# M. TECH. (AUTOMATION)- R13 Regulations

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
(Established by an Act No.30 of 2008 of A.P. State Legislature)  
Kukatpally, Hyderabad – 500 085, Andhra Pradesh (India)

**M. TECH. (AUTOMATION)**  
(R13) COURSE STRUCTURE AND SYLLABUS

## I Year I Semester

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<tr>
<th>Code</th>
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## I Year II Semester

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## II Year I Semester

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year - I Sem. M.Tech (Automation)

AUTOMATION IN MANUFACTURING

UNIT – I:
OVERVIEW OF MANUFACTURING AND AUTOMATION: Production systems, Automation in production systems, Automation principles and strategies, Manufacturing operations, production facilities. Basic elements of an automated system, levels of automation; Hardware components for automation and process control, programmable logic controllers and personal computers.

UNIT – II:

UNIT – III:

UNIT – IV:

UNIT – V:
QUALITY CONTROL AND SUPPORT SYSTEMS: Quality in Design and manufacturing, inspection principles and strategies, Automated inspection, contact Vs non contact, CMM. Manufacturing support systems. Quality function deployment, computer aided process planning, concurrent engineering, shop floor control, just in time and lean production.

REFERENCES:
2. Automation, Production Systems and CIM/ MikeJ P. Grower/PHI
6. Manufacturing and Automation Technology / R Thomas Wright and Michael Berkehiser / Good Heart/Willcox Publishers
UNIT I:
CONCEPTS OF ACCURACY:

GEOMETRIC DIMENSIONING AND TOLERANCING: Tolerance Zone Conversions – Surfaces, Features, Features of Size, Datum Features – Datum Oddly Configured and Curved Surfaces as Datum Features, Equalizing Datums – Datum Feature of Representation – Form controls, Orientation Controls – Logical Approach to Tolerancing.

UNIT II:
DATUM SYSTEMS:
Design of freedom, Grouped Datum Systems – different types, two and three mutually perpendicular grouped datum planes; Grouped datum system with spigot and recess, pin and hole; Grouped Datum system with spigot and recess pair and tongue – slot pair – Computation of Transnational and rotational accuracy, Geometric analysis and application.

UNIT III:
TOLERANCE ANALYSIS:

UNIT IV:
TOLERANCE CHARTING TECHNIQUES:
Operation Sequence for typical shaft type of components, Preparation of Process drawings for different operations, Tolerance worksheets and centrally analysis, Examples, Design features to facilitate machining; Datum Features – functional and manufacturing Components design – Machining Considerations, Redesign for manufactured, Examples.

UNIT V:

MEASURING SYSTEMS PROCESSING: In processing or in-situ measurement of position of processing point-Post process and on-machine measurement of dimensional features and surface-mechanical and optical measuring systems.

REFERENCES:
5. Precision Engineering/VC Venkatesh & S Izman/TMH
MODERN CONTROL ENGINEERING

UNIT - I
Mathematical modelling of dynamic systems, Transient response of second and higher order systems, Root locus and Bode plots, Lead, lag and Lead-Lag circuits.

UNIT - II
State variables, Transition matrix, Transformation of Variables, Diagonalization of matrix, Canonical form.

UNIT - III
State Variable feedback systems, Closed loop pole zero assignment, observability and controllability.

UNIT - IV
Introduction to non linear systems, Phase plane method.

UNIT - V

REFERENCES:
SIMULATION MODELING OF MANUFACTURING SYSTEMS

UNIT - I
System - ways to analyze the system - Model - types of models - Simulation - Definition - Types of simulation models - steps involved in simulation - Advantages & Disadvantages. / Parameter estimation - estimator - properties - estimate - point estimate - confidence interval estimates - independent - dependent - hypothesis - types of hypothesis- step - types l& 2 errors - Framing - string law of large numbers.

UNIT - II
Building of Simulation model validation - verification - credibility - their timing - principles of valid simulation Modeling - Techniques for verification - statistical procedures for developing credible model. Modeling of stochastic input elements - importance - various procedures - theoretical distribution - continuous - discrete their suitability in modeling.

UNIT - III

UNIT - IV
Output data analysis - Types of Simulation w. r. t output data analysis – warm up period- Welch algorithm - Approaches for Steady - State Analysis - replication - Batch means methods - corn pan Sons.

UNIT - V
Applications of Simulation - flow shop system - job shop system - M/M1 queues with infinite and finite capacities - Simple fixed period inventory system – New boy paper problem.

REFERENCES:
CONCURRENT ENGINEERING AND PRODUCT LIFE CYCLE MANAGEMENT
(Elective-I)

UNIT I:
INTRODUCTION: Extensive definition of Concurrent Engineering(CE), CE design methodologies, Review of CE techniques like DFM (Design for manufacture), DFA (Design for assembly), QFD (Quality function deployment), RP (Rapid prototyping), TD (Total design), for integrating these technologies, organizing for CE, CE tool box, Collaborative product development.

UNIT II:
USE OF INFORMATION TECHNOLOGY: IT Support Solid modeling, product data management, Collaborative product commerce, Artificial Intelligence, expert systems, Software hardware component design.

UNIT III:
DESIGN STAGE: Lifecycle design of products, opportunities for manufacturing enterprises, Modality of Concurrent engineering design, Automated analysis idealization control, CE in optimal structural design, Real time constraints.

UNIT IV:
NEED FOR PLM: Importance of PLM, Implementing of PLM, Responsibility for PLM, Benefits to different managers, Components of PLM, Emergence of PLM, Life cycle problems to resolve, Opportunities to seize.

UNIT V:
COMPONENTS OF PLM: components of PLM, Product lifecycle activities, Product organizational structure, Human resources in product lifecycle, Methods, techniques, practices, Methodologies, Processes, System components in lifecycle, slicing and dicing the systems, Interfaces, Information, Standards.

REFERENCES:
1. Integrated Product Development / M.M. Anderson and L. Hein/ IFS Publications
2. Design for Concurrent Engineering/ J Cleetus/ CE Research Centre, Morgantown,
3. Concurrent Engineering Fundamentals/ Prasad/ Prentice hall India Integrated Product Development
4. Concurrent Engineering in product Design and Development/ I. Moustapha/ New age International
UNIT - I
Mechatronics in Products - Semi conductor Sensors and micro electro mechanical Devices, Actuators
Hydraulics Actuators, pneumatic Actuators. Programmable Logic Controllers (PLC), basic structure,
input/output processing, programming, Mnemonics. Timers, relays and counters, data handling, selection of
PLC. Control architecture, Analog, Digital, Examples of Mechatronic systems from Robotics. Manufacturing,
Machine Diagnosis.

UNIT - II
Miniaturization and application, Micro electro mechanical devices and trends in developing them,
Miniactuators, Microsensors, and Micromotors, Principles of Operations. Introduction, Absolute and Relative
Tolerance in Manufacturing, Human Manufacturing, Top-Down Manufacturing Methods, Bottom-Up
Approaches.

UNIT — III
Dry Etching, Definitions, Plasmas or Discharges, Ion Etching or Sputtering and Ion, Beam Milling, Plasma
etching (Radical Etching ), Physical Etching.
Wet Isotropic And Anisotropic Etching, Alignment Patterns, Chemical Etching Models, Etching with Bias
and/or Illumination of the Semiconductor - Etch - Stop Techniques, Problems.

UNIT - IV
Physical and Chemical Vapour Deposition, Silk, Screening, Printing , Sol-Gel Deposition Technique, Doctors’
Blade or Tape Casting, Plasma Spraying, Deposition and Arraying Methods of Organic Layers in BIOMEMS,
Thin versus Thick Film Deposition, Selection Criteria for Deposition Method.

UNIT - V
Surface Micromachining Processes, Poly-Si and Non-Poly-Si Surface Micromachining Modifications, Surface
Micromachining Modifications, LIGA, Background , LIGA and LIGA, Like Process Steps.
Introduction and exposure to Nanotechnology, Application, Basics of nanofabrication, nano machining, nano
assembly.

REFERENCES:
3. Lawrence J. Kamm - Understanding Electro-Mechanical Engineering, An Introduction to Mechatronics,
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
I Year - I Sem. M.Tech (Automation)

ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS
(Elective-I)

UNIT-I
ARTIFICIAL INTELLIGENCE: Introduction, definition, underlying assumption, important of AI & related fields State space representations, defining a problem, production systems and its characteristic, search and control strategies - Introduction, preliminary concepts, examples of Search problems.

UNIT-II
UNIFORMED OR PRELIMINARY CONCEPTS: Examples of search problems, Uniformed or Blind Search, Informed Search, Or Graphs, Heuristic Search techniques - Generate and Test, Hill climbing, best first search, problem, reduction, constraint satisfaction, Means - Ends Analysis.
Knowledge Representation Issues: Representations and Mapping, Approaches, Issues in Kr, Types of Knowledge procedural Vs Declarative, Logic programming. Forward Vs Backward reasoning, Matching, Non monotonic reasoning and it logic.

UNIT-III
USE OF PREDICATE LOGIC: Representing Simple facts, Instance and is a relationships, Syntax and Semantics for propositional logic, FOPL, and properties of Wffs, conversion to casual form, Resolution Natural deduction

UNIT-IV

UNIT-V
INTRODUCTION TO KNOWLEDGE ACQUISITION: Types of learning, General Learning model, and performance measures.
Typical Expert Systems: MYCIN, Variants of MYCIN, PROSPECTOR, DENDRAL, PUFF etc.

REFERENCES:
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, strain and strain rate on plastic behavior, 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.

REFERENCES:
5. Material Science and Engineering/William D Callister/John Wiley and Sons
UNIT-I
MEASUREMENT OF CUTTING FORCES: Strain gauge and piezoelectric transducers and their characteristics. Dynamometer construction, Bridge circuits. Instrumentation and calibration, Displacement and strain measurements by photo elasticity. Holography, interferometer, Moire, techniques, strain gauge rosettes.

UNIT-II

UNIT-III
METALLURGICAL STUDIES: Optical and electron microscopy, X-Ray diffraction, Bragg's Law and its application for studying crystal structure and residual stresses. Electron spectroscopy, electron microprobe. Surface Measurements: Micro hardness, roughness, accuracy of dimensions and forms. 3-D co-ordinate Measuring Machines.

UNIT-IV

UNIT-V

REFERENCES:
4. Box and Jenkins; Time Series analysis, Forecasting and control, Holden Day Sanfrancisco.
5. Dove and Adams, Experimental stress analysis and motion measurement Prentice Hall of India Delhi.
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

UNIT-IV
Digital electronics and systems, digital logic control, micro processors 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.

REFERENCES:
6. Mechatronics/M.D.Singh/J.G.Joshi/PHI.
MANUFACTURING SIMULATION & PRECISION ENGINEERING LABORATORY

A. MANUFACTURING SIMULATION

The students will be given training on the use and application of the following software to manufacturing problems:

1. Auto MOD Software.
2. PROMOD
3. SLAM-II
4. CAFIMS
5. Flexsim

They also learn how to write sub routines in C-language and interlinking with the above packages.

Problems for modelling and simulation experiments:

1. AGV planning
2. ASRS simulation and performance evaluation
3. Machines, AGVs and AS/RS integrated problems
4. JIT system
5. Kanban flow
6. Material handling systems
7. M.R.P. Problems
8. Shop floor scheduling etc.

B. PRECISION ENGINEERING

1. Hydraulic and Pneumatic circuits
2. Closed loop control systems
3. Study of the chip formation in turning process
4. Study of operation of tool and cutter grinder, twist drill grinder, Centreless grinder
5. Determination of cutting forces in turning
6. Experiments in unconventional manufacturing processes-AJM and study of USM, EDM, Laser Machining and Plasma spraying
7. Inspection of parts using tool makers microscope, roughness and form tester
8. Study of micro-controllers, programming on various CNC machine tools and also controllers
9. Studies on PLC programming
10. Study and programming of robots
JAWAHarlAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
I Year -II Sem. M.Tech (Automation)

FLUID POWER SYSTEMS

UNIT-I

UNIT-II
TRANSMISSION SYSTEM: component effectiveness, breakage, compressibility, linearity constant torque load, constant power load. Inertia load, viscous damping.

UNIT-III
VALVE CONTROLLED SYSTEMS: Flow through a single speed control valve, series pressure compensation, parallel pressure compensation, combined directional and flow rate control valve. Steady reaction force. Transient reaction force. Advanced pneumatics circuits for controlling multi cylinders (inoperable circuits), Electro pneumatics with relay logic, Pneumatics System with PIP) controllers Application of fluids a non-moving part logic

UNIT-IV
ANALYSIS OF ACCUMULATOR SYSTEMS: Accumulator system dynamics. Thermodynamics consideration. Accumulator as observed of pressure shocks.

UNIT-V
FEED BACK SYSTEMS: Pressure control, position control, pump/motor systems, control with variable capacity pumps, pump stroke mechanisms, position control using metering valve, double acting actuator, speed control, inertia load position control system. Programmable sequential control using pneumatic modular elements, stepper controls.

REFERENCES:
1. Fluid Power systems/ A.B Goodnain/ Me Millian Press Ltd, 1976
2. The Control of Fluid Power/ McCloy and Martin H.R./ Longman Publications/1973
MICROPROCESSORS AND APPLICATIONS

UNIT-I

UNIT-II
Linking and Relocation, Stacks, procedures, Interrupts and Interrupt Routines, Macros, Program Design Byte and string manipulation, I/O programming.

UNIT-III
I/O Interface Serial Communication Interfaces, 8251 programmable communication interface, A/D and D/A example. Programmable Timers and Event counters, 8254 programmable Interval Timer, interval Application to A/D, DMA Controller (8237).

UNIT-IV
Peripheral Devices Keyboard and Display keyboard Design, LED, Display Design, Keyboard/Display Controller (8279), CRT Controller and Interface (8275), Floppy Disk Controller (8272).

UNIT-V
Advanced processor Architecture 80386, 80486 and Pentiums’ Register structure, Instruction set, Memory management protected and virtual modes, memory paging mechanism.

REFERENCES:
2. Barry B.Brey The Intel Microprocessors, PHI, 1995. ME 513 With effect from the Academic Year 2003-2004
4. Microprocessors and Applications/B Ram
5. Introduction to Microprocessor/ Adithya P Mathur/ TMC Publications/New Delhi
INTELLIGENT INSTRUMENTATION AND MANUFACTURING

UNIT-I
Introduction - Introduction of intelligent instrumentation, Historical Perspective, Current status, software based instruments.
Virtual Instrumentation: Introduction to graphical programming, data flow & graphical programming techniques, advantage of VI techniques, VIs and sub VIs loops and charts, arrays, clusters and graphs, case and sequence structure, formula nodes, string and file I/O Code Interface Nodes and DLL links.

UNIT-II
Data Acquisition Method, Analog and Digital IO, Counters, Timers, Basic ADC design, interfacing methods of DAQ hardware, software structure, use of simple and intermediate VIs. Use of Data Sockets for Networked communication and controls.

UNIT-III
PC Hardware Review and Instrumentation Buses, Structure, timing, interrupts, DMA, operating system, ISA, PCI, USB, PCMCIA Buses. IEEE488.1 & 488.2 serial Interfacing -RS 232C, RS422, RS423, RS485, USB, VXI, SCXI, P3JJ.

UNIT-IV
ANALYSIS TECHNIQUES: DSP software, Measurement, filters and wavelets, windows, curve fitting probability & statistics.
Communication: Basis networking methods and their applications in instrumentation, use of Data sockets for distributed control.

UNIT-V
COMPONENTS OF KNOWLEDGE BASED SYSTEMS: Basic components of knowledge based system, knowledge Representation, comparison of knowledge Representation Schems, Interference Engine, knowledge acquisition Machine Learning - concept of Artificial intelligence, conceptual learning, Artificial Neural Networks - Biological Neuron, Artificial Neuron, types of Neural Networks^ applications in manufacturing.

REFERENCES:
1. Intelligent Instrumentation/ G.C. Barney/Prentice Hall, 1995ce:
2. Lab VIEW For everyone/ Lisa, K.Wells & Jeffery Travis/ Prentice Hall, 1997
INDUSTRIAL ROBOT TECHNOLOGY

UNIT I

UNIT II
Robotic Sensory Devices, Non optical Position sensors, Optical position sensors, velocity sensors, Accelerometers, Proximity sensors, touch and Slip sensors, Force and Torque sensors - Robot vision system.

UNIT III
Methods of Robot programming - Lead though programming methods - capabilities and limitations, Textual Robot languages - robot language structure - motion commands, end effectors and sensor commands, Robot programming functions, robot programming environment, On-Line and Off Line programming Languages.

UNIT IV
Robot cell layouts - multiple Robots and machine interface, consideration in work cell design, interlocks, error detection and recovery, Robot cycle time analysis, simulation of Robot work cells.

UNIT V
Application of robots in material transfer, machine loading and unloading, welding, assembly and inspection, safety, training, maintenance and quality aspects, Economics and social aspects of robotics.

REFERENCES:
4. Robot Dynamics and Control/ Spong and Vidhyasagar/ John Wiley and Sons
UNIT-I

UNIT-II
GEOMETRIC PROGRAMMING: Polynomials – arithmetic - geometric inequality – unconstrained G.P- constrained G.P

UNIT-III
DYNAMIC PROGRAMMING: Multistage decision process, principles of optimality, examples, conversion of final problem to an initial value problem, application of dynamic programming, production inventory, allocation, scheduling replacement.

UNIT-IV
LINEAR PROGRAMMING: Formulation – Sensitivity analysis. Change in the constraints, cost coefficients, coefficients of the constraints, addition and deletion of variable, constraints.
Simulation – Introduction – Types- steps – application – inventory – queuing – thermal system

UNIT -V
INTEGER PROGRAMMING: Introduction – formulation – Gomory cutting plane algorithm – Zero or one algorithm, branch and bound method
STOCHASTIC PROGRAMMING:
Basic concepts of probability theory, random variables- distributions-mean, variance, correlation, co variance, joint probability distribution- stochastic linear, dynamic programming.

REFERENCES:
2. Introtudory to operation Research / Kasan & Kumar / Springar
4. Operation Research / H.A.Taha /TMH
5. Optimization in operations research / R.LRardin
6. Optimization Techniques /Benugundu & Chandraputla / Pearson Asia
UNIT-I

UNIT-II

UNIT-III
Fuzzy Implications, Translation rules, Triangular norms, Triangular conorm, Fuzzy Rule base system, Fuzzy logic controller, Defuzzification Methods, Fuzzy logic applications-prevention of Road accidents-control room temperature-Robot control system-domestic applications-Industrial applications.

UNIT-IV
Basic concepts of Neural Network-Processing units-connection between units-output rules- Network topologies-paradigms of learning –perception, Back-propagation, classification Models-Association Models, optimization models.

UNIT-V
Rule Based Neural Networks-Network Training –Application of Neural Network in Mathematical Modeling-Knowledge based approaches-applications in Mechanical Engineering –Fuzzy –Neural, example, Neuro – Fuzzy examples-Intelligence in Automation.

REFERENCES:
5. Stamations and Understanding Neural Networks and Fuzzy Logic/ V. Karthalopoulos Basic concepts Applications, IEE Neural Networks Council PHI 2001.
UNIT I:
QUALITY VALUE AND ENGINEERING: An overview of quality system, quality engineering in production design, quality engineering in design of production processes. Loss Function and Quality Level: Derivation and use of Quadratile loss function, Economic consequences of tightening tolerances as a means to improve quality, Evaluations and types of tolerances.(N-type, S-type and L-type)

UNIT II:
TOLERANCE DESIGN AND TOLERANCING: Functional limits, tolerance design for N-type, L-type and S-type characteristics, tolerance allocation for multiple components. Parameter and Tolerance Design; Introduction to parameter design, signal to noise ratios, Parameter design strategy, some of the case studies on parameter and tolerance designs.

UNIT III:
ANALYSIS OF VARIANCE (ANOVA): NO-way ANOVA, One-way ANOVA, Two-way ANOVA, Critique of F-test, ANOVA for four level factors, multiple level factors.

UNIT IV:
ORTHOGONAL ARRAYS: Typical test strategies, better test strategies, efficient test strategies, steps in designing, conducting and analyzing an experiment. Interpolation of Experimental Results: Interpretation methods, percent contribution, estimating the mean.

UNIT V:
ISD-9000 Quality System, BDRE, 6-sigma, Bench-marking, Quality circles - Brain Storming - Fishbone diagram - Problem analysis.

REFERENCES:
UNIT I
Overview of Smart Materials, Structures and Products Technologies.

UNIT II

UNIT III
SMART SENSOR, ACTUATOR AND TRANSDUCER TECHNOLOGIES: Smart Sensors: Accelerometers; Force Sensors; Load Cells; Torque Sensors; Pressure Sensors; Microphones; Impact Hammers; MEMS Sensors; Sensor Arrays Smart Actuators: Displacement Actuators; Force Actuators; Power Actuators: Vibration Dampers; Shakers; Fluidic Pumps; Motors; smart Transducers: Ultrasonic Transducers; Sonic Transducers.

UNIT-IV
MEASUREMENT, SIGNAL PROCESSING, DRIVE AND CONTROL TECHNIQUES: Quasi-static and Dynamic Measurement Methods; Signal conditioning devices; Constant voltage, Constant-current and Pulse drive methods; Calibration methods; Structural dynamics and Identification techniques; Passive, Semi-active and Active control; Feedback and feed forward/control strategies

UNIT-V
DESIGN, ANALYSIS, MANUFACTURING AND APPLICATIONS OF ENGINEERING SMART STRUCTURES AND PRODUCTS: Case studies incorporating design, analysis, manufacturing and application issues involved in integrating smart materials and devices with signal processing and control capabilities to engineering smart structures and products; Emphasis on structures, automation and precision manufacturing equipment, automotives, consumer products, sporting products, computer and telecommunications products, as well as medical and dental tools and equipment.

REFERENCES:
UNIT-I
Causes and effects of vibration, Vibration of single Degree and Multi Degree of freedom systems. Steady state and transient characteristics of Vibration.

UNIT-II
Introduction to Condition Monitoring, Failures types, investigation and occurrences. Causes of failure, Characteristics of vibration ~SHM, Periodic motion, Displacement, Velocity and acceleration. Peak to peak & RMS, Linear and logarithmic scales and phase angle.

UNIT-III

UNIT-IV
Condition monitoring through vibration analysis. Frequency analysis, Filters, Vibration signature of active systems, vibration limits and standards. Contaminant analysis, SOAP and other contaminant monitoring techniques.

UNIT-V
Special vibration measuring techniques Change in sound method, Ultrasonic measurement method, Shock pulse measurement, Kurtosis, Acoustic emission monitoring, Cepstrum analysis, Modal analysis, critical speed analysis, shaft -orbit & position analysis.

REFERENCES:
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
I Year -II Sem. M.Tech (Automation)

DESIGN FOR MANUFACTURING AND ASSEMBLY
(Elective-IV)

UNIT I:
INTRODUCTION: Design philosophy steps in Design process - General Design rules for manufacturability - basic principles of design Ling for economical production - creativity in design. Materials: Selection of Materials for design Developments in Material technology - criteria for material selection - Material selection interrelationship with process selection process selection charts.

UNIT II:
MACHINING PROCESS: Overview of various machining processes - general design rules for machining - Dimensional tolerance and surface roughness - Design for machining - Ease - Redesigning of components for machining ease with suitable examples. General design recommendations for machined parts. METAL CASTING: Appraisal of various casting processes, selection of casting process, - general design considerations for casting - casting tolerances - use of solidification simulation in casting design - product design rules for sand casting.

UNIT III:

UNIT-IV
ASSEMBLE ADVANTAGES: Development of the assemble process, choice of assemble method assemble 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.

REFERENCES:
4. Computer Aided Assembly London/ A Delbainbre/.
1. Principles of automation
2. Limit stops and CAM control devices
3. Pneumatic, hydraulic, electrical systems in automation
4. Microprocessor applications in automated systems.
5. CNC machines and programming.
6. Robotics Systems and Programming
7. Automated transfer devices.
8. Training on Programmable Logic Controllers