engineering, K. A. Ingle, McGraw-Hill
3. Rapid Prototyping, Ali Kamrani, Emad Nasr, Springer, 2006

REFERENCES:

1. Smart Product Engineering, Michael Abramovici, Rainer stark, Springer Berlin Heidelberg
2. Product Design: Techniques in Reverse Engineering and New Product Development, K. Otto and K. Wood, Prentice Hall, 2001

ONLINE RESOURCES:

1. <https://www.polyga.com/reverse-engineering-101-scan-to-cad/>
2. https://www.bftinternational.com/en/artikel/bft_Reverse_engineering_techniques_From_3D_scanning_to_the_CAD_file_in_the_3357131.html
3. <https://physicaldigital.com/what-is-reverse-engineering/>
4. <https://all3dp.com/2/reverse-engineering-software-reverse-engineering-tools/>

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PE1CD09) COMPUTER INTEGRATED MANUFACTURING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Computer Aided Design, Computer Aided Manufacturing, Machine Tools, Operations Research

COURSE OBJECTIVES:

- To understand planning required in manufacturing area
- To learn the fundamentals of computer assisted numerical control programming
- To learn quality control and material handling
- To learn the guidelines and criteria for implementing CAD/CAM systems and assisted software's for manufacturing

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand the basics of manufacturing and application of group technology

CO-2: Develop CAPP systems and derive production metrics based on testing

CO-3: Apply concept of quality control and material handling

CO-4: Design automated material handling and storage systems for a typical production system and balance the line

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	2	-	3	3	-
CO-2	3	-	-	3	3	-
CO-3	3	-	-	3	3	-
CO-4	3	-	-	3	3	-

UNIT-I:

Introduction: Scope of computer integrated manufacturing, Product cycle, Production automation.

Group Technology: Role of group technology in CAD/CAM integration, methods for developing part families, classification and coding, Examples of coding systems, Facility design using group technology.

UNIT-II:

Computer Aided Process Planning: Approaches to process planning- Manual, variant, Generative approach, Process planning systems—CAPP, DCLASS, CMPP, Criteria for selecting a CAPP system, Part feature recognition.

UNIT-III:

Integrative Manufacturing Planning and Control: Role of integrative manufacturing in CAD/CAM integration, over view of production control—Forecasting, Master production schedule, rough cut capacity planning, M.R.P., order release, shop floor control, Quality assurance, Planning and control systems, Cellular manufacturing.

UNIT-IV:

Cellular Manufacturing Systems: Part Families, Parts Classification and Coding, Features of Parts Classification and Coding Systems, Opitz of Parts Classification and Coding Systems, Production Flow Analysis, Composite Part Concept, Machine Cell Design, Applications of Group Technology, Quantitative analysis of Cellular Manufacturing, grouping of parts and Machines by Rank Order Clustering, Arranging Machines in a GT Cell.

UNIT-V:

Computer Aided Quality Control: Terminology in quality control, contact inspection methods, non-Contact inspection methods, Computer Aided Testing, Integration of CAQC with CAD/CAM

TEXT BOOKS:

1. Automation, Production Systems and Computer Integrated Manufacturing, Mikell P. Groover, 3rd Edition, Prentice Hall Inc., 2007
2. Assembly Automation and Product Design, Geoffrey Boothroyd, Taylor and Francis
3. System Approach to Computer Integrated Manufacturing, Nanua Singh, Wiley & Sons Inc., 1996

REFERENCES:

1. Computer Aided Design and Manufacturing, David D. Bedworth, Mark R. Henderson, Philip M. Wolfe, McGraw-Hill Publishers
2. CAD/CAM, Mikel P. Groover, Emery W. Zimmer, PHI Ltd.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PE1CD10) PRODUCT DESIGN AND DEVELOPMENT STRATEGIES

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Engineering Drawing, Engineering Design, Manufacturing

COURSE OBJECTIVES:

- To comprehend the basic concepts of product design and development process
- To apply structural approach to concept generation, selection and testing in product development
- To analyze the product features and its architecture so as to incorporate them suitably in product
- To apply economic analysis in product development and recognize intellectual property issues

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Implement the product design and development process and the integrate customer requirements in product design

CO-2: Apply structural approach to concept generation, selection and testing

CO-3: Demonstrate the skills in creation of a product by considering various aspects like product architecture, industrial design and design for manufacture

CO-4: Evaluate the economics of product design and development

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	3	2	1	3	1
CO-2	2	2	2	1	3	1
CO-3	3	2	1	2	2	1
CO-4	1	1	2	1	2	1

UNIT-I:

Introduction: Introduction to product design and development, Characteristics of successful product development, Composition of product development team, Challenges of product development, Generic product development process and its adaptation, Process flows for various product developments, Product development organizations.

UNIT-II:

Customer Needs: Raw data collection, Its interpretation in terms of customer needs, Organizing the needs into hierarchy, Establishing the relative importance of needs and its reflection on the results.

Product Specifications: Definitions, When to establish specifications, Establishing target specifications, Setting final specifications

UNIT-III:

Concept Generation, Selection & Testing: Activity of concept generation, Five step method, Introduction to concept selection, Benefits of structured method, Concept screening, Concept scoring, Concept testing methodology

UNIT-IV:

Product Architecture: Introduction, Its implications, Establishing the architecture, Platform planning, Design issues, DFE Industrial Design: Industrial design process – Need, Impact, Management and Assessment

UNIT-V:

Design for Manufacturing & Prototyping: DFM defined, DFM process, Introduction to prototyping - Principles Technologies, Planning for prototypes.
Economics of Product Development: Elements, Economic analysis process, Factors for success of project, Qualitative analysis

TEXT BOOKS:

1. Product Design and Development, Karl T. Ulrich and Steven D. Eppinger, Tata McGraw Hill
2. Product Design, Kevin Otto and Kristin Wood, Pearson Education

REFERENCES:

1. Engineering Design, George E. Dieter, Linda C. Schmidt, McGraw-Hill International Edition
2. Engineering Design Process, Yousef Haik, T. M. M. Shahin, Cengage Learning
3. Engineering Design: A Project-based Introduction, Clive L. Dym, Patrick Little, John Wiley & Son

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PE1CD11) COMPUTER AIDED PROCESS PLANNING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: CAD, CAM, Manufacturing Processes

COURSE OBJECTIVES:

- To understand process planning techniques
- To understand various manufacturing parameters effectively in production rate
- To understand Manufacturing tolerances in design and manufacturing process

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Apply the concept of computer aided process planning

CO-2: Design appropriate tolerances in design and manufacturing and tool paths

CO-3: Implement techniques of CAPP

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	1	1	1	2	3	1
CO-2	2	2	2	2	2	1
CO-3	1	1	2	2	2	1

UNIT-I:

Introduction to CAPP: Introduction and definition of process planning, Scope of process planning, Information requirement for process planning system in CAD/CAM, Role of process planning, Advantages of conventional process planning over CAPP, Structure of Automated process planning system, Feature recognition, Methods.

UNIT-II:

Approaches of Process Planning: Manual approach, CAPP approaches. Generative CAPP System: Importance, Principle of Generative CAPP system, Automation of logical decisions, Knowledge based systems, Inference Engine, Implementation, Benefits. Generative approach-Forward and backward planning,

UNIT-III:

Retrieval CAPP System: Significance, Group technology, Structure, Relative advantages, Implementation and applications. Examples of process planning system-CAM-I, Automated process planning, D-CLASS (CAPP). Logical Design of process planning.

UNIT-IV:

Determination of Manufacturing Tolerances: Design tolerances, Manufacturing tolerances, Methods of tolerance allocation, Sequential approach, Integration of design and manufacturing tolerances, Advantages of integrated approach over sequential approach.

UNIT-V:

Implementation Techniques for CAPP: MIPLAN system, Computer programming languages for CAPP, Criteria for selecting a CAPP system and benefits of CAPP, Computer integrated planning systems and Capacity planning system. Practical use of CAPP in real Manufacturing area

TEXT BOOKS:

1. Automation, Production systems and Computer Integrated Manufacturing System, Mikell P. Groover
2. Computer Aided Design and Manufacturing, Dr. Sadhu Singh

REFERENCES:

1. Computer Aided Process Planning, H. P. Wang & J. K. Li, 1st Edition, Elsevier Science & Technology Publishers, 1991
2. Computer Aided Engineering, David Bedworth
3. Principles of Process Planning-A Logical Approach, Gideon Halevi and Roland D. Weill, Chapman & Hall, 1995

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PE1AM07) QUALITY ENGINEERING IN MANUFACTURING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To comprehend the various quality tools and principles of Quality Loss Function
- To apply the robust design methodology in solving practical engineering problems
- To determine the variation in experimental data and analyze the residuals through regression

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Value the concept of quality, use quality tools and evaluate the quality loss

CO-2: Design and conduct the experiments using appropriate array for predicting optimal results

CO-3: Analyze and interpret the experimental data for variation and residuals

CO-4: Develop and assess regression models

CO-5: Perform & interpret a proper response surface analysis using appropriate experimental designs

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	-	-	3	2	3
CO-2	3	-	-	3	2	3
CO-3	3	-	-	3	3	3
CO-4	3	-	-	2	3	3
CO-5	3	-	-	2	3	3

UNIT-I:

Quality Value and Engineering: Quality engineering in product design, design of production processes and production, Overview of Quality Tools - Fishbone diagram, Brainstorming, Quality circles, Benchmarking, Six-sigma, ISO-9000 Quality system

Loss Function and Quality Level: Quality Loss Function (QLF) for N-type, S-type and L-type characteristics, Use of QLF, Economic consequences of tightening tolerances as a means to improve quality

UNIT-II:

Orthogonal Arrays: Introduction, Degrees of Freedom, Linear Graphs & Interaction tables, Strategies in Experimentation - Typical, Better & efficient, Steps in designing, conducting and analyzing an experiment

UNIT-III:

Analysis of Variance (ANOVA): No-way ANOVA, One-way ANOVA, Two-way ANOVA, Types of Errors, ANOVA for four level factors, Critique of F-test, Interpretation of experimental results, Percent contribution.

UNIT-IV:

Parameter Design: Introduction to parameter design, Signal to noise ratios, Parameter design strategy, Numericals on S/N analysis

Tolerance Design: Functional limits, Tolerance design for N-type, L-type and S-type characteristics, Tolerance allocation for multiple components

UNIT-V:

Regression Modeling: Introduction, Linear regression models, Estimation of linear regression models, Hypothesis testing and confidence intervals in multiple regression, Prediction of New Response Observations, Regression Model diagnostics

Response Surface Design: Introduction, Method of steepest ascent, Analysis of a second-order response surface, Experimental designs for fitting response surfaces

TEXT BOOKS:

1. Taguchi Techniques for Quality Engineering, Philip Ross, McGraw Hill, 2005
2. Quality Engineering in Production Systems, G. Taguchi, El Sayed, T. C. Hsiang, McGraw Hill, 1989
3. Design and Analysis of Experiments, D. C. Montgomery, 8th Edition, Wiley & Sons, 2013

REFERENCES:

1. Quality Engineering using Robust Design, M. S. Phadke, Pearson Education, 2008
2. Taguchi's Quality Engineering Handbook, G. Taguchi, Subir Chowdhary, Yui Wu, Wiley & Sons, 2005

ONLINE RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_mg48/preview

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PC2CD03) ADDITIVE MANUFACTURING LABORATORY

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

COURSE PREREQUISITES: CAD, Knowledge of Additive Manufacturing Processes

COURSE OBJECTIVES:

- To understand about the CAD model conversion to STL file format and rectification of errors in STL file
- To explain about build parameters involved in 3D printing
- To explain about part orientation and support structures involved in 3D printing
- To understand about the post processing & Dimensional measurement of 3D printed parts

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Develop CAD models and convert them to STL files and be in a position to rectify the STL errors

CO-2: Decide the build parameters involved in 3D printing

CO-3: Apply the knowledge of part orientation and support structures involved in 3D printing

CO-4: Perform post processing & Dimensional measurement of 3D Printed parts involved in 3D printing

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	2	3	-	3	3
CO-2	3	2	3	-	3	3
CO-3	3	2	3	-	3	3
CO-4	3	2	3	-	3	3

- Overview of 3D Printing and introduction to FDM

LIST OF EXPERIMENTS:

1. Introduction to CAD modeling and preparation of CAD models of simple mechanical engineering components
2. Conversion of CAD model to STL file format and correction of errors
3. Working with build orientation for optimum printing time
4. Definition of build parameters for 3D printing including support structures
5. 3D printing of modeled components
6. Support Material Removal & Dimensional Measurement of 3D Printed parts using digital vernier calipers

REFERENCES:

1. CATIA V5 Help Manual
2. Autodesk Netfabb User Manual
3. Makerbot User Manual

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PC2CD04) COMPUTER AIDED ENGINEERING LABORATORY

TEACHING SCHEME		
L	T/P	C
0	2	1

EVALUATION SCHEME					
D-D	PE	LR	CP	SEE	TOTAL
10	10	10	10	60	100

COURSE PRE-REQUISITES: Engineering Mechanics, Mechanics of Solids, Heat Transfer

COURSE OBJECTIVES:

- To introduce fundamentals of the analysis software, its features and applications
- To learn the basic element types in Finite Element analysis
- To know the concept of discretization of continuum, Loading conditions and
- To analyze the structure using pre-processor and postprocessor conditions

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Classify the types of uniaxial members in plane and space to and Evaluate the stiffness matrix, B matrix and loading matrices of beam/in plane/solid elements using MATLAB software

CO-2: Generalize Plane stress, plane strain conditions & axisymmetric loading on in plane members to predicting the failure behavior and finding the SCF

CO-3: Analyse connecting rod with solid elements, performing static analysis on flat & curved shells to determine stresses, strains with different boundary conditions.

CO-4: Predict the natural frequencies and modes shapes using Modal, Harmonic analysis. Also finding the critical load using Buckling analysis

CO-5: Simulate steady state heat transfer analysis of chimney, Transient heat transfer of castings, Non-linear, Buckling analysis of shells &CFD analysis

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	1	3	2	2	-	1
CO-2	1	3	2	2	-	1
CO-3	1	3	2	2	-	1
CO-4	1	3	2	2	-	1
CO-5	1	3	2	2	-	1

LIST OF PROGRAMS / EXPERIMENTS / EXERCISES:

1. Analysis of Plane Truss & Spatial Truss with various cross sections and materials under static, thermal and combined loading
2. A) 2D & 3D beam analysis with emphasize on sections, materials, loads (forces and moments) and supports
 1. Use of MATLAB for finding B matrix, stiffness matrix and loading matrices of beam/in plane/solid elements.

3. Static analysis of plate (isotropic and orthotropic material) with a hole to determine the deformations, the stresses to study the failure behavior and SCF.
4. Structural analysis in Plane stress, plane strain and axisymmetric loading on the in plane members with in plane loading.
5. Static analysis of connecting rod with tetrahedron and brick elements.
6. Static Analysis of flat and curved shell due to internal pressure and moments to estimate the strains, stresses and reactions forces and moments with different boundary conditions
7. Buckling analysis of plates, shells and beams to estimate BF and modes
8. Modal analysis of beams, plates and shells for natural frequencies and mode shapes
9. Harmonic analysis of a Shaft subjected to periodic force and transient analysis of plate subjected to stepped and ramped loading with varying time
10. Steady state heat transfer Analysis Cross section of chimney and transient heat transfer analysis of solidification of castings.
11. Nonlinear analysis of cantilever beam with non-linear materials at tip moment and post Buckling analysis of shells for critical loads
12. Coupled field analysis.
13. Flow analysis of pipe with different fluids/gasses/air for velocity and pressure gradients
14. CFD analysis of aerofoil design
15. CFD analysis of ducts/impeller/fan

Note:

1. Any of FEA software ANSYS/ABAQUS/NASTRAN/NISA/CAEFEM/ADINA may be used
2. Any 12 experiments to be conducted

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22PW4CD02) MINI-PROJECT

TEACHING SCHEME

L	T/P	C
0	4	2

CIE	SEE	TOTAL
40	60	100

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand the formulated industry / technical / societal problems

CO-2: Analyze and / or develop models for providing solution to industry / technical / societal problems

CO-3: Interpret and arrive at conclusions from the project carried out

CO-4: Demonstrate effective communication skills through oral presentation

CO-5: Engage in effective written communication through project report

COURSE OUTLINE:

- A student shall undergo a mini-project during II semester of the M.Tech. programme.
- A student, under the supervision of a faculty member, shall collect literature on an allotted project topic of his / her choice, critically review the literature, carry out the project work, submit it to the department in a prescribed report form and shall make an oral presentation before the departmental Project Review Committee.
- Evaluation of the mini-project shall consist of CIE and SEE and shall be done by a Project Review Committee (PRC) consisting of the Head of the Department, faculty supervisor and a senior faculty member of the specialization / department.
- CIE shall be carried out for 40 marks on the basis of review presentation as per the calendar dates and evaluation format.
- SEE shall be carried out at the end of semester for 60 marks on the basis of oral presentation and submission of mini-project report.
- Prior to the submission of mini-project report to the PRC, its soft copy shall be submitted to the PG Coordinator for PLAGIARISM check.
- The mini-project report shall be accepted for submission to the PRC only upon meeting the prescribed similarity index of less than 25%.

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. II Semester

(22MN6HS02) ANCIENT WISDOM

TEACHING SCHEME

L	T/P	C
2	0	0

EVALUATION SCHEME

SE-I	SE-II	SEE	TOTAL
50	50	-	100

COURSE OBJECTIVES:

- To introduce the contribution from Ancient Indian system & tradition to modern science & Technology
- To trace, identify and develop the ancient knowledge systems
- To introduce the sense of responsibility, duties and participation of individual for establishment of fearless society

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Familiarize learners with major sequential development in Indian science, engineering and technology

CO-2: Understand eco-friendly, robust and scientific planning and architecture system of ancient India

CO-3: Trace, identify, practice and develop the significant Indian mathematic and astronomical knowledge

CO-4: Understand the importance of Indian aesthetics in individual realization of the truth arises by realizing the harmony within

UNIT-I:

Indian Science & Technology: Indian S & T Heritage, sixty-four art forms and occupational skills (64 Kalas)

Ancient Architecture:

Scientific Achievements though Ancient Architect: Musical Pillars of Vitthal temple, Sundial of konark temple, construction of eight shiva temple in straight line from Kedarnath to rameshwaram at longitude 79°E 41'54, Veerbhadra temple with 70 hanging pillars

UNIT-II:

Foundation Concept for Science and Technology: The Introduction to Ancient Mathematics & Astronomy Introduction to Brief introduction of inception of Mathematics & Astronomy from vedic periods. Details of different authors who has given mathematical & astronomical sutra (e.g. arytabhatta, bhaskara, brahmagupta, varamahira, budhyana, yajanvlkya, panini, pingala, 22 bharaṭ muni, sripati, mahaviracharya, madhava, Nilakantha somyaji, jyeshthadeva, bhaskara-II, shridhara Number System and Units of Measurement, concept of zero and its importance, Large numbers & their representation, Place Value of Numerals, Decimal System, Measurements for time, distance and weight, Unique approaches to represent numbers (Bhūta Saṃkhya System, Kaṭapayādi System), Pingala and the Binary system, Knowledge Pyramid

Indian Mathematics, Great Mathematicians and their contributions, Arithmetic Operations, Geometry (Sulba Sutras, Aryabhatiya-bhasya), value of π , Trigonometry, Algebra, Chandah Sastra of Pingala, Indian Astronomy, celestial coordinate system,

Elements of the Indian Calendar Aryabhatiya and the Siddhantic Tradition Pancanga
– The Indian Calendar System

UNIT-III:

Humanities & Social Sciences: Health, Wellness & Psychology, Ayurveda Sleep and Food, Role of water in wellbeing Yoga way of life Indian approach to Psychology, the Triguna System Body-Mind-Intellect-Consciousness Complex. Governance, Public Administration & Management reference to ramayana, Artha Sastra, Kautilyan State

UNIT-IV:

Aspiration and Purpose of Individual and Human Society: Aims of Human life; at individual level and societal level. At societal level; Four purusarthas Dharma, Artha, Kama, Moksha.

Individual Level:

Program for Ensuring Human Purpose:

Fundamental Concept of Nishashastra: Satyanishtha Aur Abhiruchi (Ethics, Integrity & aptitude). The true nature of self; Shiksha Valli, Bhrgu Valli (concept of Atman-Brahman (self, soul).

The True Constitution of Human: Ananda Valli (Annamaya Kosha, Pranamaya Kosha, Manomaya Kosha, Vijnanamaya Kosha, Anandamaya Kosha). The four states of consciousness (Waking state, Dreaming state, Deep Sleep State, Turiya the fourth state), Consciousness (seven limbs and nineteen mouths), Prajna, Awareness. The Life Force Prana (Praana-Apaana-Vyaana-Udaana- Samaana

Ancient Indian Science (Ayurveda & Yoga)

Ayurveda for Life, Health and Well-being: Introduction to Ayurveda: understanding Human body and Pancha maha bhuta, the communication between body & mind, health

Introduction to Yoga: Definition, Meaning and objectives of Yoga, Relevance of yoga in modern age. the six cleansing procedures of Yoga, understanding of Indian psychological concept, consciousness, tridosha & triguna.

UNIT-V:

Five Important Slokas for Enlightenment

Gayatri Mantram, Santi Mantram: Asatoma Sadgamaya, Geeta (Yada Yadahi Dharmasya, Glanirbhavati Bharata), Amanitwam Adambitwam..., Karmanyevadikarastu... Maa phaleshukadachana

TEXT BOOKS:

1. Textbook on Indian Knowledge Systems, Prof. B Mahadevan, IIM Bengaluru
2. Indian Knowledge Systems, Kapur K. and Singh A. K., 2005

REFERENCES:

1. Tatvabodh of Sankaracharya, Central Chinmay Mission Trust, Bombay, 1995
2. Value and Distribution System in India, B. L. Gupta, Gyan Publication House
3. Ancient Indian Culture and Civilization, Reshmi Ramdhoni, Star Publication, 2018
4. Ancient Indian Society, Maharaj Swami Chidatmanjee, Anmol Publication
5. Ancient Indian Classical Music, Lalita Ramkrishna, Shubhi Publications

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. III Semester

(22PE1AM14) INTRODUCTION TO MACHINE LEARNING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To introduce the concepts of Machine learning and need for data preparation
- To understand and apply linear and non-linear algorithms
- To understand and apply neural networks and ensemble algorithms

COURSE OUTCOMES: After completion of this course the student should be able to

CO-1: Comprehend concepts of Machine Learning and need for data preparation

CO-2: Understand and apply linear and non-linear algorithms

CO-3: Analyze and apply neural networks, ensemble algorithms

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	-	1	2	1	2	-
CO-2	-	1	2	1	2	-
CO-3	-	1	2	1	2	-

UNIT - I:

Introduction to Machine Learning and Data Preparation: Introduction to machine learning, Data Loading, scaling of data- normalize and standardize data, algorithm evaluation methods, evaluation metrics, simple examples

UNIT - II:

Linear Algorithms: Simple linear regression, multi variate linear regression, logistic regression, perceptron, prediction using simple datasets.

UNIT - III:

Non-Linear Algorithms: Classification and regression trees, Naïve Bayes, k-NN, Back propagation algorithm, predictions with simple datasets

UNIT -IV:

Neural Networks: Introduction to Perceptron and Neural Networks, Activation and Loss functions, ANN architecture-Input layer, Hidden layer and output layer, Types of Neural Networks- Single layer feed-forward network, Multilayer feed-forward network, Multi-Layer Perceptron (MLP), Recurrent networks or feedback ANN, Characteristics of Neural Networks, Simple problems on Back Propagation.

UNIT-V:

Computer Vision: Introduction to Convolutional Neural Networks (CNNs), What is CNN, Common uses for CNN, CNN's Basic Architecture, simple image processing examples. Ensemble Algorithms: Introduction on ensemble methods, Bootstrap Aggregation, Random Forest, stacked generalization algorithms, simple examples.

TEXT BOOK:

1. Machine Learning Algorithms from Scratch with Python, Brownlee Jason, Machine Learning Mastery, 2016

REFERENCES:

1. Artificial Intelligence: A Modern Approach, Stuart Russell & Peter Norvig, 3rd Edition Prentice-Hall, 2009
2. Artificial Intelligence, Ela Kumar, Wiley, 2021
3. Artificial Intelligence: Concepts and Applications, Lavika Goel, Kindle Edition, Wiley, 2021
4. Nature-Inspired Optimization in Advanced Manufacturing Processes and Systems, Edited by Ganesh M. Kakandikar and Dinesh G. Thakur, 1st Edition, CRC Press, 2021

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. III Semester

(22PE1CD12) CONCURRENT ENGINEERING

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PREREQUISITES: Computer-Aided Design

COURSE OBJECTIVES:

- To comprehend the methodologies and role of information technology in Concurrent Engineering
- To provide a systematic approach to the integrated, concurrent design of products and their related processes
- To analyze and apply manufacturing concepts for intelligent design of manufacturing system
- To perform concurrent mechanical design and project management for new product development

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand the need of concurrent engineering and strategic approaches for product design

CO-2: Apply concurrent design principles to product design

CO-3: Analyze the manufacturing concepts in qualitative and physical approach

CO-4: Perform computer-based assembly planning

CO-5: Understand the concurrent mechanical design and new product development

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	1	1	2	1	2	-
CO-2	1	1	2	1	1	1
CO-3	1	1	1	1	2	-
CO-4	1	1	2	1	2	-
CO-5	1	1	1	1	1	-

UNIT - I:

Introduction: Extensive definition of CE - CE design methodologies - Organizing for CE -CE tool box collaborative product development.

Use of Information Technology: IT support - Solid modeling - Product data management - Collaborative product commerce - Artificial Intelligence - Expert systems - Software hardware co- design.

UNIT - II:

Design Stage: Life-cycle design of products - opportunity for manufacturing enterprises - modality of Concurrent Engineering Design.

Automated analysis idealization control - Concurrent engineering in optimal structural design - Real time constraints.

UNIT - III:

Manufacturing Concepts and Analysis: Manufacturing competitiveness - Checking the design process - conceptual design mechanism – Qualitative, physical approach - An intelligent design for manufacturing system.

UNIT - IV:

JIT System: Low inventory - modular - Modeling and reasoning for computer-based assembly planning, Design of Automated manufacturing.

Project Management: Life Cycle semi realization - design for economics - evaluation of design for manufacturing cost.

UNIT - V:

Concurrent Mechanical Design: Decomposition in concurrent design - negotiation in concurrent engineering design studies - product realization taxonomy - plan for Project Management on new product development – bottleneck technology development.

TEXT BOOK:

1. Concurrent Engineering: Automation Tools and Technology, Andrew Kusaik, Wiley John and Sons Inc., 1992

REFERENCES:

1. Integrated Product Development, Anderson M. M. and Hein L. Berlin, Springer Verlag, 1987
2. Design for Concurrent Engineering, Cleetus J., Concurrent Engineering Research Centre, Morgantown W. V., 1992

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. III Semester

(22PE1CD13) PRODUCT DATA MANAGEMENT

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Management Science

COURSE OBJECTIVES:

- To understand tools and methods for product design and development
- To create awareness of the role of multiple functions in creating a new product and architecture (e.g. marketing, finance, industrial design, engineering, production)
- To know the customer needs into the development of new products and managing requirements
- To understand design for manufacture and do prototyping

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand the need of Industrial Product & Development, customer needs & Design aspects of new products.

CO-2: Understand the product architecture and need of Industrial Product & Development in design aspects of new products.

CO-3: Involve customer into the development of new products and managing requirements

CO-4: Design for manufacture and do prototyping

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	2	2	3	2	2
CO-2	2	2	2	3	2	2
CO-3	2	2	2	3	2	2
CO-4	2	2	2	3	2	2

UNIT-I:

Introduction - Need for IPPD – strategic importance of product development – integration of customer, designer, material supplier and process planner, Competitor and customer – behavior analysis. Understanding customer – promoting customer understanding – involve customer in development and managing requirements – Organization – process management and improvement – Plan and establish product specification.

UNIT-II:

Concept Generation and Selection: Task – Structured approaches – Clarification – Search – Externally and internally – explore systematically – reflect on the solutions and process – concept selection – methodology – benefits.

Product Architecture: Implications – Product change – variety – component standardization – product performance – manufacturability.

UNIT-III:

Product Development Management: Establishing the architecture – creation – clustering – geometric layout development – fundamental and incidental interactions – related system level design issues – secondary systems – architecture of the chunks – creating detailed interface specifications.

Industrial Design: Integrate process design – Managing costs – Robust design – Integrating CAE, CAD, CAM tools – simulating product performance and manufacturing processing electronically – Need for industrial design – impact – design process.

UNIT-IV:

Investigation of customer needs – conceptualization – refinement – management of the industrial design process – technology driven products – user – driven products – assessing the quality of industrial design.

UNIT-V:

Design for Manufacturing and Product Development: Definition – Estimation of manufacturing cost reducing the component costs and assembly costs – Minimize system complexity. Prototype basics – Principles of prototyping – planning for prototypes – Economics analysis – Understanding and representing tasks – baseline project planning – accelerating the project execution.

TEXT BOOKS:

1. Product Design and Development, Kari T. Ulrich and Steven D. Eppinger, McGraw Hill International, 1999
2. Concurrent Engineering Integrated Product development, Kemnneth Crow, DRM Associates, 26/3, Via Olivera, Palos Verdes

REFERENCES:

1. Effective Product Design and Development, Stephen Rosenthal, Business One Orwin, Homewood, 1992, ISBN 1-55623-603-4
2. Tool Design–Integrated Methods for Successful Product Engineering, Staurt Pugh Addison Wesley Publishing, ISBN 0-202-41369-5
3. Production and Operations Management, Chase, TMH

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. III Semester

(22PE1AM13) DESIGN FOR HYDRAULIC AND PNEUMATIC SYSTEMS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Computer Aided Design, Computer Aided Manufacturing, Machine Tools, Operations Research.

COURSE OBJECTIVES:

- To introduce the industrial hydraulics and pneumatics, their parts, functions and their structure
- To give the required information about hydraulics and pneumatics
- To teach the fundamentals of hydraulic and pneumatic circuit design
- To teach the hydraulic and pneumatic automation and basics of PLC controls

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Identify hydraulic and pneumatic system components and their applications

CO-2: Design hydraulic and pneumatic circuits

CO-3: Explore the similarities and differences of the electrical, pneumatic and hydraulic systems

CO-4: Interpret PLC applications in hydraulic and pneumatic circuits

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	2	2	2	2	1
CO-2	2	3	3	3	2	2
CO-3	1	2	3	2	1	1
CO-4	3	3	3	2	3	2

UNIT – I:

Fluid Power Principles and Fundamentals: Introduction to Fluid power- Advantages and Applications- Fluid power systems – Types of fluids- Properties of fluids Basics of Hydraulics – Pascal's Law- Principles of flow – Work, Power and Torque. Properties of air– Perfect Gas Laws.

UNIT – II:

Hydraulic System and Components

Sources of Hydraulic Power: Pumping Theory – Pump Classification- Construction, Working, Design, Advantages, Disadvantages, Performance, Selection criterion of Linear, Rotary- Fixed and Variable displacement pumps, Hydraulic Actuators: Cylinders – Types and construction, Hydraulic motors Control Components: Direction control, Flow control and Pressure control valves- Types, Construction and Operation- Applications.

UNIT – III:

Hydraulic Circuits: Industrial hydraulic circuits- Regenerative, Sequence, Reciprocation, Fail-safe, Speed control, Hydrostatic transmission, Accumulators, Electro hydraulic circuits.

UNIT – IV:

Pneumatic System: Compressors- Filter, Regulator, Lubricator, Muffler, Air control Valves, Pneumatic actuators, Pneumatic logic circuits, Time and pilot control.

UNIT – V:

Design of Hydraulic and Pneumatic Circuits: Design of circuits using the components of hydraulic system for Drilling, Planning, Shaping, Punching, Press, Sequential circuit design for simple application using cascade method, Electro pneumatic circuits. Selection criteria of pneumatic components.

Applications: Microprocessor and PLC- Applications in Hydraulic and Pneumatic- Low cost Automation – Hydraulic and Pneumatic power packs.

TEXT BOOKS:

1. Fluid Power with Applications, Anthony Esposito, PHI, Pearson Education, 2005
2. Hydraulic and Pneumatic Controls, Shanmugasundaram K., Chand & Co, 2006

REFERENCES:

1. Oil Hydraulics Systems – Principles and Maintenance, Majumdar S. R., Tata McGraw Hill, 2001
2. Pneumatic Systems – Principles and Maintenance, Majumdar S. R., Tata McGraw Hill, 2007
3. Power Hydraulics, Micheal J., Pinches and Ashby J. G., Prentice Hall, 1989
4. Basic Fluid Power, Dudelyt A. Pease and John J. Pippenger, Prentice Hall, 1987
5. Hydraulic and Pneumatic Control, Srinivasan R., 2nd Edition, Tata McGraw - Hill Education, 2012

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. III Semester

(22PE1CD14) FUZZY LOGIC AND NEURAL NETWORKS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Production Technology, Machine Tools

COURSE OBJECTIVES:

- To comprehend the basic principles of feed forward neural networks
- To impart design and control aspects of feedback networks
- To implement fuzziness involved in various systems and fuzzy set theory
- To analyze the fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Comprehend the concepts of feed forward neural networks

CO-2: Analyze the various feedback networks

CO-3: Understand the concept of fuzziness involved in various systems and fuzzy set theory

CO-4: Comprehend the fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	1	1	3	1	-
CO-2	3	1	2	3	1	-
CO-3	2	-	1	2	2	-
CO-4	1	-	2	3	2	-

UNIT- I:

Fuzzy Set Theory and Fuzzy Logic Control: Basic concepts of fuzzy sets- Operations on fuzzy sets- Fuzzy relation equations- Fuzzy logic control- Fuzzification –Defuzzification- Knowledge base- Decision making logic- Membership functions – Rule base.

UNIT- II:

Adaptive Fuzzy Systems: Performance index- Modification of rule base- Modification of membership functions- Simultaneous modification of rule base and membership functions- Genetic Algorithms-Adaptive fuzzy system- Neuro fuzzy systems.

UNIT- III:

Artificial Neural Networks: Introduction- History of neural networks- multilayer perceptions- Back propagation algorithm and its Variants- Different types of learning, examples.

UNIT- IV:

Mapping and Recurrent Networks: Counter propagation –Self organization Map-Cognitron and Neocognitron- Hopfield Net- Kohonen Nets- Grossberg Nets- Art-I, Art-II reinforcement learning

UNIT- V:

Case Studies: Application of fuzzy logic and neural networks to Measurement-Control- Adaptive Neural Controllers – Signal Processing and Image Processing

TEXT BOOK:

1. C++, Neural networks and Fuzzy logic, Vallum B. R., Hayagriva V. R., BPB Publications, New Delhi, 1996
2. Fuzzy logic & Neural Networks, Chennakesava R. Alavala, New Age International, 2008

REFERENCES:

1. Neural Networks for Control, Millon W. T., Sutton R. S. and Werbos P. J., MIT Press, 1992
2. Fuzzy Sets Fuzzy Logic, Klir G. J., Yuan B. B., Prentice Hall of India Pvt. Ltd., New Delhi
3. Neural Networks and Fuzzy Systems, Kosko, Prentice hall of India Pvt. Ltd., New Delhi, 1994
4. Introduction to Fuzzy Control, Dirankov D. Hellendoorn H, Reinfrank M., Narosa Publications House, 1996
5. Introduction to Artificial Neural Systems, Zurada J. M., Jaico Publishing House, 1994

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. III Semester

(22OE1CN01) BUSINESS ANALYTICS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To understand the role of business analytics within an organization and to analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization
- To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making and to become familiar with processes needed to develop, report, and analyze business data
- To use decision-making tools/Operations research techniques and to manage business process using analytical and management tools
- To analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Apply knowledge of data analytics

CO-2: Think critically in making decisions based on data and deep analytics

CO-3: Use technical skills in predicative and prescriptive modeling to support business decision-making

CO-4: Translate data into clear, actionable insights

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	-	1	-	1	1
CO-2	3	-	2	-	1	2
CO-3	2	1	1	-	1	1
CO-4	1	2	1	-	1	1

UNIT-I:

Business Analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organization, competitive advantages of Business Analytics.

Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

UNIT-II:

Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data Business Analytics Technology.

UNIT-III:

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes.

Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

UNIT-IV:

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.

Monte Carlo Simulation and Risk Analysis: Monte Carlo Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

UNIT-V:

Decision Analysis: Formulating Decision Problems, Decision Strategies without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

Recent trends in Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

TEXT BOOKS:

1. Business Analytics-Principles, Concepts, and Applications, Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press
2. Business Analytics, James Evans, Pearson Education
3. Business Analytics, Purba Halady Rao, PHI, 2013

REFERENCES:

1. Business Analytics for Managers: Taking Business Intelligence Beyond Reporting, Gert H. N. Laursen, Jesper Thorlund, 2nd Edition, Wiley Publications
2. Business Analytics: Data Analysis & Decision Making, S. Christian Albright, Wayne L. Winston 5th Edition, 2015
3. Business Intelligence Guidebook: From Data Integration to Analytics, Rick Sherman Elsevier, 2014

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. III Semester

(22OE1AM01) INDUSTRIAL SAFETY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE PRE-REQUISITES: Elements of Mechanical, Civil, Electrical and Industrial Engineering

COURSE OBJECTIVES:

- To achieve an understanding of principles, various functions and activities of safety management
- To communicate effectively information on Health safety and environment facilitating collaboration with experts across various disciplines so as to create and execute safe methodology in complex engineering activities
- To anticipate, recognize, and evaluate hazardous conditions and practices affecting people, property and the environment, develop and evaluate appropriate strategies designed to mitigate risk
- To develop professional and ethical attitude with awareness of current legal issues by rendering expertise to wide range of industries

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Apply risk management principles to anticipate, identify, evaluate and control physical, chemical, biological and psychosocial hazards

CO-2: Communicate effectively on health and safety matters among the employees and with society at large

CO-3: Demonstrate the use of state of the art occupational health and safety practices in controlling risks of complex engineering activities and understand their limitations

CO-4: Interpret and apply legislative / Legal requirements, industry standards, and best practices in accident prevention programmes in a variety of workplaces

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	3	2	2	3	1
CO-2	-	-	-	-	2	3
CO-3	3	1	2	1	-	-
CO-4	-	2	-	1	-	2

UNIT-I:

Safety Management: Evaluation of modern safety concepts – Safety management functions – safety organization, safety department – safety committee, safety audit - performance measurements and motivation – employee participation in safety and productivity.

UNIT-II:

Operational Safety: Hot metal Operation – Boiler, pressure vessels – heat treatment shop - gas furnace operation-electroplating-hot bending pipes – Safety in welding and cutting. Cold-metal Operation- Safety in Machine shop- metal cutting – shot blasting, grinding, painting – power press and other machines.

Safe Handling and Storage: Material Handling, Compressed Gas Cylinders, Corrosive Substances, Hydrocarbons, Waste Drums and Containers

UNIT-III:

Safety Measures: Layout design and material handling - Use of electricity – Management of toxic gases and chemicals – Industrial fires and prevention – Road safety– Safety of sewage disposal and cleaning – Control of environmental pollution – Managing emergencies in industrial hazards.

UNIT-IV:

Accident Prevention: Human side of safety – personal protective equipment – Causes and cost of accidents. Accident prevention programmes - Specific hazard control strategies - HAZOP – Training and development of employees – First Aid – Fire fighting devices – Accident reporting investigation.

UNIT-V:

Safety, Health, Welfare & Laws: Safety and health standards – Industrial hygiene – occupational diseases prevention - Welfare facilities – History of legislations related to safety–pressure vessel act- Indian boiler act- The environmental protection act – Electricity act - Explosive act.

TEXT BOOKS:

1. Safety Management, John V. Grimaldi and Rollin H. Simonds, All India Travellers Bookseller, New Delhi, 1989
2. Safety Management in Industry, Krishnan N. V., Jaico Publishing House, 1996

REFERENCES:

1. Occupational Safety Manual, BHEL
2. Industrial Safety and The Law, P. M. C. Nair Publisher's, Trivandrum
3. Managing Emergencies in Industries, Loss Prevention of India Ltd., Proceedings, 1999
4. Safety Security and Risk Management, U. K. Singh & J. M. Dewan, A. P. H. Publishing Company, New Delhi, 1996
5. Industrial Safety Management: Hazard Identification and Risk Control, L. M. Deshmukh, McGraw-Hill Education (India) Private Limited, 2005

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. III Semester

(22OE1AM02) OPERATIONS RESEARCH

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To analyze linear programming models in practical and their practical use
- To apply the transportation, assignment and sequencing models and their solution methodology for solving problems
- To apply inventory and queuing, inventory models and their solution methodology for solving problems
- To evaluate the simulation models

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Evaluate the problems using linear programming

CO-2: Analyze assignment, transportation problems

CO-3: Apply inventory and queuing problems for real time problems

CO-4: Model the real-world problem and simulate it

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	1	3	3	2	-	-
CO-2	1	3	3	3	-	-
CO-3	1	3	3	3	-	-
CO-4	1	3	3	3	-	-

UNIT-I:

Introduction to Operations Research: Definitions of OR, Characteristics of OR, Scope of OR, Classification of Optimization Techniques, models in OR, General L.P Formulation, Graphical solution, Simplex Techniques.

Allocation: Linear Programming Problem Formulation- Graphical solution-Simplex method-Artificial variables technique-Two phase method, Big-M Method-Duality Principle.

UNIT-II:

Transportation Problem: Formulation-Optimal solution-unbalanced transportation problem-Degeneracy. Assignment problem-Formulation-Optimal solution-Variations of Assignment Problem-Travelling Salesman Problem.

Sequencing: Introduction-Flow Shop sequencing-n jobs through two machines-n jobs through three machines-Job shop sequencing-two jobs through m machines.

UNIT-III:

Waiting Lines: Introduction-Single channel-Poisson arrivals-exponential service times-with infinite population and finite population models-Multichannel-Poisson arrivals-exponential service times with infinite population single channel Poisson arrivals.

UNIT-IV:

Inventory Models: Deterministic inventory, models - Probabilistic inventory control models

UNIT-V:

Simulation: Definition-Types of simulation models-phases of simulation-applications of simulation Inventory and Queuing problems-Advantages and Disadvantages-Brief Introduction of Simulation Languages.

TEXT BOOKS:

1. Operations Research, S. D. Sharma, Kedarnath Ramnath, Meerut, New Delhi
2. Engineering Optimization, S. S. Rao, New Age International Publications, 2014
3. Introduction to Genetic Algorithms, S. N. Sivanandam, Springer

REFERENCES:

1. Operations Research-An Introduction, H. A. Taha, PHI, 2008
2. Principles of Operations Research, H. M. Wagner, PHI, Delhi, 1982
3. Introduction to Optimization: Operations Research, J. C. Pant, Jain Brothers, Delhi, 2008

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. III Semester

(22OE1AM03) ENTREPRENEURSHIP AND START-UPS

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To motivate the engineers to inculcate the skills thereof in any professional role and to consider intrapreneurship or entrepreneurship as career choices for personal and societal growth
- To understand different Theories of Entrepreneurship and their Classification
- To create Feasibility Reports, Business, Project Plans and resolve Operational problems
- To understand the roles of Family, non-family entrepreneurs and learning about Startups' Opportunities, Corporate Legal and Intellectual Property related issues

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Understand the role of an entrepreneur in the economic development and discover societal problems as entrepreneurial opportunities and ideate to develop solutions through systematic and creative approaches to innovation and business strategy

CO-2: Learn different Theories of entrepreneurship, the role of Family and Non-Family entrepreneurs and problem-solving skills

CO-3: Create Marketing, Financial Plans and evaluate Structural, Financial and Managerial Problems

CO-4: Apply lean methodology to startup ideas using Business Model Canvas and be able to create Business Plans through establishing business incubators. Understand Corporate Legal and Intellectual Property related matters

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	2	1	3	2	-	3
CO-2	1	-	-	-	-	2
CO-3	1	-	-	-	-	2
CO-4	-	-	-	1	-	-

UNIT-I:

Entrepreneurship: Definition of Entrepreneur, Entrepreneurial motivation and barriers; Internal and external factors; Types of entrepreneurs, Personality and Skill Set of an Entrepreneur, Entrepreneurship as a career for engineers, scientists, and technologists.

UNIT-II:

Theories of Entrepreneurship: Classification of entrepreneurship. Creativity and Innovation: Creative Problems Solving, Creative Thinking, Lateral Thinking, Views of De Bono, Khandwala and others, Creative Performance in terms of motivation and skills.

Family and Non-Family Entrepreneurs: Role of Professionals, Professionalism vs. family entrepreneurs, Role of Woman entrepreneur, Sick industries, Reasons for Sickness, Remedies for Sickness, Role of BIFR in revival, Bank Syndications.

UNIT-III:

Creativity and Entrepreneurial Plan: Idea Generation, Screening and Project Identification, Creative Performance, Feasibility Analysis: Economic, Marketing, Financial and Technical; Project Planning, Evaluation, Monitoring and Control, segmentation, Targeting and positioning of Product, Role of SIDBI in Project Management.

UNIT-IV:

Operation Problems: Incubation and Take-off, Problems encountered Structural, Financial and Managerial Problems, Types of Uncertainty. Institutional support for new ventures: Supporting organizations; Incentives and facilities; Financial Institutions and Small-scale Industries, Govt. Policies for SSIs.

UNIT-V:

Startups' Opportunity Assessment, Business Models, Entrepreneur talk, Clinical/Regulatory, Sector Specific Group Briefing by Advisory Committee, Corporate Legal and Intellectual Property, Pitching, Payers and Reimbursement, Pitch practice, Investors, Mistakes I Won't Repeat, Business Development and Exits, Finance, Budgeting, Team Building, Opportunities in Telangana State and India – incubators, schemes, accelerators.

TEXT BOOKS:

1. Understanding Enterprise: Entrepreneurship and Small Business, Bridge S. et al., Palgrave, 2003
2. Holt- Entrepreneurship: New Venture Creation, Prentice-Hall, 1998
3. Entrepreneurship Development, Robert D. Hisrich, Michael P. Peters, Tata McGraw Hill Edition

REFERENCES:

1. New Venture Creation: An Innovator's Guide to Entrepreneurship, Marc H. Meyer and Frederick G. Crane, 2nd Edition, Sage Publications
2. Technology Ventures: From Idea to Enterprise, Byers, Dorf, Nelson
3. Venture Deals: Be Smarter Than Your Lawyer and Venture Capitalist - Feld, Mendelson, Costolo
4. Breakthrough Entrepreneurship, Burgstone and Murphy
5. Business Model Generation, Alexander Osterwalder

VNR VIGNANA JYOTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

M.Tech. III Semester

(22OE1PL01) WASTE TO ENERGY

TEACHING SCHEME		
L	T/P	C
3	0	3

EVALUATION SCHEME				
SE	CA	ELA	SEE	TOTAL
30	5	5	60	100

COURSE OBJECTIVES:

- To create awareness in students of energy conservation
- To identify the use of different types of Bio waste energy resources
- To understand different types of bio waste energy conservations
- To detect different waste conversion into different forms of energy

COURSE OUTCOMES: After completion of the course, the student should be able to

CO-1: Find different types of energy from waste to produce electrical power

CO-2: Estimate the use of bio waste to produce electrical energy

CO-3: Understanding different types of bio waste and its energy conversions

CO-4: Analyze the bio waste utilization and to avoid the environmental pollution

COURSE ARTICULATION MATRIX:

(Define Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes using mapping levels 1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)					
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	3	2	3	1	2	1
CO-2	3	3	3	3	2	3
CO-3	3	2	3	2	2	3
CO-4	3	3	3	3	2	3

UNIT-I:

Introduction to Energy From Waste: Classification of waste as fuel, Agro based, Forest residue, Industrial waste, MSW (Municipal solid waste) – Conversion devices – Incinerators, Gasifiers, Digestors. Urban waste to energy conversion, Biomass energy Programme in India.

UNIT-II:

Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

UNIT-III:

Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power.

UNIT-IV:

Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

UNIT-V:

Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion.

Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

TEXT BOOKS:

1. Biogas Technology-Transfer and Diffusion, M. M. EL-Halwagi, Elsevier Applied Science Publisher, 1984
2. Introduction to Biomass Energy Conversions, Sergio Capareda

REFERENCES:

1. Non-Conventional Energy, Desai Ashok V., Wiley Eastern Ltd., 1990
2. Biogas Technology - A Practical Hand Book, Khandelwal K. C. and Mahdi S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983
3. Food, Feed and Fuel from Biomass, Challal D. S., IBH Publishing Co. Pvt. Ltd., 1991
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996