### JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
(Established by Andhra Pradesh Act No.30 of 2008)
Kukatpally, Hyderabad - 500 085, Andhra Pradesh (India)

#### B.TECH. MECHANICAL ENGINEERING

**IV YEAR I SEMESTER**

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<td>Production Drawing Practice and Instrumentation Lab</td>
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**Note:** All End Examinations (Theory and Practical) are of three hours duration.

**T-Tutorial**

L – Theory

P – Practical/Drawing

C – Credits
UNIT – I


UNIT – II


UNIT – III
Sequencing – Introduction – Flow –Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through ‘m’ machines

Replacement: Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely- Group Replacement.

UNIT – IV

Inventory: Introduction – Single item, Deterministic models – Purchase inventory models with one price break and multiple price breaks –Stochastic models – demand may be discrete variable or continuous variable – Single Period model and no setup cost.

UNIT – V

Dynamic Programming:
Simulation: Introduction, Definition, types of simulation models, Steps involved in the simulation process- Advantages and disadvantages, applications of simulation to queuing and inventory.

**TEXT BOOKS:**
2. Introduction to O.R/Hillier & Libermann/TMH.

**REFERENCE BOOKS:**
1. Introduction to O.R /Taha/PHI.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

M Year B.Tech. ME-I Sem

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(A70353) POWER PLANT ENGINEERING

**UNIT – I**
Introduction to the Sources of Energy – Resources and Development of Power in India. **Steam Power Plant:** Plant Layout; Working of different Circuits, Fuel and handling equipments, types of coals, coal handling, choice of handling equipment, coal storage, Ash handling systems.

**Combustion Process:** Properties of coal – overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, cyclone furnace, design and construction, Dust collectors, cooling towers and heat rejection, Corrosion and feed water treatment.

**UNIT – II**
Internal Combustion Engine Plant:


**UNIT – III**

**UNIT – IV**
**Nuclear Power Station:** Nuclear fuel – breeding and fertile materials – Nuclear reactor – reactor operation. **Types of Reactors:** Pressurized water reactor, Boiling water reactor, sodium-graphite reactor, fast Breeder Reactor, Homogeneous Reactor, Gas cooled Reactor, Radiation hazards and shielding – radioactive waste disposal.

**UNIT – V**
**Power Plant Economics And Environmental Considerations:** Capital cost,
investment of fixed charges, operating costs, general arrangement of power distribution, Load curves, load duration curve. Definitions of connected load, Maximum demand, demand factor, average load, load factor, diversity factor – related exercises. Effluents from power plants and Impact on environment – pollutants and pollution standards – Methods of Pollution control.

TEXT BOOKS:

REFERENCES:

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

Year B.Tech. ME-I Sem

(A70328) CAD / CAM

UNIT – I
Fundamentals of CAD/CAM, Automation – design process, Application of computers for design, Benefits of CAD, Computer configuration for CAD applications, Computer peripherals for CAD, Design workstation, Graphic terminal, CAD software - definition of system software and application software, CAD database and structure.

Geometric Modeling: 3-D wire frame modeling, wire frame entities and their definitions, Interpolation and approximation of curves, Concept of parametric and non-parametric representation of curves, Curve fitting techniques, definitions of cubic spline, Bezier, and B-spline.

UNIT-II
Surface modeling: Algebraic and geometric form, Parametric space of surface, Blending functions, parametrization of surface patch, Subdividing, Cylindrical surface, Ruled surface, Surface of revolution Spherical surface, Composite surface, Bezier surface, B-spline surface, Regenerative surface and pathological conditions.

Solid Modelling: Definition of cell composition and spatial occupancy enumeration, Sweep representation, Constructive solid geometry, Boundary representations.

UNIT – III

UNIT – IV
Group Technology: Part families, Parts classification and coding, Production flow analysis, Machine cell design.

Computer aided process planning: Difficulties in traditional process planning, Computer aided process planning: retrieval type and generative type, Machinability data systems.

Computer aided manufacturing resource planning: Material resource planning, inputs to MRP, MRP output records, Benefits of MRP, Enterprise resource planning, Capacity requirements planning.
UNIT – V
Flexible manufacturing system: F.M.S equipment, FMS layouts, Analysis methods for FMS benefits of FMS.

Computer aided quality control: Automated inspection- Off-line, On-line, contact, Non-contact; Coordinate measuring machines, Machine vision.

Computer Integrated Manufacturing: CIM system, Benefits of CIM, Benefits of CIM

TEXT BOOKS:
1. CAD/CAM /Groover M.P./ Pearson education.
2. CAD/CAM Concepts and Applications/ Alavala/ PHI.

REFERENCE BOOKS :
1. CAD/CAM Principles and Applications/P.N.Rao/ TMH.
2. CAD / CAM Theory and Practice/ Ibrahim Zeid/TMH.
3. CAD / CAM / CIM/Radhakrishnan and Subramanian/ New Age.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
V Year B.Tech. ME-I Sem
(A70343) INSTRUMENTATION AND CONTROL SYSTEMS

UNIT – I

UNIT – II
Measurement of Displacement: Theory and construction of various transducers to measure displacement – Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers, Calibration procedures.


UNIT – III
Measurement of Level: Direct method – Indirect methods – capacitative, ultrasonic, magnetic, cryogenic fuel level indicators – Bubbler level indicators.


Measurement of Speed: Mechanical Tachometers – Electrical tachometers – Stroboscope, Non-contact type of tachometer.


UNIT – IV

Measurement of Humidity: Moisture content of gases, sling psychrometer, Absorption psychrometer, Dew point meter.

UNIT – V

TEXT BOOKS:
2. Instrumentation, measurement & analysis / B.C.Nakra & K.K.Choudhary / TMH.

REFERENCE BOOKS:
2. Instrumentation and Control systems/ S.Bhaskar/Anuradha Agencies.
5. Mechanical Measurements / Sirohi and Radhakrishna / New Age.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
IV Year B.Tech. ME-I Sem

(A70355) ROBOTICS
(Elective – I)

UNIT – I

UNIT – II


UNIT – III


UNIT IV

Robot actuators and Feed back components: Actuators: Pneumatic.

UNIT V
Robot Application in Manufacturing: Material handling - Assembly and Inspection – Work cell design, work volume, Robot screen.

TEXT BOOKS:
1. Industrial Robotics / Groover M P /Pearson Edu.
2. Robotic Engineering / Richard D. Klaften/ Prentice Hall.
3. Robot Analysis and Intelligence / Asada and Slotine / Wiley Inter-Science.
5. Robotics and Control / Mittal R K & Nagrath I J / TMH.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M Year B.Tech. ME-I Sem

(A70346) MECHANICAL VIBRATIONS
(Elective-I)

UNIT-I:
Single Degree of Freedom Systems: Undamped and damped free vibrations; forced vibrations; coulomb damping; Response to excitation; rotating unbalance and support excitation; vibration isolation and transmissibility. Response to Non Periodic Excitations: unit impulse, unit step and unit ramp functions; response to arbitrary excitations. The Convolution Integral; shock spectrum; System response by the Laplace Transformation method.

UNIT-II:
Two Degree Freedom Systems: Principal modes- undamped and damped free and forced vibrations; undamped vibration absorbers;

UNIT-III:
Multi Degree Freedom Systems: Matrix formulation, stiffness and flexibility influence coefficients; Eigen value problem; normal modes and their properties; Free and forced vibration by Modal analysis; Method of matrix inversion; Torsional vibrations of multi-rotor systems and geared systems; Discrete- Time systems.

Vibration measuring instruments: Vibrometers, velocity meters & accelerometers

UNIT-IV:

UNIT V:
Numerical Methods: Raleigh's stodola's, Matrix iteration, Rayleigh- Ritz Method and Holzer's methods.

TEXT BOOKS:
1. Mechanical Vibrations/Groover/Nem Chand and Bros.

REFERENCE BOOKS:
5. Mechanical Vibrations and sound engineering/ A.G.Ambekar/ PHI.
(A70348) MECHATRONICS
(Elective-I)

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, hydromechanical, electro-hydraulic servo systems: Mechanical actuating systems and electrical actuating systems.

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.

TEXT BOOKS:

REFERENCES:
(A70347) MECHANICS OF COMPOSITE MATERIALS
(Elective-I)

UNIT-I
Introduction to Composite Materials: Introduction, Classification, Polymer Matrix Composites, Metal Matrix Composites, Ceramic Matrix Composites, Carbon-Carbon Composites, Fiber-Reinforced Composites and nature-made composites, and applications.

UNIT-II

UNIT-III

UNIT-IV

UNIT-V

TEXT BOOKS:

REFERENCES:
text of job evaluation and limitations.

Project Management (PERT/CPM): Network Analysis, Program Evaluation and Review Technique (PERT), Critical Path Method (CPM), identifying critical path, Probability of completing the project within given time, Project Cost Analysis, Project Crashing. (simple problems)

TEXT BOOKS:

REFERENCE BOOKS:
1. Motion and Time Study by Ralph M Barnes/ John Willey & Sons Work Study by ILO.
2. Human factors in Engineering & Design/Ernest J McCormick / TMH.
3. Production & Operation Management/Paneer Selvam /PHI.
5. Industrial Engineering Hand Book /Maynard.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. ME-I Sem

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(A70359) UNCONVENTIONAL MACHINING PROCESSES

(Elective – II)

Objectives:
1. To understand the need and importance of non traditional machining methods.
2. To know the basic principle, equipment, process variables and mechanics of metal removal in abrasive jet machining and water jet machining.
3. To study the fundamentals of tool design, surface finishing and metal removal rate of electro chemical grinding, electro chemical machining and electro chemical honing.
4. To understand principles of operation, types of electrodes and process parameters and machine tool selection in EDM and Electric discharge grinding and wire cut process.
5. To know the basics of Electron Beam Machining and comparison of thermal and non thermal processes.
6. To study the various process parameters and applications of Plasma in manufacturing industries.

UNIT – I

Ultrasonic machining – Elements of the process, mechanics of metal removal process parameters, economic considerations, applications and limitations, recent development.

UNIT – II
Abrasive jet machining, Water jet machining and abrasive water jet machining: Basic principles, equipments, process variables, mechanics of metal removal, MRR, application and limitations.

UNIT - III

UNIT - IV
Generation and control of electron beam for machining, theory of electron beam machining, comparison of thermal and non-thermal processes – General Principle and application of laser beam machining – thermal features, cutting speed and accuracy of cut.

UNIT - V
Application of plasma for machining, metal removal mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries. Chemical machining-principle - maskants – etchants - applications.

TEXT BOOK:
Advanced machining processes - VK Jain, Allied publishers.

REFERENCES:
1. Modern Machining Process - Pandey P.C. and Shah H.S., TMH.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
IV-Year B.Tech. ME-I Sem
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(A70337) CNC TECHNOLOGIES
(Selective - II)

Objectives:
1. Understand basic features of NC and CNC Machines and their Design Considerations.
2. To study various system devices hardware and software interpolations.
3. To know various tooling systems used in CNC Machines.
5. To study about the DNC systems and Adaptive Control used for various machining process.

UNIT I:
Features of NC Machines, Fundamentals of numerical control, advantage of NC systems, classification of NC systems, point to point, NC and CNC, incremental and absolute, open and closed loop systems, Features of NC Machine Tools, design consideration of NC machine tool, methods of improving machine accuracy.

UNIT II:
System Devices: Drives, feedback devices, counting devices.
Interpolators for manufacturing systems: DDA integrator, DDA hardware interpolators, CNC software interpolators.

UNIT III:
Tooling for CNC Machines: Interchangeable tooling system, preset and qualified tools, coolant fed tooling system, modular fixturing, quick change tooling system, automatic head changers.

UNIT IV:
NC Part Programming: Manual programming-Basic concepts, Point-to-Point contour programming, canned cycles, parametric programming.
Computer-Aided Programming: General information, APT programming, Examples APT programming problems (2D machining only). NC programming on CAD/CAM systems, the design and implementation of post processors, Introduction to CAD/CAM software, Automatic Tool Path generation.
UNIT V:

TEXT BOOKS:

REFERENCE BOOKS:
2. Mechatronics – HMT, TMH.
(A70339) DESIGN FOR MANUFACTURING AND ASSEMBLY
(Elective - II)

Objectives:
1. To understand various general design rules for manufacturability and criteria for material selection.
2. To study various machining process and tolerance aspects in machining.
3. To know the design considerations for casting and welding process.
4. To understand the conceptual design factors to be considered in forging, extrusion and sheet metal work.
5. To study the general design guidelines for manual assembly and development of DFA Methodology.

UNIT I:
Introduction: Design philosophy – Steps in Design process – General Design rules for Manufacturability – Basic principles of designing for economical production – Creativity in design.

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.

UNIT III:
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 IV:
Forging: Design factors for forging – Closed die forging design – parting

lines of dies – Drop forging die design – General design recommendations

UNIT V:

TEXT BOOK:
1. Product design for Manufacture and Assembly - Geoffrey Boothroyd, Peter Dewhurst and W.A. Knight, CRC Press.

REFERENCE BOOKS:
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. ME-I Sem

(A72909) NANO TECHNOLOGY

(Elective-II)

Objective:
Nano Technology is one of the core subjects of multidisciplinary nature. This has extensive applications in the field of energy, electronics, Biomedical Engg. Etc. Built to specifications by manufacturing matter on the atomic scale, the Nano products would exhibit an order of magnitude improvement in strength, toughness and efficiency. The objective here is impart the basic knowledge in Nano Science and Technology.

Unit-I:

Unit-II:

Unit-III:

Unit-IV:

Unit-V:

TEXT BOOKS:

REFERENCES BOOKS:
3. Transport in Nano structures- David Ferry, Cambridge University press 2000

Outcome of the study:
The present syllabus of "Introduction to Nano Technology" will give insight into many aspects of Nanoscience, technology and their applications in the prospective of materials science.
(A70390) COMPUTER AIDED DESIGN AND MANUFACTURING LAB

1. Drafting: Development of part drawings for various components in the form of orthographic and isometric. Representation of dimensioning and tolerances.


3. Determination of deflection and stresses in 2D and 3D trusses and beams.

4. Determination of deflections, principal and Von-mises stresses in plane stress, plane strain and Axi-symmetric components.

5. Determination of stresses in 3D and shell structures (at least one example in each case)


7. Study state heat transfer analysis of plane and aXi-symmetric components.

8. Development of process sheets for various components based on Tooling and Machines.


10. Study of various post processors used in NC Machines.


12. Machining of simple components on NC lathe and Mill by transferring NC Code / from CAM software.

13. Quality Control and inspection.

(A70391) PRODUCTION DRAWING PRACTICE AND INSTRUMENTATION LAB

(A) PRODUCTION DRAWING PRACTICE

UNIT – I

CONVENTIONAL REPRESENTATION OF MATERIALS: conventional representation of parts – screw joints, welded joints, springs, gears, electrical, hydraulic and pneumatic circuits – methods of indicating notes on drawings.

Limits, Fits and Tolerances: Types of fits, exercises involving selection / interpretation of fits and estimation of limits from tables.

UNIT – II

FORM AND POSITIONAL TOLERANCES: Introduction and indication of form and position tolerances on drawings, types of run out, total run out and their indication.

UNIT – III

SURFACE ROUGHNESS AND ITS INDICATION: Definition, types of surface roughness indication – Surface roughness obtainable from various manufacturing processes, recommended surface roughness on mechanical components. Heat treatment and surface treatment symbols used on drawings.

UNIT – IV

DETAILED AND PART DRAWINGS: Drawing of parts from assembly drawings with indications of size, tolerances, roughness, form and position errors etc.

UNIT – V

PRODUCTION DRAWING PRACTICE: Part drawings using computer aided drafting by CAD software

TEXT BOOKS:

1. Production and Drawing /K.L. Narayana & P. Kannaiah/ New Age
2. Machine Drawing with Auto CAD/ Pohit and Ghosh, PE

REFERENCES:

(B) INSTRUMENTATION LAB

2. Calibration of transducer for temperature measurement.
3. Study and calibration of LVDT transducer for displacement measurement.
4. Calibration of strain gauge for temperature measurement.
5. Calibration of thermocouple for temperature measurement.
7. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
8. Calibration of resistance temperature detector for temperature measurement.
9. Study and calibration of a rotameter for flow measurement.
10. Study and use of a Seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
11. Study and calibration of Mcleod gauge for low pressure.