SCIENT INSTITUE OF TECHNOLOGY

IBRAHIMPATNAM, RANGAREDDY DISTRICT, T.S.-501506

1.3.2 Average percentage of courses that include experiential learning through project work/fieldWork/internship during last five years

Summery Sheet for Last 5 years

Academic year/Branch	CSE	ECE	EEE	H&S	MBA	MTECH	CIVIL	MECH	TOTAL
2019-2020	37	34	32	25	19	5	NA	NA	152
2018-2019	37	30	26	21	08	16	NA	NA	138
2017-2018	24	23	16	31	7	30	NA	NA	131
2016-2017	30	22	3	31	13	43	12	11	165
2015-2016	26	23	6	17	9	48	19	21	169
TOTAL	154	132	83	125	56	142	31	32	755

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IBRAHIMPATNAM, RANGAREDDY DISTRICT, T.S.-501506

1.3.2 Average percentage of courses that include experiential learning through project work/fieldWork/ internship during last five years

B.Tech –MECHANICAL ENGINEERING

2016-2017

Sr.no	Regulations	No. of Course	Year of Study
1	R13	11	IV year I sem&IIsem

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Ibrahimpatnam

IV YEAR I SEMESTER

Code	Subject	L	T/P/D	C
A70352	Operations Research	4	-	4
A70353	Power Plant Engineering	4	-	4
A70328	CAD/CAM	4	-	4
A70343	Instrumentation and Control Systems	4	-	4
	ELECTIVE – I	4	-	4
A70355	Robotics			
A70346	Mechanical Vibrations			
A70348	Mechatronics			
A70347	Mechanics of Composite Materials			
A70332	Industrial Management			
	ELECTIVE – II	4	-	4
A70359	Unconventional Machining Processes			
A70337	CNC Technology			
A70336	Automation in Manufacturing			
A70339	Design for Manufacturing			
A72909	Nanotechnology			
A70390	Computer Aided Design & Manufacturing Lab	-	3	2
A70391	Production Drawing Practice and Instrumentation Lab	-	3	2
	Total	**24**	**6**	**28**

IV YEAR II SEMESTER

Code	Subject	L	T/P/D	C
A80366	Production Planning and Control	4	-	4
	ELECTIVE – III	4	-	4
A80527	Artificial Neural Networks			
A80367	Total Quality Management			
A80363	Maintenance and Safety Engineering			
A80365	Plant Layout & Material Handling			
	ELECTIVE – IV	4	-	4
A80324	Renewable Energy Sources			
A80362	Jet Propulsion & Rocket Engineering			
A80338	Computational Fluid Dynamics			
A80361	Gas Dynamics			
A80087	Industry Oriented Mini Project	-	-	2
A80089	Seminar	-	6	2
A80088	Project Work	-	15	10
A80090	Comprehensive Viva	-	-	2
	Total	**12**	**21**	**28**

Note: All End Examinations (Theory and Practical) are of three hours duration.

T-Tutorial L – Theory P – Practical D-Drawing C – Credits

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. ME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A70352) OPERATIONS RESEARCH

UNIT – I

Development – Definition– Characteristics and Phases – Types of models – Operations Research models – applications.

Allocation: Linear Programming Problem Formulation – Graphical solution – Simplex method – Artificial variables techniques: Two–phase method, Big-M method.

UNIT – II

Transportation Problem – Formulation – Optimal solution, unbalanced transportation problem – Degeneracy.

Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem- Traveling Salesman problem.

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

Theory of Games: Introduction –Terminology– Solution of games with saddle points and without saddle points- 2 x 2 games – dominance principle – m x 2 & 2 x n games -graphical method.

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

Waiting Lines: Introduction – Terminology-Single Channel – Poisson arrivals and Exponential Service times – with infinite population and finite population models– Multichannel – Poisson arrivals and exponential service times with infinite population.

Dynamic Programming:

Introduction – Terminology- Bellman's Principle of Optimality – Applications of dynamic programming- shortest path problem – linear programming problem.

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 :

1. Operations Research /J.K.Sharma 4e. /MacMilan.
2. Introduction to O.R/Hillier & Libermann/TMH.

REFERENCE BOOKS :

1. Introduction to O.R /Taha/PHI.
2. Operations Research/ NVS Raju/ SMS Education/3rd Revised Edition.
3. Operations Research /A.M.Natarajan, P.Balasubramaniam, A. Tamilarasi/Pearson Education.
4. Operations Research / Wagner/ PHI Publications.
5. Operations Research/M.V. Durga Prasad, K. Vijaya Kumar Reddy, J. Suresh Kumar/ Cengage Learning.

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IV Year B.Tech. ME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(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:

DIESEL POWER PLANT: Introduction – IC Engines, types, construction– Plant layout with auxiliaries – fuel supply system, air starting equipment, lubrication and cooling system – super charging. **Gas Turbine Plant:** Introduction – classification - construction – Layout with auxiliaries – Principles of working of closed and open cycle gas turbines. Combined Cycle Power Plants and comparison. **Direct Energy Conversion:** Solar energy, Fuel cells, Thermo electric and Thermo ionic, MHD generation.

UNIT – III

Hydro Electric Power Plant: Water power – Hydrological cycle / flow measurement – drainage area characteristics – Hydrographs – storage and Pondage – classification of dams and spill ways. **Hydro Projects And Plant:** Classification – Typical layouts – plant auxiliaries – plant operation pumped storage plants. **Power From Non-Conventional Sources:** Utilization of Solar- Collectors- Principle of Working, Wind Energy – types – HAWT, VAWT -Tidal Energy.

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 :

1. Power Plant Engineering/ P.C.Sharma / S.K.Kataria Pub.
2. A Course in Power Plant Engineering: / Arora and S. Domkundwar.

REFERENCES :

1. A Text Book of Power Plant Engineering / Rajput / Laxmi Publications.
2. Power Plant Engineering: P.K.Nag/ II Edition /TMH.
3. An Introduction to Power Plant Technology / G.D. Rai/Khanna Publishers.
4. Power plant Engg / Elanchezhian/ I.K. International Pub.
5. Power plant Engineering/ Ramalingam/ Scietech Publishers.

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IV Year B.Tech. ME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(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

NC Control Production Systems : Numerical control, Elements of NC system, NC part programming : Methods of NC part programming, Manual part programming, Computer assisted part programming, Post Processor, Computerized part program, SPPL (A Simple Programming Language). CNC, DNC and Adaptive Control Systems.

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.
4. Principles of Computer Aided Design and Manufacturing/ Farid Amirouche/ Pearson.
5. Computer Numerical Control Concepts and programming/Warren S Seames/ Thomson.

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IV Year B.Tech. ME-I Sem	L	T/P/D	C
	4	-/-/-	4

(A70343) INSTRUMENTATION AND CONTROL SYSTEMS

UNIT – I

Definition – Basic principles of measurement – Measurement systems, generalized configuration and functional descriptions of measuring instruments – examples. Dynamic performance characteristics – sources of error, Classification and elimination of error.

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.

Measurement of Temperature: Classification – Ranges – Various Principles of measurement – Expansion, Electrical Resistance – Thermistor – Thermocouple – Pyrometers – Temperature Indicators..

Measurement of Pressure: Units – classification – different principles used, Manometers, Piston, Bourdon pressure gauges, Bellows – Diaphragm gauges. Low pressure measurement – Thermal conductivity gauges – ionization pressure gauges, Mcleod pressure gauge.

UNIT – III

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

Flow Measurement: Rotameter, magnetic, Ultrasonic, Turbine flow meter, Hot – wire anemometer, Laser Doppler Anemometer (LDA) .

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

Measurement of Acceleration and Vibration: Different simple instruments – Principles of Seismic instruments – Vibrometer and accelerometer using this principle.

UNIT – IV

Stress Strain Measurements: Various types of stress and strain measurements – electrical strain gauge – gauge factor – method of usage of resistance strain gauge for bending compressive and tensile strains – usage for measuring torque, Strain gauge Rosettes.

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

Measurement Of Force, Torque And Power: Elastic force meters, load cells, Torsion meters, Dynamometers.

UNIT – V

Elements of Control Systems: Introduction, Importance – Classification – Open and closed systems Servomechanisms – Examples with block diagrams – Temperature, speed and position control systems.

TEXT BOOKS:

1. Measurement Systems: Applications & Design / D.S Kumar/Anuradha Agencies.
2. Instrumentation, measurement & analysis /B.C.Nakra & K.K.Choudhary/ TMH.

REFERENCE BOOKS:

1. Principles of Industrial Instrumentation and Control Systems/ Chennakesava R Alavala/ Cengage Learning.
2. Instrumentation and Control systems/ S.Bhaskar/ Anuradha Agencies.
3. Experimental Methods for Engineers / Holman/McGraw Hill.
4. Mechanical and Industrial Measurements / R.K. Jain/ Khanna Publishers.
5. Mechanical Measurements / Sirohi and Radhakrishna / New Age.
6. Instrumentation & Mech. Measurements /A.K. Tayal /Galgotia Publications.

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IV Year B.Tech. ME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A70355) ROBOTICS

(Elective – I)

UNIT – I

Introduction, Automation and Robotics – An over view of Robotics – classification by coordinate system and control systems - **Components of the Industrial Robotics:** Degrees of freedom – End effectors: Mechanical gripper – Magnetic – Vacuum cup and other types of grippers – General consideration on gripper selection and design, Robot actuator and sensors.

UNIT – II

Motion Analysis: Basic rotation matrices – Composite rotation matrices – Euler Angles – Equivalent Angle and Axis – Homogeneous transformation – Problems.

Manipulator Kinematics: D-H notations - Joint coordinates and world coordinates - Forward and inverse kinematics – problems.

UNIT – III

Differential Kinematics: Differential Kinematics of planar and spherical manipulators - Jacobians – problems.

Robot Dynamics: Lagrange – Euler formulations – Newton-Euler formulations – Problems on planar two link manipulators.

UNIT IV

Trajectory Planning: Joint space scheme – cubic polynomial fit – Avoidance of obstacles – **Types of motion:** Slew motion - joint interpolated motion – straight line motion – problems.

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 screan.

TEXT BOOKS :

1. Industrial Robotics / Groover M P /Pearson Edu.
2. Introduction to Robotic Mechanics and Control / JJ Craig/ Pearson/ 3rd edition.

REFERENCES :

1. Robotics / Fu K S/ McGraw Hill.
2. Robotic Engineering / Richard D. Klaftez/ Prentice Hall.
3. Robot Analysis and Intelligence / Asada and Slotine / Wiley Inter-Science.
4. Robot Dynamics & Control/Mark W. Spong and M. Vidyasagar / John Wiley & Sons (ASIA) Pvt. Ltd.
5. Robotics and Control / Mittal R K & Nagrath I J / TMH.

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IV Year B.Tech. ME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(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:

Frequency Domain Vibration Analysis: Over view, machine-train monitoring parameters-Data base development-vibration data acquisition-trending analysis-failure- node analysis-signature analysis-root cause analysis.

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.
2. Elements of Vibration Analysis / Meirovitch/ TMH, 2001.

REFERENCE BOOKS:

1. Mechanical Vibrations/VP Singh/Danapathi Rai & Sons.
2. Mechanical Vibrations/ SS Rao/ Pearson, 2009/4th Edition.
3. Mechanical Vibrations/Debabrata Nag/Wiley.
4. Vibration problems in Engineering / S.P. Timoshenko.
5. Mechanical Vibrations and sound engineering/ A.G.Ambekar/ PHI.
6. Theory and Practice of Mechanical Vibrations/JS Rao & K. Gupta/ New Age Intl. Publishers/Revised 2nd Edition.

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IV Year B.Tech. ME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(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, hydro-pneumatic, 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:

1. MECHATRONICS Integrated Mechanical Electronics Systems/KP Ramachandran & GK Vijaya Raghavan/WILEY India Edition/2008
2. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering/ W Bolton/ Pearson Education Press/3rd edition, 2005.

REFERENCES:

1. Mechatronics Source Book by Newton C Braga, Thomson Publications, Chennai.

2. Mechatronics – N. Shanmugam / Anuradha Agencies Publishers.
3. Mechatronics System Design / Devdas shetty/Richard/Thomson.
4. Mechatronics/M.D.Singh/J.G.Joshi/PHI.
5. Mechatronics – Electronic Control Systems in Mechanical and Electrical Engg. 4th Edition, Pearson, 2012 W. Bolton
6. Mechatronics – Principles and Application Godfrey C. Onwubolu, Wlsevier, 2006 Indian print.

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IV Year B.Tech. ME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(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

Reinforcements: Fibers- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and born carbide fibers. Particulate composites, Polymer composites, Thermoplastics, Thermosetts, Metal matrix and ceramic composites.

UNIT-III

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, Relationship of Compliance and Stiffness Matrix to Engineering Elastic Constants of a Lamina.

UNIT-IV

Macro Mechanical Analysis of Laminates: Introduction , Laminate Code , Stress–Strain Relations for a Laminate, In-Plane and Flexural Modulus.

UNIT-V

Failure Analysis of Laminates: Introduction, Special Cases of Laminates, Applications, Failure Criterion for a Laminate.

TEXT BOOKS:

1. Mechanics of Composite Materials/ R. M. Jones/ Mc Graw Hill Company, New York, 1975.
2. Engineering Mechanics of Composite Materials/Isaac and M Daniel/ Oxford University Press, 1994.

REFERENCES:

1. Analysis and performance of fibre Composites/ B. D. Agarwal and L. J. Broutman/ Wiley- Inter science, New York, 1980.
2. Mechanics of Composite Materials/ Second Edition (Mechanical Engineering)/ Autar K. Kaw/Publisher: CRC.
3. Analysis of Laminated Composite Structures/ L. R. Calcote/ Van Nostrand Rainfold, New York, 1969.
4. Advanced Mechanics of Composite Materials/ Vasiliev &Morozov/ Elsevier/Second Edition.

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IV Year B.Tech. ME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A70332) INDUSTRIAL MANAGEMENT

(Elective-I)

UNIT I:

Introduction to Management: Entrepreneurship and organization - Nature and Importance of Management, Functions of Management, Taylor's Scientific Management Theory, Fayol's Principles of Management, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management

UNIT II:

Designing Organizational Structures: Departmentation and Decentralization, Types of Organization structures - Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organization, Cellular Organization, team structure, boundary less organization, inverted pyramid structure, lean and flat organization structure and their merits, demerits and suitability.

UNIT III:

Operations Management: Objectives- product design process- Process selection-Types of production system(Job, batch and Mass Production),- Plant location-factors- Urban-Rural sites comparison- Types of Plant Layouts- Design of product layout- Line balancing(RPW method)

Value analysis-Definition-types of values- Objectives- Phases of value analysis- Fast diagram

UNIT IV:

Work Study: Introduction – definition – objectives – steps in work study – Method study – definition – objectives – steps of method study. Work Measurement – purpose – types of study – stop watch methods – steps – key rating – allowances – standard time calculations – work sampling.

Statistical Quality Control: variables-attributes, Shewart control charts for variables- $\overline{X}$ chart, R chart, - Attributes-Defective-Defect- Charts for attributes-p-chart -c chart (simple Problems), Acceptance Sampling- Single sampling- Double sampling plans-OC curves.

UNIT V:

Job Evaluation : methods of job evaluation – simple routing objective systems – classification method – factor comparison method – point method

– benefits of job evaluation and limitations.

Project Management (PERT/CPM): Network Analysis, Programme 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:

1. Industrial Engineering and Management/O.P. Khanna/Khanna Publishers.
2. Industrial Engineering and Management Science/T.R. Banga and S.C.Sarma/Khanna Publishers.

REFERENCE BOOKS:

1. Motion and Time Study by Ralph M Barnes/ John Willey & SonsWork Study by ILO.
2. Human factors in Engineering & Design/Ernest J McCormick / TMH.
3. Production & Operation Management /Paneer Selvam /PHI.
4. Industrial Engineering Management/NVS Raju/Cengage Learning.
5. Industrial Engineering Hand Book /Maynard.
6. Industrial Engineering Management / RaviShankar/ Galgotia.

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IV Year B.Tech. ME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(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

Introduction: Need for non-traditional machining methods-Classification of modern machining processes – considerations in process selection. Materials. Applications.

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.

Electro – Chemical Processes : Fundamentals of electro-chemical machining, electro-chemical grinding, electro chemical honing and deburring process, metal removal rate in ECM, Tool design, Surface finish and accuracy, economic aspects of ECM – Simple problems for estimation of metal removal rate.

UNIT - III

Thermal Metal Removal Processes : General Principle and applications of Electric Discharge Machining, Electric Discharge Grinding and electric discharge wire cutting processes – Power circuits for EDM, Mechanics of metal removal in EDM, Process parameters, selection of tool electrode and dielectric fluids, surface finish and machining accuracy, characteristics of spark eroded surface and machine tool selection. Wire EDM-principle and applications.

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.
2. New Technology - Bhattacharya A, The Institution of Engineers, India 1984.
3. Unconventional Machining Processes - C. Elanchezhian,, B. Vijaya Ramnath and M Vijayan, Anuradha Publications, 2005.
4. Unconventional Manufacturing Processes – M.K. Singh, New Age International Publishers.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. ME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A70337) CNC TECHNOLOGIES

(Elective – 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.
4. Understand both Manual and Computer Aided Programming for Generating Various Contours.
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:

CNC Machines Elements: Machine Structure- Guideways - feed drives-spindles - spindle bearings.

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:

DNC Systems and Adaptive Control: Introduction, type of DNC systems, advantages and disadvantages of DNC, adaptive control with optimization, Adaptive control with constraints, Adaptive control of machining processes like turning, grinding.

TEXT BOOKS:

1. Computer Control of Manufacturing Systems - Yoram Koren ,Tata Mc Graw Hill, 2009.
2. Computer Aided Manufacturing - Elanchezhian, Sunder Selvan and Shanmuga Sunder, University Science Press, Second edition.

REFERENCE BOOKS:

1. Machining Tools Hand Book Vol 3, (Automation & Control)/ Manfred Weck / John Wiley and Sons, 1984.
2. Mechatronics – HMT, TMH.
3. Computer Numerical Control-Operations and Programming – Jon Stenerson and Kelly Curron Pul, 3rd Edition.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. ME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A70336) AUTOMATION IN MANUFACTURING

(Elective – II)

UNIT – I

Introduction: Types and strategies of automation, pneumatic and hydraulic components circuits, Automation in machine tools. Mechanical feeding and too changing and machine tool control transfer the automaton.

UNIT – II

Automated flow lines : Methods or work part transport transfer Mechanical buffer storage control function, design and fabrication consideration.

Analysis of Automated flow lines: General terminology and analysis of transfer lines without and with buffer storage, partial automation, implementation of automated flow lines.

UNIT – III

Assembly system and line balancing : Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

UNIT –I V

Automated material handling : Types of equipment, functions, analysis and design of material handling systems conveyor systems, automated guided vehicle systems.

Automated storage systems, Automated storage and retrieval systems; work in process storage, interfacing handling and storage with manufacturing.

UNIT – V

Fundamentals of Industrial controls: Review of control theory, logic controls, sensors and actuators, Data communication and LAN in Manufacturing

Business process Re-engineering: Introduction to BPE logistics, ERP, Software configuration of BPE.

TEXT BOOK:

1. Automation, Production Systems and Computer Integrated Manufacturing : M.P. Groover 3e./PE/PHI, 2009.

REFERENCES:

1. Computer Aided Manufacturing, Tien-Chien Chang, Richard A. Wysk and Hsu-Pin Wang, Pearson, 2009.
2. Automation by W. Buekinsham.

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IV Year B.Tech. ME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A70339) DESIGN FOR MANUFACTURING AND ASSEMBLY
(Elective - II)

Objectives:

- To understand various general design rules for manufacturability and criteria for material selection.
- To study various machining process and tolerance aspects in machining.
- To know the design considerations for casting and welding process.
- To understand the conceptual design factors to be considered in forging, extrusion and sheet metal work.
- 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.

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

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.

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 – Design of brazed joints.

UNIT IV:

Forging: Design factors for forging – Closed die forging design – parting

lines of dies – Drop forging die design – General design recommendations Extrusion, Sheet Metal Work: Design guidelines for Extruded sections - Design principles for Punching, Blanking, Bending, Deep Drawing – Keeler Goodman Forming Limit Diagram – Component Design for Blanking.

UNIT V:

Design for Assembly: General design guidelines for Manual Assembly- Development of Systematic DFA Methodology- Assembly Efficiency- Classification System for Manual handling- Classification System for Manual Insertion and Fastening- Effect of part symmetry on handling time-.

TEXT BOOK:

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

REFERENCE BOOKS:

1. Product design and Manufacturing - A.K Chitale and R.C Gupta, Prentice – Hall of India, New Delhi, 2003.
2. Design and Manufacturing - Surender Kumar & Goutham Sutradhar, Oxford & IBH Publishing Co. Pvt .Ltd., New Delhi, 1998.
3. Product Design- Kevin Otto and Kristin Wood, Pearson Education.

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IV Year B.Tech. ME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(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:

Introduction: History and Scope, Can Small Things Make a Big Difference? Classification of Nanostructured Materials, Fascinating Nanostructures, Applications of Nanomaterials, Nature: The Best of Nanotechnologist, Challenges and Future Prospects.

Unit-II:

Unique Properties of Nanomaterials: Microstructure and Defects in Nanocrystalline Materials:Dislocations, Twins,stacking faults and voids, Grain

Boundaries, triple and disclinations, **Effect of Nano-dimensions on Materials Behavior:** Elastic properties, Melting Point, Diffusivity, Grain growth characteristics, Enhanced solid solubility, **Magnetic Properties**: Soft magnetic nanocrystalline alloy, Permanent magnetic nanocrystalline materials, Giant Magnetic Resonance, Electrical Properties, Optical Properties, Thermal Properties and Mechanical Properties.

Unit-III:

Synthesis Routes: Bottom up approaches: Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Sol-gel method ,Self assembly, **Top down approaches:** Mechanical alloying, Nano-lithography, **Consolidation of Nanopowders**: Shock wave consolidation, Hot isostatic pressing and Cold isostatic pressing Spark plasma sintering.

Unit-IV:

Tools to Characterize nanomaterials: X-Ray Diffraction (XRD), Small Angle X-ray scattering (SAXS), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Scanning Tunneling Microscope (STM), Field Ion Microscope (FEM), Three-dimensional

Atom Probe (3DAP), Nanoindentation.

Unit-V:

Applications of Nanomaterials: Nano-electronics, Micro- and Nano-electromechanical systems (MEMS/NEMS), Nanosensors, Nanocatalysts, Food and Agricultural Industry, Cosmetic and Consumer Goods, Structure and Engineering, Automotive Industry, Water- Treatment and the environment, Nano-medical applications, Textiles, Paints, Energy, Defence and Space Applications, Concerns and challenges of Nanotechnology.

TEXT BOOKS:

1. Text Book of Nano Science and Nano Technology – B.S. Murthy, P. Shankar, Baldev Raj, B.B. Rath and James Munday, University Press-IIM.
2. Introduction to Nanotechnology – Charles P. Poole, Jr., and Frank J. Owens, Wley India Edition, 2012.

REFERENCES BOOKS:

1. Nano: The Essentials by T.Pradeep, Mc Graw- Hill Education.
2. Nanomaterials, Nanotechnologies and Design by Michael F. Ashby, Paulo J. Ferreira and Daniel L.Schodek.
3. Transport in Nano structures- David Ferry, Cambridge University press 2000
4. Nanofabrication towards biomedical application: Techniques, tools, Application and impact – Ed. Challa S.,S. R. Kumar, J. H. Carola.
5. Carbon Nanotubes: Properties and Applications- Michael J. O'Connell.
6. Electron Transport in Mesoscopic systems - S. Dutta, Cambridge University press.

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.

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IV Year B.Tech. ME-I Sem	**L**	**T/P/D**	**C**
	-	**-/3/-**	**2**

(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.
2. Part Modeling: Generation of various 3D Models through Protrusion, revolve, sweep. Creation of various features. Study of parent child relation. Feature based and Boolean based modeling and Assembly Modeling. Study of various standard Translators. Design of simple components.
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)
6. Estimation of natural frequencies and mode shapes, Harmonic response of 2D beam.
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.
9. Development of manufacturing defects and tool management systems.
10. Study of various post processors used in NC Machines.
11. Development of NC code for free form and sculptured surfaces using CAM software.
12. Machining of simple components on NC lathe and Mill by transferring NC Code / from CAM software.
13. Quality Control and inspection.

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IV Year B.Tech. ME-I Sem	**L**	**T/P/D**	**C**
	-	-/3/-	2

(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:

1. Geometric dimensioning and tolerancing/James D. Meadows/ B.S Publications
2. Engineering Metrology/ R.K. Jain/Khanna Publications

(B) INSTRUMENTATION LAB

1. Calibration of Pressure Gauges
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.
6. Calibration of capacitive transducer for angular displacement.
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.

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IV Year B.Tech. ME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A80366) PRODUCTION PLANNING AND CONTROL

UNIT-I

Introduction: Definitions – objectives of production planning and control-functions of production planning and control-elements of production control-types of production- organization of production planning and control – internal organizations department

UNIT-II

Forecasting – Importance of forecasting – types of forecasting, their uses-general principles of forecasting techniques- Qualitative methods and quantitative methods.

UNIT-III

Inventory management – Functions inventory- Relevant inventory cost- ABC analysis- VED Analysis- EOQ model – Inventory control systems – P- Systems and Q – Systems

Introduction to MRP And ERP, LOB(Line of balance), JIT inventory, Japanese concepts.

UNIT- IV

Routing – Definition – routing procedure- Route sheets – Bill of material-factors affecting routing procedure. Schedule – definition – difference with loading.

Scheduling polices – techniques, standard scheduling methods- job shop, flow shop,.

Line balancing, aggregate planning- methods for aggregate planning- Chase planning, expediting, control aspects.

UNIT-V

Dispatching – Activities of dispatcher- Dispatching procedure - follow up – definition – reasons for existence of functions – types of follow up, applications of computer in production planning and control

TEXT BOOKS:

1. Production Planning and Control/ M.Mahajan/ Dhanpati rai & Co.
2. Production Planning and Control/ Jain & Jain/ Khanna publications

REFRENCE BOOKS :

1. Production Planning and Control- Text & cases/ SK Mukhopadhyaya /PHI.

2. Production and operations Management/ R.Panneer Selvam/PHI.
3. Operations Management/Chase/PHI.
4. Operations management/ Heizer/Pearson.
5. Production and Operations Management(Theory and Practice)/Dipak Kumar Bhattacharyya/University Press.
6. Operations Management/S.N. Chary/TMH.

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IV Year B.Tech. ME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A80527) ARTIFICIAL NEURAL NETWORKS
(Elective-III)

UNIT- I

Introduction - what is a neural network? Human Brain, Models of a Neuron, Neural networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks

Learning Process – Error Correction learning, Memory based learning, Hebbian learning, Competitive, Boltzmann learning, Credit Assignment Problem, Memory, Adaption, Statistical nature of the learning process.

UNIT- II

Back Propagation: back propagation and differentiation, Hessian matrix, Generalization, Cross validation, Network pruning Techniques, Virtues and limitations of back propagation learning, Accelerated convergence, supervised learning.

UNIT- III

Single Layer Perceptrons: Adaptive filtering problem, Unconstrained Organization Techniques, Linear least square filters, least mean square algorithm, learning curves, Learning rate annealing techniques, perceptron – convergence theorem, Relation between perceptron and Bayes classifier for a Gaussian Environment

Multilayer Perceptron – Back propagation algorithm XOR problem, Heuristics, Output representation and decision rule, Computer experiment, feature detection.

UNIT- IV

Self Organization Maps: Two basic feature mapping models, Self organization map, SOM algorithm, properties of feature map, computer simulations, learning vector quantization, Adaptive patter classification.

UNIT- V

Neuro Dynamics: Dynamical systems, stability of equilibrium states, attractors, neuro dynamical models, manipulation of attractors as a recurrent network paradigm

Hopfield Models – Hopfield models, computer experiment

TEXT BOOK:

1. Neural networks: A comprehensive foundation/ Simon Hhaykin/ PHI.

REFERENCES:

1. Artificial neural networks/ B.Vegnanarayana/PHI.
2. Neural networks in Computer intelligence/ Li Min Fu/ TMH/2003.
3. Neural networks/ James A Freeman David M S kapura/ Pearson education/2004.
4. Introduction to Artificial Neural Systems/Jacek M. Zurada/JAICO Publishing House Ed. 2006.

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IV Year B.Tech. ME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A80367) TOTAL QUALITY MANAGEMENT

(Elective-III)

UNIT - I

Introduction, The concept of TQM, Quality and Business performance, attitude and involvement of top management, communication, culture and management systems.

Management of Process Quality: Definition of quality, Quality Control, a brief history, Product Inspection vs. Process Control, Statistical Quality Control, Control Charts and Acceptance Sampling.

UNIT -II

Customer Focus and Satisfaction: Process Vs. Customer, internal customer conflict, quality focus, Customer Satisfaction, role of Marketing and Sales, Buyer – Supplier relationships.

Bench Marking: Evolution of Bench Marking, meaning of bench marking, benefits of bench marketing, the bench marking procedure, pitfalls of bench marketing.

UNIT- III

Organizing for TQM: The systems approach, Organizing for quality implementation, making the transition from a traditional to a TQM organization, Quality Circles, seven Tools of TQM: Startification, check sheet, Scatter diagram, Ishikawa diagram, paneto diagram, Kepner &Tregoe Methodology.

UNIT- IV

The Cost of Quality: Definition of the Cost of Quality, Quality Costs, Measuring Quality Costs, use of Quality Cost information, Accounting Systems and Quality Management.

UNIT -V

ISO9000: Universal Standards of Quality: ISO around the world, The ISO9000 ANSI/ASQC Q- 90. Series Standards, benefits of ISO9000 certification, the third party audit, Documentation ISO9000 and services, the cost of certification implementing the system.

TEXT BOOK:

1. Total Quality Management / Joel E.Ross/Taylor and Franscis Limited.
2. Total Quality Management/P.N.Mukherjee/PHI.

REFERENCE BOOKS:

1. Beyond TQM / Robert L.Flood.
2. Statistical Quality Control / E.L. Grant.
3. Total Quality Management:A Practical Approach/H. Lal.
4. Quality Management/Kanishka Bedi/Oxford University Press/2011.
5. Total Engineering Quality Management/Sunil Sharma/Macmillan.

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IV Year B.Tech. ME-II Sem	**L**	**T/P/D**	**C**
	4	-/-/-	4

(A80363) MAINTENANCE AND SAFETY ENGINEERING

(Elective-III)

UNIT-I

Introduction, Need for Maintenance, Facts and Figures, Modern Maintenance, Problem and Maintenance Strategy for the 21st Century, Engineering Maintenance Objectives and Maintenance in Equipment Life Cycle, Terms and Definitions.

Maintenance Management and Control: Maintenance Manual, Maintenance, Facility Evaluation, Functions of Effective Maintenance Management, Maintenance Project Control Methods, Maintenance Management Control Indices.

UNIT-II

Types of Maintenance: Preventive Maintenance, Elements of Preventive, Maintenance Program, Establishing Preventive Maintenance Program PM Program Evaluation and Improvement, PM Measures, PM Models, Corrective Maintenance, Corrective Maintenance Types, Corrective Maintenance Steps and Downtime Components, Corrective Maintenance Measures, Corrective Maintenance Models.

Inventory Control In Maintenance: Inventory Control Objectives and Basic Inventory Decisions, ABC Inventory Control Method, Inventory Control Models Two-Bin Inventory Control and Safety Stock, Spares Determination Factors Spares Calculation Methods

UNIT- III

Quality and Safety In Maintenance: Needs for Quality Maintenance Processes, Maintenance Work Quality, Use of Quality Control Charts in Maintenance Work Sampling, Post Maintenance Testing, Reasons for Safety Problems in Maintenance, Guidelines to Improve Safety in Maintenance Work, Safety Officer's Role in Maintenance Work, Protection of Maintenance Workers.

Maintenance Costing: Reasons for Maintenance Costing, Maintenance Budget Preparation Methods and Steps, Maintenance Labor Cost Estimation, Material Cost Estimation, Equipment Life Cycle Maintenance Cost Estimation, Maintenance Cost Estimation Models.

UNIT-IV

Reliability, Reliability Centered Maintenance, RCM: Goals and Principles, RCM Process and Associated Questions, RCM Program Components

Effectiveness Measurement Indicators, RCM Benefits and Reasons for Its Failures, Reliability Versus Maintenance and Reliability in Support Phase, Bathtub Hazard Rate Concept, Reliability Measures and Formulas, Reliability Networks, Reliability Analysis Techniques.

UNIT-V

Maintainability: Maintainability Importance and Objective, Maintainability in Systems Life Cycle, Maintainability Design Characteristics, Maintainability Functions and Measures, Common Maintainability Design Errors.

TEXT BOOKS

1. Reliability, Maintenance and Safety Engineering/ Dr. A.K.Guptha/ Laxmi Publications.
2. Industrial Safety Management/ L.M. Deshmukh/TMH.

REFERENCES:

1. Maintenance Engineering & Management / R.C.Mishra/ PHI.
2. Reliability Engineering / Elsayed/ Pearson.
3. Engineering Maintenance a modern approach/ B.S Dhallon/ C.R.R Publishers.
4. A Text Book of Reliability and Maintenance Engineering/Alakesh Manna/IK International Publishing House.
5. Plant Maintenance and Reliability Engineering/NVS Raju/Cengage Learning.

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IV Year B.Tech. ME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A80365) PLANT LAYOUT AND MATERIAL HANDLING

(Elective-III)

UNIT – I

Introduction- Classification of Layout, Advantages and Limitations of different layouts, Layout design procedures, Overview of the plant layout.

Process layout & Product layout: Selection, specification, Implementation and follow up, comparison of product and process layout.

UNIT – II

Heuristics for Plant layout – ALDEP, CORELAP, CRAFT, Group Layout, Fixed position layout- Quadratic assignment model. Branch and bound method

UNIT – III

Introduction, Material Handling systems, Material Handling principles, Classification of Material Handling Equipment, Relationship of material handling to plant layout.

UNIT – IV

Basic Material Handling systems: Selection, Material Handling method- path, Equipment, function oriented systems.

UNIT – V

Methods to minimize cost of material handling- Maintenance of Material Handling Equipments, Safety in handling Ergonomics of Material Handling equipment. Design, Miscellaneous equipments.

TEXT BOOKS:

1. Operations Management/ PB Mahapatra/PHI.
2. Aspects of Material handling/ Dr. KC Arora & Shinde/ Lakshmi Publications.

REFERENCES:

1. Facility Layout & Location an analytical approach/ RL Francis/ LF Mc Linnis Jr, White/ PHI.
2. Production and Operations Management/ R Panneerselvam/ PHI.
3. Introduction to Material handling/ Ray, Siddhartha/ New Age.
4. Plant Layout and Material Handling/RB Chowdary/Khanna Publishers.
5. Plant Maintenance and Reliability Engineering/NVS Raju/Cengage Learning.

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IV Year B.Tech. ME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A80324) RENEWABLE ENERGY SOURCES

(Elective-IV)

UNIT – I

Principles of Solar Radiation: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power - Physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, Solar radiation on titled surface, Instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT – II

Solar Energy Collection: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

Solar Energy Storage and Applications: Different methods, sensible, latent heat and stratified storage, solar ponds. Solar applications - solar heating/ cooling techniques, solar distillation and drying, Photovoltaic energy conversion.

UNIT – III

Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics.

Bio-Mass: Principles of Bio-Conversion, Anaerobic /aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation, and economic aspects.

UNIT – IV

Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.

OTEC : Principles, utilization, setting of OTEC plants, thermodynamic cycles.

Tidal and Wave Energy: Potential and conversion techniques, mini-hydel power plants, their economics.

UNIT –V

Direct Energy Conversion: Need for DEC, Carnot cycle, limitations, Principles of DEC. Thermo-electric generators, Seebeck, Peltier and Joule Thompson effects, figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principle, faraday's laws,

thermodynamic aspects, selection of fuels and operating conditions.

TEXT BOOKS:

1. Renewable Energy Sources / Twidell & Weir / Taylor and Francis / 2nd Special Indian Edition.
2. Non- conventional Energy Sources / G.D. Rai / Dhanpat Rai and Sons.

REFERENCE BOOKS:

1. Energy Resources Utilization and Technologies / Anjaneyulu & Francis / BS Publications/2012.
2. Principles of Solar Energy / Frank Krieth & John F Kreider / Hemisphere Publications.
3. Non-Conventional Energy / Ashok V Desai / Wiley Eastern.
4. Non-Conventional Energy Systems / K Mittal / Wheeler.
5. Renewable Energy Technologies / Ramesh & Kumar / Narosa.
6. Renewable Energy Resources / Tiwari and Ghosal / Narosa.

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IV Year B.Tech. ME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A80362) JET PROPULSION AND ROCKET ENGINEERING

(Elective-IV)

UNIT-I

Fundamentals of Gas Turbine theory-Thermo dynamic Cycles, open closed and semi-closed – parameters of performances –cycle modifications for improvement of performance.

JET PROPULSION: Historical sketch-reaction principle – essential features of propulsion devices-Thermal Engines, Classification of – Energy flow thrust, Thrust power and propulsion efficiency-Need for Thermal Jet Engines and applications.

UNIT-III

TURBOPROP AND TURBOJET: Thermo dynamic cycles, plant layout, essential components, principles of operation – performance evaluation. Thrust Augmentation and Thrust reversal-Contrasting with piston Engine Propeller plant.

UNIT-IV

RAMJET: Thermo dynamic Cycle, plant lay-out, essential components – principle of operation - performance evaluation – comparison among atmospheric thermal jet engines – scram jet and pulse jet, elementary treatment.

ROCKET ENGINES: Need for, applications – Basic principles of operation and parameter s of performance – classification ,solid and liquid propellant rocket engines ,advantages, domains of application –propellants – comparison of propulsion systems.

UNIT-V

ROCKET TECHNOLOGY: Flight mechanics, Application Thrust profiles, Acceleration –staging of Rockets, need for – Feed systems, injectors and expansion nozzles – Rocket heat transfer and ablative cooling.

TEXT BOOKS:

1. Gas Turbines and propulsive systems/P.Khajuria & S.P.Dubey/ Dhanpat rai pub.
2. Gas Dynamics & Space Propulsion/ M.C.Ramaswamy / Jaico Publishing House.

REFERENCE BOOKS:

1. Rocket propulsion Elements / Sutton / John Wiley & sons / 7th Edition.
2. Gas Turbines /Cohen, Rogers & Sarvana Muttoo/Addision Wesley & Longman.
3. Gas Turbines/V. Ganesan /TMH.
4. Elements of Gas Turbine Propulsion / Jock D Mattingly /Mc Grill.

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IV Year B.Tech. ME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A80338) COMPUTATIONAL FLUID DYNAMICS

(Elective-IV)

UNIT-I

Elementary details in numerical techniques: Number system and errors, representation of integers, fractions, floating point arithmetic, loss of significance and error propagation, condition for instability, computational methods for error estimation, convergence of sequences.

Applied Numerical Methods: Solution of a system of simultaneous Linear Algebraic Equations, iterative schemes of Matrix Inversion, Direct Methods for Matrix inversion, Direct Methods for banded matrices.

UNIT - II

Finite Difference Applications in Heat conduction and Convection – Heat conduction, steady heat conduction in a rectangular geometry, transient heat conduction, finite difference application in convective heat transfer, closure.

Finite Differences, discretization, consistency, stability, and Fundamentals of fluid flow modeling: Introduction, elementary finite difference quotients, implementation aspects of finite-difference equations, consistency, explicit and implicit methods.

UNIT - III

Introduction to first order wave equation; Stability of hyperbolic and elliptic equations, fundamentals of fluid flow modeling, conservative property, the upwind scheme.

UNIT - IV

Review of Equations Governing Fluid Flow and Heat Transfer: Introduction, conservation of mass, Newton's second law of motion, expanded forms of Navier-stokes equations, conservation of energy principle, special forms of the Navier-stokes equations.

UNIT-V

Finite volume method: Approximation of surface integrals, volume integrals, interpolation and differentiation practices, upwind interpolation, linear interpolation and quadratic interpolation.

TEXT BOOKS:

1. Numerical heat transfer and fluid flow / Suhas V. Patankar/ Hema shava Publishers corporation & Mc Graw Hill.
2. Computational Fluid Flow and Heat Transfer/ Muralidaran/ Narosa

Publications.

REFERENCES:

1. Computational Fluid Dynamics: Basics with applications/John D. Anderson/ Mc Graw Hill.
2. Fundamentals of Computational Fluid Dynamics/Tapan K. Sengupta / Universities Press.
3. Introduction to Theoretical and Computational Fluid Dynamics/C. Pozrikidis/Oxford University Press/2nd Edition.

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IV Year B.Tech. ME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A80361) GAS DYNAMICS

(Elective-IV)

UNIT-I

Introduction, Concept of continuum and control volume, continuity equation, momentum equation, streamline, steady, one dimensional dynamic equation of a fluid flow with and without friction, energy equation. Basic concepts of compressible flow.

Properties of atmosphere, standard atmosphere, relative pressure, use of air and gas tables. Condition for neglecting compressibility. Compressible flow, acoustic velocity, Mach number, Mach cone, Mach angle.

UNIT-II

Isentropic Flow: Stagnation enthalpy, density, pressure and temperature, local acoustic speed. maximum speed, variation of Compressibility with mach number.

UNIT-III

Variable Area Flow: Criteria for acceleration and deceleration, critical condition, nozzle discharge co-efficient, nozzle efficiency, operation of nozzles under varying backpressures.

Flow in constant area duct: Adiabatic and isothermal- flow calculation of pressure, temperature, density, Mach number relationships. Limiting length of duct for adiabatic and isothermal flow. Fanno line.

Diabatic flow: Flow of perfect gases in constant area duct with heat exchange, density temperature, pressure and mach number relationships. Limiting conditions. Rayleigh line.

UNIT-IV

Wave Phenomenon: Pressure disturbances in compressible fluid, type of shock waves – normal, shock. Pressure –density-velocity-temperature and Mach number relations for a plane normal shock- Shock tube-mach reflection – thin area prandtl theory.

UNIT-V

Shock intensity- Rayleigh- Pilot and Prandtl- Pitot equation for normal shock. Introduction to oblique shockwaves and hypersonic flow – Fenno flow.

TEXT BOOKS:

1. Gas dynamics through problems/ Zoeb Hussain/ WILEY EASTERN LTD.

2. Fundamentals of Compressible Flow/ S.M. Yahya / New Age International Publishers, 2004.

REFERENCES:

1. Gas dynamics/ E. Radha Krishnan/ P.H.I Publication/4th Edition/2012.
2. Gas Dynamics for engineers / P Balachandran / PHI / Eastern Economy Edition /2012.
3. Gas Dynamics/ H.W. Lipman and A. Rashkho/ John Wiley/ 1963.
4. Gas Dynamics/ Cambel and Jennings/ McGraw Hill/ 1958.
5. Fundamentals of Gas Dynamics / Robert D. Zucker & Oscar Biblarz/ Wiley India / 2nd Edition.
6. Gas Dynamics and Jet Propulsion / S L Somasundaram / New age International Publishers.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. ME-II Sem	L	T/P/D	C
	-	-/-/-	2

(A80087) INDUSTRY ORIENTED MINI PROJECT

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. ME-II Sem	L	T/P/D	C
	-	-/6/-	2

(A80089) SEMINAR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. ME-II Sem	L	T/P/D	C
	-	-/15/-	10

(A80088) PROJECT WORK

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. ME-II Sem	L	T/P/D	C
	-	-/-/-	2

(A80090) COMPREHENSIVE VIVA

SCIENT INSTITUE OF TECHNOLOGY

IBRAHIMPATNAM, RANGAREDDY DISTRICT, T.S.-501506

1.3.2 Average percentage of courses that include experiential learning through project work/fieldWork/ internship during last five years

B.Tech –MECHANICAL ENGINEERING

2015-2016

Sr.no	Regulations	No. of Course	Year of Study
1	R13	13	III year I sem&IIsem
2	R09	7	IV YEAR I sem&IIsem

PRINCIPAL
nt Institute of Technology
Ibrahimpatnam, R. R. Dt.-501 506

Scient Insittute of Technology
R. R. Dt.
501 506
Ibrahimpatnam

II YEAR II SEMESTER

Code	Subject	L	T/P/D	C
A40312	Production Technology	4	-	4
A40309	Kinematics of Machinery	4	-	4
A40313	Thermal Engineering -I	4	-	4
A40112	Mechanics of Fluids and Hydraulic Machines	4	-	4
A40310	Machine Drawing	-	6	4
A40006	Mathematics–II	4	-	4
A40382	Production Technology Lab	-	3	2
A40188	Mechanics of Fluids & Hydraulic Machines Lab	-	3	2
	Total	**20**	**12**	**28**

III YEAR I SEMESTER

Code	Subject	L	T/P/D	C
A50010	Managerial Economics and Financial Analysis	4	-	4
A50318	Engineering Metrology	4	-	4
A50317	Dynamics of Machinery	4	-	4
A50321	Machine Tools	4	-	4
A50316	Design of Machine Members – I	4	-	4
A50326	Thermal Engineering -II	4	-	4
A50384	Machine Tools & Metrology Lab	-	3	2
A50383	Thermal Engineering Lab	-	3	2
	Total	**24**	**6**	**28**

III YEAR II SEMESTER

Code	Subject	L	T/P/D	C
A62405	Automobile Engineering	4	-	4
A60330	Finite Element Methods	4	-	4
A60334	Refrigeration and Air Conditioning	4	-	4
A60329	Design of Machine Members – II	4	-	4
A60331	Heat Transfer	4	-	4
	Open Elective	4	-	4
A60117	Disaster Management			
A60017	Intellectual Property Rights			
A60018	Human Values and Professional Ethics			
A60387	Heat Transfer Lab	-	3	2
A60086	Advanced Communication Skills Lab	-	3	2
	Total	**24**	**6**	**28**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. ME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A50010) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Objectives:

To enable the student to understand and appreciate, with a practical insight, the importance of certain basic issues governing the business operations namely: demand and supply, production function, cost analysis, markets, forms of business organisations, capital budgeting and financial accounting and financial analysis.

Unit I

Introduction & Demand Analysis: Definition, Nature and Scope of Managerial Economics. Demand Analysis: Demand Determinants, Law of Demand and its exceptions. *Elasticity of Demand*: Definition, Types, Measurement and Significance of Elasticity of Demand. *Demand Forecasting.* Factors governing demand forecasting, methods of demand forecasting.

Unit II

Production & Cost Analysis: *Production Function* – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale. *Cost Analysis*: Cost concepts. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance.

Unit III

Markets & New Economic Environment: Types of competition and Markets, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly. *Pricing*: Objectives and Policies of Pricing. Methods of Pricing. *Business:* Features and evaluation of different forms of Business Organisation: Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, *New Economic Environment*: Changing Business Environment in Post-liberalization scenario.

Unit IV

Capital Budgeting: Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising capital - Trading Forecast, Capital Budget, Cash Budget. Capital Budgeting: features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems).

Unit V

Introduction to Financial Accounting & Financial Analysis: Accounting concepts and Conventions - Introduction IFRS - Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). *Financial Analysis*: Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability ratios. Du Pont Chart.

TEXT BOOKS:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2009.
2. S.A. Siddiqui & A.S. Siddiqui, Managerial Economics and Financial Analysis, New Age international Publishers, Hyderabad 2013.
3. M. Kasi Reddy & Saraswathi, Managerial Economics and Financial Analysis, PHI New Delhi, 2012.

REFERENCES:

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.2012.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, Pearson, 2012.
3. Lipsey & Chrystel, Economics, Oxford University Press, 2012
4. Domnick Salvatore: Managerial Economics in a Global Economy, Thomson, 2012.
5. Narayanaswamy: Financial Accounting—A Managerial Perspective, Pearson, 2012.
6. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas, 2012.
7. Truet and Truet: Managerial Economics: Analysis, Problems and Cases, Wiley, 2012.
8. Dwivedi: Managerial Economics, Vikas, 2012.
9. Shailaja & Usha : MEFA, University Press, 2012.
10. Aryasri: Managerial Economics and Financial Analysis, TMH, 2012.
11. Vijay Kumar & Appa Rao, Managerial Economics & Financial Analysis, Cengage 2011.
12. J. V. Prabhakar Rao & P.V. Rao, Managerial Economics & Financial Analysis, Maruthi Publishers, 2011.

Outcomes:

At the end of the course, the student will

- understand the market dynamics namely, demand and supply, demand forecasting , elasticity of demand and supply, pricing methods and pricing in different market structures.

- Gain an insight into how production function is carried out to achieve least cost combination of inputs and cost analysis
- Develop an understanding of
- Analyse how capital budgeting decisions are carried out
- Understand the framework for both manual and computerised accounting process
- Know how to analyse and interpret the financial statements through ratio analysis.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. ME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A50318) ENGINEERING METROLOGY

UNIT – I

Systems of Limits and Fits : Introduction, normal size, tolerance limits, deviations, allowance, fits and their types – unilateral and bilateral tolerance system, hole and shaft basis systems – interchangeability and selective assembly. Indian standard Institution system – International Standard system for plane and screwed work.

UNIT – II

Linear Measurement : Length standard: line and end standard, slip gauges – calibration of slip gauges, Dial indicator, micrometers.

Measurement Of Angles and Tapers : Different methods – Bevel protractor – angle slip gauges – spirit levels – sine bar – Sine plate used to determine the tapers.

Limit Gauges : Taylor's principle – Design of GO and NO GO gauges, plug, ring, snap, taper, profile and position gauges.

UNIT – III

Optical Measuring Instruments : Tool maker's microscope and its uses – collimators, optical projector – optical flats and their uses, interferometer.

Flat Surface Measurement : Measurement of flat surfaces – instruments used: straight edges, surface plates, optical flat and auto collimator.

UNIT – IV

Surface Roughness Measurement: Differences between surface roughness and surface waviness – Numerical assessment of surface finish: CLA, R.M.S Values, R_z values,R_{10} value- Methods of measurement of surface finish: profilograph, Talysurf- ISI symbols for indication of surface finish.

UNIT -V

Measurement Through Comparators: Comparators: Mechanical, Electrical and Electronic Comparators, pneumatic comparators and their uses in mass production.

Screw Thread Measurement : Element of measurement – errors in screw threads – measurement of effective diameter, angle of thread and thread pitch, profile thread gauges.

Machine Tool Alignment Tests: Requirements of Machine Tool Alignment Tests, Alignment tests on lathe, milling, drilling machine tools. Preparation of acceptance charts.

Gear Measurement: Gear measuring instruments, Gear tooth profile measurement, Measurement of diameter, pitch pressure angle and tooth thickness.

Coordinate Measuring Machines: Types of CMM, Role of CMM, and Applications of CMM.

TEXT BOOKS :

1. Engineering Metrology / R.K. Jain / Khanna Publishers.
2. Engineering Metrology / I C Gupta./ Dhanpath Rai.

REFERENCE BOOKS :

1. Dimensional Metrology/Connie Dotson/Cengage Learning.
2. BIS Standards on Limits & Fits, Surface Finish, Machine Tool Alignment etc.
3. Fundamentals of Dimensional Metrology/ / Connie Dotson / Thomson/ 4th Edition.
4. Engineering Metrology/Kenneth John Hume/McDonald.
5. Engineering Metrology/D.M. Anthony/Pergamon Press.
6. Principles of Engineering Metrology/Rega Rajendra/Jaico Publications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. ME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A50317) DYNAMICS OF MACHINERY

UNIT – I

Angular Motion: Gyroscopes – effect of precession – motion on the stability of moving vehicles such as motorcycle – motorcar – aero planes and ships. Static and Dynamic Force Analysis of planar mechanisms.

UNIT – II

Friction: Inclined plane – Friction of screw and nuts - Pivots and collars – uniform pressure, uniform wear – friction circle and friction axis: lubricated surfaces – boundary friction – film lubrication. Clutches. Single plate, multi plate, cone clutch, centrifugal clutches.

Brakes And Dynamometers: Simple block brake - Internal expanding brake-band brake of vehicle. Dynamometers – absorption and transmission types. General description and methods of operation.

UNIT – III

Turning Moment Diagram and Flywheels: Turning moment- Inertia torque-connecting rod angular velocity and acceleration-crank effort and torque diagrams-fluctuation of energy – flywheels and their

Governors: Watt, Porter and Proell governors- Spring loaded governors – Hartnell and Hartung with auxiliary springs- Sensitiveness, isochronisms and hunting– effort and power of the governors.

UNIT – IV

Balancing: Balancing of rotating masses- Primary, Secondary, and higher balancing of reciprocating masses. Analytical and graphical methods. Unbalanced forces and couples. Examination of "V" and multi cylinder in-line and radial engines for primary and secondary balancing- locomotive balancing – Hammer blow – Swaying couple – variation of tractive effort.

UNIT – V

Vibrations: Free Vibration of mass attached to vertical spring –oscillation of pendulums- Transverse loads – vibrations of beams with concentrated and distributed loads. Dunkerly's method – Raleigh's method. Whirling of shafts – critical speed – torsional vibrations – one, two and three rotor systems.

TEXT BOOKS:

1. Theory of Machines/ S.S.Rattan/McGraw Hill.

2. Theory of Mechanism and Machines /Jagdish Lal/Metropolitan Book Company.

REFERENCE BOOKS:

1. Theory of Machines/ Shigley/ Mc Graw Hill Publishers.
2. Theory of Machines/ Thomas Bevan/Pearson.
3. Theory of Machines/ R.K.Bansal/Lakshmi publications/5th Edition.
4. Mechanism and Machine Theory/ JS Rao and RV Duggipati/ New Age.
5. Theory of Machines/Sadhu Singh/Pearson/3rd Edition.
6. Mechanism and Machine Theory/Ashok G. Ambekar/PHI/Eastern Economy Edition.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. ME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A50321) MACHINE TOOLS

UNIT – I

Elementary treatment of metal cutting theory – Element of cutting process – Geometry of single point tool and angles chip formation and types of chips – built up edge and its effects, chip breakers. Mechanics of orthogonal cutting –Merchant's Force diagram, cutting forces – cutting speeds, feed, depth of cut, tool life, coolants, machinability – Tool materials.

UNIT – II :

Engine lathe – Principle of working, specification of lathe – types of lathe – work and tool holding devices, Taper turning, Thread turning – Lathe attachments. Turret and capstan lathe – Principal features of automatic lathes – classification : Single spindle and multi-spindle automatic lathes – tool layouts.

UNIT – III :

Shaping ,slotting and planning machines – Principles of working – Principal parts – specification, classification, operations performed. Kinematic scheme of the shaping, slotting and planning machines, machining time calculations.

Drilling and Boring Machines – Principles of working, specifications, types, operations performed – tool holding devices – twist drill – Boring machines – Fine boring machines – Jig boring machine. Deep hole drilling machine. Kinematics scheme of the drilling and boring machines

UNIT – IV

Milling machine – Principles of working – specifications – classifications of milling machines – Principal features of horizontal, vertical and universal milling machines – machining operations Geometry of milling cutters – methods of indexing – Accessories to milling machines, kinematic scheme of milling machines.

Lapping, honing and broaching machines – comparison of grinding, lapping and honing. Kinematics scheme of Lapping, Honing and Broaching machines. Constructional features of speed and feed Units, machining time calculations

UNIT –V

Finishing Processes: Grinding – fundamentals – theory of grinding – classification of grinding machines – cylindrical and surface grinding machine- Tool and cutter grinding machine – special types of grinding machines, Different types of abrasives – bonds specification of a grinding wheel and

selection of a grinding wheel, Kinematic. Scheme of grinding machines.

TEXT BOOKS:

1. Production Technology/HMT/Tata McGraw Hill.
2. Production Technology / R.K. Jain and S.C. Gupta/Khanna Publishers.

REFERENCE BOOKS:

1. Principles of Machine Tools/ Bhattacharya A and Sen.G.C/ New Central Book Agency.
2. Workshop Technology – Vol.-II/ B.S. Raghuvamsi.
3. Elements of Work Shop Technology – Vol. II/Hajra Choudry/ Media Promoters.
4. Fundamentals of Metal Machining and Machine Tools/ Geofrey Boothroyd/ McGraw Hill.
5. Manufacturing Processes/JP Kaushish/Prentice Hall/2nd Edition.
6. Machine Tools/C Elanchezhian & M. Vijayan/Anuradha Publications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. ME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A50316) DESIGN OF MACHINE MEMBERS - I

NOTE : Design Data books are not permitted in the Examinations. The design must not only satisfy strength criteria but also rigidity criteria.

UNIT – I

Introduction: General considerations in the design of Engineering Materials and their properties – selection –Manufacturing consideration in design. Tolerances and fits –BIS codes of steels. Theories of failure – Factor of safety – Design for strength and rigidity – preferred numbers.

Fatigue loading: Stress concentration – Theoretical stress Concentration factor – Fatigue stress concentration factor- Notch Sensitivity – Design for fluctuating stresses – Endurance limit – Estimation of Endurance strength – Goodman's line – Soderberg's line.

UNIT – II

Design of Fasteners: Riveted joints-methods of failure of riveted joints-strength equations-efficiency of riveted joints- eccentrically loaded riveted joints.

Welded joints: Design of fillet welds- axial loads-circular fillet welds-bending and torsion.

Design of bolts with pre-stresses- design of joints under eccentric loading-bolts of uniform strength.

UNIT – III

Keys, Cotters and Knuckle Joints: Design of Keys-stresses in keys-cottered joints-spigot and socket, sleeve and cotter, jib and cotter joints-Knuckle joints.

UNIT – IV

Design of Shafts: Design of solid and hollow shafts for strength and rigidity – Design of shafts for complex loads– Shaft sizes – BIS code- Design of shafts for gear and belt drives.

Shaft couplings : Rigid couplings – Muff, Split muff and Flange couplings. Flexible couplings – PIN-Bush coupling.

UNIT – V

Mechanical Springs: Stresses and deflections of helical springs-extension-compression springs- springs for static and fatigue loading-natural frequency of helical springs-energy storage capacity-helical torsion springs-co-axial springs.

TEXT BOOKS:

1. Machine design/Pandya & Shah/ Charotar Publishing House Pvt. Ltd.
2. Machine Design/ PV Soundararajan Murthy and N. Shanmugam/ Anuradha Publishers.

REFERENCE BOOKS:

1. Design of Machine Elements/V.M. Faires.
2. Machine design/ Schaum Series.
3. Mechanical Engineering Design/JE Shigley.
4. Machine Design/S Md. Jalaluddine/Anuradha Publishers.
5. Machine Design/UC Jindal/Pearson.
6. Design of Machine Elements (Vol.1)/T. Krishna Rao/IK International Publishing House/2nd Edition.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. ME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A50326) THERMAL ENGINEERING – II

UNIT – I

Basic Concepts: Rankine cycle - Schematic layout, Thermodynamic Analysis, Concept of Mean Temperature of Heat addition, Methods to improve cycle performance – Regeneration & reheating.

Combustion: Fuels and combustion- concept of heat of reaction-adiabatic flame temperature-stoichiometry-flue gas analysis.

UNIT – II

Boilers: Classification – Working principles with sketches including H.P.Boilers – Mountings and Accessories – Working principle.

Steam Nozzles : Function of nozzle – Applications and Types- Flow through nozzles- Thermodynamic analysis.

UNIT – III

Steam Turbines: Classification – Impulse turbine; Mechanical details – Velocity diagram – Effect of friction – Power developed, Axial thrust, Blade or diagram efficiency – Condition for maximum efficiency.

Reaction Turbine: Mechanical details – Principle of operation, Thermodynamic analysis of a stage, Degree of reaction –Velocity diagram – Parson's reaction turbine – Condition for maximum efficiency.

Steam Condensers: Requirements of steam condensing plant – Classification of condensers – Working principle of different types.

UNIT IV

Gas Turbines: Simple gas turbine plant – Ideal cycle, essential components – Parameters of performance – Actual cycle – Regeneration, Inter cooling and Reheating –Closed and Semi-closed cycles – Merits and Demerits- Brief Concepts about compressors- Combustion chambers and turbines of Gas Turbine Plant.

UNIT – V

Jet Propulsion : Principle of Operation –Classification of jet propulsive engines – Working Principles with schematic diagrams and representation on T-S diagram - Thrust, Thrust Power and Propulsion Efficiency – Turbo jet engines – Needs and Demands met by Turbo jet – Schematic Diagram, Thermodynamic Cycle, Performance Evaluation Thrust Augmentation – Methods.

Rockets: Application – Working Principle – Classification – Propellant Type

– Thrust, Propulsive Efficiency – Specific Impulse – Solid and Liquid propellant Rocket Engines.

TEXT BOOKS:

1. Thermal Engineering / Rajput / Lakshmi Publications.
2. Gas Turbines/V.Ganesan /TMH.

REFERENCE BOOKS:

1. Gas Turbines and Propulsive Systems/ P.Khajuria & S.P.Dubey / Dhanpatrai Pub.
2. Thermal Engineering/ Ballaney / Khanna Pub.
3. Gas Turbines / Cohen, Rogers and Saravana Muttoo / Addison Wesley – Longman.
4. Thermal Engineering/R.S. Khurmi & J.S.Gupta / S.Chand Pub.
5. Thermodynamics and Heat Engines / R. Yadav / Central Book Depot.
6. Thermal Engineering / Ajoy Kumar/ Narosa.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. ME-I Sem	**L**	**T/P/D**	**C**
	-	**-/3/-**	**2**

(A50384) MACHINE TOOLS & METROLOGY LAB

Section-A:

1. Use of gear teeth vernier calipers for checking the chordal addendum and chordal height of the spur gear.
2. Machine tool alignment of test on the lathe.
3. Tool makers microscope and its application
4. Angle and taper measurements by bevel protractor and sine bars.
5. Use of spirit level and optical flats in finding the flatness of surface plate.
6. Thread measurement by 2-wire and 3-wire methods.

Section-B:

1. Introduction of general purpose machines -Lathe, Drilling machine, Milling machine, Shaper,
2. Planing machine, slotting machine, Cylindrical Grinder, surface grinder and tool and cutter grinder.
3. Step turning and taper turning on lathe machine
4. Thread cutting and knurling on -lathe machine.
5. Drilling and Tapping
6. Shaping and Planning
7. Slotting
8. Milling
9. Cylindrical Surface Grinding
10. Grinding of Tool angles.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. ME-I Sem	**L**	**T/P/D**	**C**
	-	**-/3/-**	**2**

(A50383) THERMAL ENGINEERING LAB

PERFORM ANY 10 OUT OF THE 12 EXERCISES.

1. I.C. Engines Valve / Port Timing Diagrams
2. I.C. Engines Performance Test for 4 Stroke SI engines
3. I.C. Engines Performance Test for 2 Stroke SI engines
4. I.C. Engines Morse, Retardation, Motoring Tests
5. I.C. Engine Heat Balance – CI/SI Engines
6. I.C. Engines Economical speed Test on a SI engine
7. I.C. Engines effect of A/F Ratio in a SI engine
8. Performance Test on Variable Compression Ratio Engine
9. IC engine Performance Test on a 4S CI Engine at constant speed
10. Volumetric efficiency of Air – Compressor Unit
11. Dis-assembly / Assembly of Engines
12. Study of Boilers

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. ME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A62405) AUTOMOBILE ENGINEERING

UNIT – I

Introduction : Layout of automobile – introduction chassis and body components . types of Automobile engines. – power unit – Introduction to engine lubrication – engine servicing.

Fuel System :S.I. Engine : Fuel supply systems, Mechanical and electrical fuel pump – filters – carburetor – types – air filters – petrol injection. Introductionto MPFI and GDI Systems.

C.I. Engines : Requirements of diesel injection systems, types of injection systems, DI Systems IDI systems. fuel pump, nozzle, spray formation, injection timing, testing of fuel pumps. Introduction CRDI and TDI Systems.

UNIT – II

Cooling System : Cooling Requirements, Air Cooling, Liquid Cooling, Thermo, water and Forced Circulation System – Radiators – Types – Cooling Fan - water pump, thermostat, evaporative cooling – pressure sealed cooling – antifreeze solutions.

Ignition System : Function of an ignition system, battery ignition system, constructional features of storage, battery, auto transformer, contact breaker points, condenser and spark plug – Magneto coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers – spark advance and retard mechanism.

Electrical System : Charging circuit, generator, current – voltage regulator – starting system, bendix drive mechanism solenoid switch, lighting systems, Horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.

UNIT – III

Transmission System : Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel – gear boxes, types, sliding mesh, constantt mesh, synchro mesh gear boxes, epicyclic gear box , over drive torque converter. Propeller shaft – Hotch – Kiss drive, Torque tube drive, universal joint, differential rear axles – types – wheels and tyres.

Suspension System : Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.

UNIT – IV

Braking System : Mechanical brake system, Hydraulic brake system, Master

cylinder, wheel cylinder tandem master cylinder Requirement of brake fluid, Pneumatic and vacuum brakes.

Steering System :Steering geometry – camber, castor, king pin rake, combined angle toein, center point steering. Types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism, steering gears – types, steering linkages.

UNIT – V

Emissions from Automobiles – Pollution standards National and international – Pollution Control – Techniques – Multipoint fuel injection for SI Engines. Common rail diesel injection Energy alternatives – Solar, Photo-voltaic, hydrogen, Biomass, alcohols, LPG,CNG, liquid Fuels and gaseous fuels, Hydrogen as a fuel for IC Engines. - their merits and demerits.

Standard Vehicle maintenance practice.

TEXT BOOKS :

1. Automobile Engineering / William H Crouse/McGraw Hill-2012.
2. A Text Book Automobile Engineering–Manzoor, Nawazish Mehdi & Yosuf Ali, Frontline Publications.

REFERENCES :

1. A Text Book of Automobile Engineering by R K Rajput, Laxmi Publications.
2. Automotive Mechanics / Heitner.
2. Automotive Engineering / Newton Steeds & Garrett.
3. Automotive Engines / Srinivasan.
4. A Text Book of Automobile Engineering By Khalil U Siddiqui New Age International.

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III Year B.Tech. ME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A60330) FINITE ELEMENT METHODS

UNIT – I:

Introduction to Finite Element Method for solving field problems. Stress and Equilibrium. Boundary conditions. Strain – Displacement relations. Stress – strain relations for 2-D and 3-D Elastic problems.

One Dimensional Problems: Finite element modeling coordinates and shape functions. Assembly of Global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions.

UNIT – II:

Analysis of Trusses: Stiffness Matrix for Plane Truss Elements, Stress Calculations and problems.

Analysis of Beams: Element stiffness matrix for two noded, two degrees of freedom per node beam element and simple problems.

UNIT – III:

Finite element modeling of two dimensional stress analysis with constant strain triangles and treatment of boundary conditions. Estimation of Load Vector, Stresses.

Finite element modeling of Axi-symmetric solids subjected to Axi-symmetric loading with triangular elements.

Two dimensional four noded Isoparametric elements and problems.

UNIT – IV:

Steady State Heat Transfer Analysis: one dimensional analysis of Slab, fin and two dimensional analysis of thin plate. Analysis of a uniform shaft subjected to torsion.

UNIT – V:

Dynamic Analysis: Formulation of finite element model, element - Mass matrices, evaluation of Eigen values and Eigen vectors for a stepped bar, truss.

Finite element – formulation to 3 D problems in stress analysis, convergence requirements, Mesh generation, techniques such as semi automatic and fully Automatic use of softwares such as ANSYS, NISA, NASTRAN, etc.

TEXT BOOKS:

1. The Finite Element Methods in Engineering / SS Rao / Pergamon.

2. Finite Element Methods: Basic Concepts and applications/ Alavala/ PHI.

REFERENCE BOOKS :

1. Introduction to Finite Elements in Engineering/Chandrupatla, Ashok and Belegundu/ Prentice – Hall.
2. Finite Element Method /Zincowitz / Mc Graw Hill.
3. Introduction to Finite element analysis/ S.Md.Jalaludeen/Anuradha Publications, print-2012.
4. A First Course in the Finite Element Method/Daryl L Logan/Cengage Learning/5th Edition.
5. Finite Element Method/Krishna Murthy / TMH.
6. Finite Element Analysis /Bathe / PHI.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. ME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A60334) REFRIGERATION AND AIR CONDITIONING

UNIT – I

Introduction to Refrigeration: -Basic concepts - Unit of refrigeration and C.O.P-refrigerators-heat pump- carnot refrigerator-applications of refrigerator – Vapour compression refrigeration- Ideal cycle –effect of sub cooling of liquid- super heating of vapour-deviations of practical (actual cycle) from ideal cycle- construction and use of P-H chart- problems.

UNIT – II

Components :

Compressors –classification – Working – Advantages and Disadvantages.

Condensers – classification – Working Principles

Evaporators – classification – Working Principles

Expansion devices – Types – Working Principles

UNIT III:

Vapor Absorption refrigeration – Description and working of ammonia – water, Li Br – water system – Calculation of HCOP, Principle and operation of three fluid vapour absorption refrigeration system.

Air refrigeration- Bell Coleman cycle – open and dente air system - ideal and actual refrigeration – applications – steam jet refrigeration system – working principle – basic operation

UNIT – IV:

Introduction to Air Conditioning:

Psychometric Properties & Processes – Sensible and latent heat loads – Characterization – Need for Ventilation, Consideration of Infiltration – Load concepts of RSHF, ASHF, ESHF and ADP.

Concept of human comfort and effective temperature –Comfort Air conditioning – Industrial air conditioning and Requirements – Air conditioning Load Calculations.

UNIT – V:

Air Conditioning systems: Classification of equipment, cooling, heating humidification and dehumidification, filters, grills and registers, deodorants, fans and blowers.

Heat Pump – Heat sources – different heat pump circuits – Applications.

TEXT BOOKS:

1. Refrigeration and Air Conditioning / CP Arora / TMH.
2. A Course in Refrigeration and Air Conditioning / SC Arora & Domkundwar / Dhanpatrai.

REFERENCE BOOKS:

1. Principles of Refrigeration /Dossat / Pearson Education.
2. Basic Refrigeration and Air-Conditioning/ Ananthanarayanan / TMH.
3. Refrigeration and Air Conditioning/ Manohar Prasad/ New Age.
4. Refrigeration and Air Conditioning/Ahmadul Ameen/PHI.

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III Year B.Tech. ME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A60329) DESIGN OF MACHINE MEMBERS - II

NOTE : Design Data Book Permitted. Design of all components should include design for strength and rigidity apart from engineering performance requirements.

UNIT – I

Bearings : Types of Journal bearings –basic modes of Lubrication – Bearing Modulus – Full and partial bearings – Clearance ratio – Heat dissipation of bearings, bearing materials – journal bearing design. Ball and roller bearings – Static load – dynamic load – equivalent radial load – design and selection of ball & roller bearings.

UNIT – II

Design of IC Engine Parts :

Connecting Rod : Thrust in connecting rod – stress due to whipping action on connecting rod ends – Cranks and Crank shafts, strength and proportions of over hung and center cranks – Crank pins, Crank shafts. Pistons, Forces acting on piston – Construction, Design and proportions of piston.

UNIT – III

Power Transmission Systems and Pulleys: Transmission of power by Belt and Rope ways, Transmission efficiencies, Belts – Flat and V types – Ropes - pulleys for belt and rope drives-materials-chain drives.

UNIT – IV

Gears : Spur gears– Load concentration factor – Dynamic load factor. – analysis of spur gears –check for plastic deformation-check for dynamic and wear consideration.

Helical and bevel gear drives: Helical and bevel gears- Load concentration factor- Dynamic load factor-analysis of helical and bevel gears- check for plastic deformation-check for dynamic and wear consideration

Design of worm gears: Properties of worm gears- selection of materials-strength and wear rating of worm gears- force analysis-friction in worm gears.

UNIT – V

Design of Power Screws: Design of Screw – design of nut – compound screw – differential screw – ball screw-possible failures.

TEXT BOOKS:

1. Machine Design/Pandya & Shah/ Charotar Publishing House Pvt. Ltd.

2. Machine Design/ PV Soundararajan Murthy and N. Shanmugam/ Anuradha Publishers.

REFERENCE BOOKS:

1. Design of Machine Elements/V.M. Faires.
2. Machine design/ Schaum Series.
3. Mechanical Engineering Design/JE Shigley.
4. Machine Design/S Md. Jalaluddine/Anuradha Publishers.
5. Machine Design/UC Jindal/Pearson.
6. Design of Machine Elements (Vol.1)/T. Krishna Rao/IK International Publishing House/2nd Edition.

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III Year B.Tech. ME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A60331) HEAT TRANSFER

UNIT – I

Introduction, Basic Modes of heat transfer – Fundamental laws of heat transfer – Simple General discussion about applications of heat transfer.

Conduction Heat Transfer: Fourier Heat transfer equation – General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates – simplification and forms of the field equation – steady, unsteady and periodic heat transfer – Initial and boundary conditions.

UNIT – II

One Dimensional Steady State Conduction Heat Transfer: Homogeneous slabs, hollow cylinders and spheres- Composite systems– overall heat transfer coefficient – Electrical analogy – Critical radius of insulation-Variable Thermal conductivity – systems with heat sources or Heat generation-Extended surface and fins.

One Dimensional Transient Conduction Heat Transfer: Systems with negligible internal resistance –Chart solutions of transient conduction systems.

UNIT – III

Convective Heat Transfer: Classification of systems based on causation of flow, condition of flow, configuration of flow and medium of flow – Dimensional analysis as a tool for experimental investigation – Buckingham Π Theorem and method, application for developing semi – empirical non-dimensional correlation for convection heat transfer – Significance of non-dimensional numbers – use of empirical correlation for convective heat transfer.

Forced convection: External Flows: Flat plates and Horizontal pipes.

Free Convection: Vertical plates and pipes-concepts about Hydrodynamic and thermal boundary layer along a vertical plate.

UNIT – IV

Heat Transfer With Phase Change:

Boiling: – Pool boiling– Calculations on Nucleate boiling, Critical Heat flux and Film boiling.

Condensation: Film wise and drop wise condensation –Film Condensation on a vertical and horizontal cylinders using empirical correlations.

Radiation Heat Transfer : Emission characteristics and laws of black-body

radiation – Irradiation – total and monochromatic quantities – laws of Planck, Wien, Kirchoff, Lambert, Stefan and Boltzmann– heat exchange between two black bodies – concepts of shape factor – Emissivity – heat exchange between grey bodies – radiation shields – electrical analogy for radiation networks.

UNIT V

Heat Exchangers: Classification of heat exchangers – overall heat transfer Coefficient and fouling factor – Concepts of LMTD and NTU methods - Problems using LMTD and NTU methods.

TEXT BOOKS :

1. Heat& Man Transfer-D.S.Kumar/S.K.Kataria& sons.
2. Heat Transfer-P.K.Nag /Mc Graw Hill/Third Edition.

REFERENCE BOOKS:

1. Heat Transfer: A Practical Approach /Yunus Cengel, Boles / TMH.
2. Heat Transfer: A Conceptual Approach/PK Sharma, K. Rana Krishna/ New age International Publishers.
3. Heat Transfer / HOLMAN/TMH.
4. Heat and Mass Transfer/ R. Yadav /CPH.
5. Essential Heat Transfer/ Christopher A Long / Pearson Education.
6. Fundamentals of Engineering, Heat & Man Transfer/R.C.Sachdeva/ NewAge.

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III Year B.Tech. ME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A60117) DISASTER MANAGEMENT

(Open Elective)

Unit-I

Environmental Hazards & Disasters: Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Different approaches & relation with human Ecology - Landscape Approach - Ecosystem Approach - Perception approach - Human ecology & its application in geographical researches.

Unit –II

Types of Environmental hazards & Disasters: Natural hazards and Disasters - Man induced hazards & Disasters - Natural Hazards- Planetary Hazards/ Disasters - Extra Planetary Hazards/ disasters - Planetary Hazards- Endogenous Hazards - Exogenous Hazards –

Unit –III

Endogenous Hazards - Volcanic Eruption – Earthquakes – Landslides - Volcanic Hazards/ Disasters - Causes and distribution of Volcanoes - Hazardous effects of volcanic eruptions - Environmental impacts of volcanic eruptions - Earthquake Hazards/ disasters - Causes of Earthquakes - Distribution of earthquakes - Hazardous effects of - earthquakes - - Earthquake Hazards in India - - Human adjustment, perception & mitigation of earthquake.

Unit –IV

Exogenous hazards/ disasters - Infrequent events- Cumulative atmospheric hazards/ disasters.

Infrequent events: Cyclones – Lightning – Hailstorms.

Cyclones: Tropical cyclones & Local storms - Destruction by tropical cyclones & local storms (causes , distribution human adjustment, perception & mitigation) Cumulative atmospheric hazards/ disasters : - Floods- Droughts- Cold waves- Heat waves Floods:- Causes of floods- Flood hazards India- Flood control measures (Human adjustment, perception & mitigation) Droughts:- Impacts of droughts- Drought hazards in India- Drought control measures- Extra Palnetary Hazards/ Disasters- Man induced Hazards / Disasters- Physical hazards/ Disasters-Soil Erosion.

Soil Erosion:— Mechanics & forms of Soil Erosion- Factors & causes of Soil Erosion- Conservation measures of Soil Erosion.

Chemical hazards/ disasters:— Release of toxic chemicals, nuclear explosion- Sedimentation processes Sedimentation processes:- Global Sedimentation problems- Regional Sedimentation problems- Sedimentation & Environmental problems- Corrective measures of Erosion & Sedimentation

Biological hazards/ disasters:- Population Explosion.

Unit –V

Emerging approaches in Disaster Management- Three Stages

1. Pre- disaster stage (preparedness)
2. Emergency Stage
3. Post Disaster stage-Rehabilitation

TEXT BOOKS:

1. Disaster Mitigation: Experiences And Reflections by Pardeep Sahni.
2. Natural Hazards & Disasters by Donald Hyndman & David Hyndman – Cengage Learning.

REFERENCES

1. R.B.Singh (Ed) Environmental Geography, Heritage Publishers New Delhi,1990.
2. Savinder Singh Environmental Geography, Prayag Pustak Bhawan, 1997.
3. Kates,B.I & White, G.F The Environment as Hazards, oxford, New York, 1978.
4. R.B. Singh (Ed) Disaster Management, Rawat Publication, New Delhi, 2000.
5. H.K. Gupta (Ed) Disaster Management, Universiters Press, India, 2003.
6. R.B. Singh, Space Technology for Disaster Mitigation in India (INCED), University of Tokyo, 1994.
7. Dr. Satender , Disaster Management t in Hills, Concept Publishing Co., New Delhi, 2003.
8. A.S. Arya Action Plan For Earthquake,Disaster, Mitigation in V.K. Sharma (Ed) Disaster Management IIPA Publication New Delhi, 1994.
9. R.K. Bhandani An overview on Natural & Man made Disaster & their Reduction,CSIR, New Delhi.
10. M.C. Gupta Manuals on Natural Disaster management in India, National Centre for Disaster Management,IIPA, New Delhi, 2001.

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III Year B.Tech. ME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A60017) INTELLECTUAL PROPERTY RIGHTS

(Open Elective)

UNIT – I

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT – II

Trade Marks : Purpose and function of trade marks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

UNIT – III

Law of copy rights : Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Law of patents : Foundation of patent law, patent searching process, ownership rights and transfer.

UNIT – IV

Trade Secrets : Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

Unfair competition : Misappropriation right of publicity, False advertising.

UNIT – V

New development of intellectual property: new developments in trade mark law ; copy right law, patent law, intellectual property audits.

International overview on intellectual property, international – trade mark law, copy right law, international patent law, international development in trade secrets law.

TEXT BOOKS & REFERENCES:

1. Intellectual property right, Deborah, E. Bouchoux, cengage learing.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tate Mc Graw Hill Publishing company ltd.,

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III Year B.Tech. ME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A60018) HUMAN VALUES AND PROFESSIONAL ETHICS

(Open Elective)

Objectives : This introductory course input is intended

a. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.

b. To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Value based living in a natural way.

c. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with Nature.

Unit I:

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education. Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Unit II:

Understanding Harmony in the Human Being - Harmony in Myself! : Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

Unit III:

Understanding Harmony in the Family and Society- Harmony in Human -

Human Relationship : Understanding harmony in the Family- the basic unit of human interaction. Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; **Trust (Vishwas) and Respect (Samman) as the foundational values of relationship.** Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals. Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family!

Unit IV:

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence : Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

Unit V:

Implications of the above Holistic Understanding of Harmony on Professional Ethics : Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics:

a) Ability to utilize the professional competence for augmenting universal human order,

b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,

c) Ability to identify and develop appropriate technologies and management patterns for above production systems.

Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order:

a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers.

b) At the level of society: as mutually enriching institutions and organizations .

TEXT BOOK

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

2. Prof. KV Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications,3rd Edition.

REFERENCE BOOKS

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA.
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991.
5. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Purblishers.
6. A.N. Tripathy, 2003, Human Values, New Age International Publishers.
7. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
9. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.
10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethichs (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.

Relevant CDs, Movies, Documentaries & Other Literature:

1. Value Education website, http://www.uptu.ac.in
2. Story of Stuff, http://www.storyofstuff.com
3. Al Gore, An Inconvenient Truth, Paramount Classics, USA
4. Charlie Chaplin, Modern Times, United Artists, USA
5. IIT Delhi, Modern Technology – the Untold Story

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. ME-II Sem	**L**	**T/P/D**	**C**
	-	**-/3/-**	**2**

(A60387) HEAT TRANSFER LAB

(Consider Performance in Any 12)

1. Composite Slab Apparatus – Overall heat transfer co-efficient.
2. Heat transfer through lagged pipe.
3. Heat Transfer through a Concentric Sphere
4. Thermal Conductivity of given metal rod.
5. Heat transfer in pin-fin
6. Experiment on Transient Heat Conduction
7. Heat transfer in forced convection apparatus.
8. Heat transfer in natural convection
9. Parallel and counter flow heat exchanger.
10. Emissivity apparatus.
11. Stefan Boltzman Apparatus.
12. Critical Heat flux apparatus.
13. Study of heat pipe and its demonstration.
14. Film and Drop wise condensation apparatus

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III Year B.Tech. ME-II Sem	**L**	**T/P/D**	**C**
	-	-/3/-	2

(A60086) ADVANCED COMMUNICATION SKILLS (ACS) LAB

Introduction

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organise ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

Syllabus:

The following course content to conduct the activities is prescribed for the Advanced Communication Skills (ACS) Lab:

1. **Activities on Fundamentals of Inter-personal Communication and Building Vocabulary** - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.
2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.
3. **Activities on Writing Skills** – Structure and presentation of different types of writing – *letter writing/Resume writing/ e-correspondence/ Technical report writing/ Portfolio writing* – planning for writing – improving one's writing.
4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/**PPTs** and written presentations through posters/projects/reports/ e-mails/assignments etc.
5. **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

Minimum Requirement:

The Advanced Communication Skills (ACS) Laboratory shall have the following infra-structural facilities to accommodate at least 35 students in the lab:

- **Spacious room with appropriate acoustics.**
- **Round Tables with movable chairs**
- **Audio-visual aids**
- **LCD Projector**
- **Public Address system**
- **P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ**
- **T. V, a digital stereo & Camcorder**
- **Headphones of High quality**

Prescribed Lab Manual: A book titled ***A Course Book of Advanced***

Communication Skills (ACS) Lab published by Universities Press, Hyderabad.

Suggested Software:

The software consisting of the prescribed topics elaborated above should be procured and used.

- **Oxford Advanced Learner's Compass**, 7th Edition
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech
- **TOEFL & GRE**(KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **The following software from 'train2success.com'**
  - **Preparing for being Interviewed**
  - **Positive Thinking**
  - **Interviewing Skills**
  - **Telephone Skills**
  - **Time Management**

Books Recommended:

1. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
2. Advanced Communication Skills Laboratory Manual by Sudha Rani, D, Pearson Education 2011.
3. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
4. Business and Professional Communication: Keys for Workplace Excellence. Kelly M. Quintanilla & Shawn T. Wahl. Sage South Asia Edition. Sage Publications. 2011.
5. The Basics of Communication: A Relational Perspective. Steve Duck & David T. McMahan. Sage South Asia Edition. Sage Publications. 2012.
6. English Vocabulary in Use series, Cambridge University Press 2008.
7. Management Shapers Series by Universities Press(India)Pvt Ltd., Himayatnagar, Hyderabad 2008.
8. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
9. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.

10. Handbook for Technical Writing by David A McMurrey & Joanne Buckely CENGAGE Learning 2008.

11. Job Hunting by Colm Downes, Cambridge University Press 2008.

12. Master Public Speaking by Anne Nicholls, JAICO Publishing House, 2006.

13. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hil 2009.

14. Books on TOEFL/GRE/GMAT/CAT/ IELTS by Barron's/DELTA/ Cambridge University Press.

15. International English for Call Centres by Barry Tomalin and Suhashini Thomas, Macmillan Publishers, 2009.

DISTRIBUTION AND WEIGHTAGE OF MARKS:

Advanced Communication Skills Lab Practicals:

1. The practical examinations for the ACS Laboratory practice shall be conducted as per the University norms prescribed for the core engineering practical sessions.

2. For the English Language lab sessions, there shall be continuous evaluation during the year for 25 sessional marks and 50 End Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The End Examination shall be conducted by the teacher concerned, by inviting the External Examiner from outside. In case of the non-availability of the External Examiner, other teacher of the same department can act as the External Examiner.

Mini Project: As a part of Internal Evaluation

1. **Seminar/ Professional Presentation**
2. **A Report on the same has to be prepared and presented.**

* ***Teachers may use their discretion to choose topics relevant and suitable to the needs of students.***
* ***Not more than two students to work on each mini project.***
* ***Students may be assessed by their performance both in oral presentation and written report.***

Outcomes

- Accomplishment of sound vocabulary and its proper use contextually.
- Flair in Writing and felicity in written expression.
- Enhanced job prospects.
- Effective Speaking Abilities

IV YEAR I SEMESTER COURSESTRUCTURE

Code	Subject	L	T/P/D	C
57022	Operations Research	4	1	4
57023	Power Plant Engineering	3	1	3
57024	CAD/CAM	4	1	4
57025	Instrumentation and Control Systems	4	-	4
	ELECTIVE – I	3	1	3
57026	Robotics			
57027	Mechanical Vibrations			
57028	Mechatronics			
57029	Composite Materials			
	ELECTIVE – II	3	1	3
57030	Unconventional Machining Processes			
57031	CNC Technology			
57032	Automation in Manufacturing			
57033	Design for Manufacturing			
57605	Computer Aced Design & Manufacturing Lab	0	3	2
57606	Production Drawing Practice and Instrumentation Lab	0	3	2
	Total	21	11	25

JAWAHAR LAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B Tech. ME -I Sem	L	T/P/D	C
	4	-/-/-	4

(57022) OPERATIONS RESEARCH

UNIT - I

Introduction: Development - Definition - Characteristics and Phases - Types of operation Research models - applications. **Allocation** - Linear Programming - Problem formulation - Graphical solution - Simplex method - Artificial variables techniques -Two-phase method, Big-M method - Duality Principle

UNIT – II

Transportation Problem: Formulation – Optimal solution - unbalanced transportation problem – Degeneracy. Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem- Traveling Salesman problem

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

Theory Of Games: Introduction – Minimax (maximin) – Criterion and optimal strategy – Solution of games with saddle points – Rectangular games without saddle points – dominance principle – m X 2 & 2 X n games -graphical method.

UNIT – V

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 – VI

Inventory: Introduction – Single item - Deterministic models – Purchase inventory models with one price break and multiple price breaks – models are not allowed – Stochastic models – demand may be discrete

variable or continuous variable - Instantaneous production, instantaneous demand and continuous demand and no set up cost- Single period model

UNIT – VII

Dynamic Programming: Introduction –Terminology- Bellman's Principle of optimality – Applications of dynamic programming- shortest path problem – linear programming problem

UNIT – VIII

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 /J K Sharma 4e /MacMilan
2. Operations Research / R Pannerselvam 2e.,PHI Publications

REFERENCES:

1. Operations Research /A M Natarajan, P Balasubramani, A. Tamilarasi/ Pearson Education
2. Operations Research: Methods & Problems / Maurice Saseini, Arhur Yaspan & Lawrence Friedman
3. Introduction to O.R /Taha 8e/PHI
4. Operations Research / Wagner/ PHI Publications
5. Operations Research / S.D.Sharma-Kedarnath
6. O.R/Wayne L.Winston/Thomson Brooks/cole
7. Introduction to O.R/Hiller & Libermann/(TMH)

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IV Year B.Tech. ME -I Sem

	L	T/P/D	C
	3	1/-/-	3

(57023) 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.

UNIT II

Steam Power Plant: 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 – III

Internal Combustion Engine Plant: DIESEL POWER PLANT: Introduction – IC Engines, types, construction– Plant layout with auxiliaries – fuel supply system, air starting equipment, lubrication and cooling system – super charging.

UNIT IV

Gas Turbine Plant: Introduction – classification - construction – Layout with auxiliaries – Principles of working of closed and open cycle gas turbines. Combined Cycle Power Plants and comparison.

UNIT – V

Hydro Electric Power Plant: Water power – Hydrological cycle / flow measurement – drainage area characteristics – Hydrographs – storage and Pondage – classification of dams and spill ways.

Hydro Projects And Plant: Classification – Typical layouts – plant auxiliaries – plant operation pumped storage plants.

UNIT VI

Power From Non-Conventional Sources: Utilization of Solar- Collectors- Principle of Working, Wind Energy – types – HAWT, VAWT -Tidal Energy.

Direct Energy Conversion: Solar energy, Fuel cells, Thermo electric and Thermo ionic, MHD generation.

UNIT – VII

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 – VIII

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 BOOK :

1. Power Plant Engineering – P.C.Sharma / S.K.Kataria Pub
2. A Course in Power Plant Engineering: / Arora and S. Domkundwar.

REFERENCES :

1. A Text Book of Power Plant Engineering / Rajput / Laxmi Publications
2. Power plant Engineering/ Ramalingam/ Scietech Publishers
3. Power Plant Engineering: P.K.Nag/ II Edition /TMH.
4. An introduction to Power Plant Technology / G.D. Rai
5. Power plant Engg - Elanchezhian- I.K. International Pub

JAWAHAR LAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. ME -I Sem	L	T/P/D	C
	4	1/-/-	4

(57024) CAD / CAM

UNIT – I

Computers in Industrial Manufacturing, Product cycle, CAD / CAM Hardware, Basic structure, CPU, Memory types, input devices, display devices, hard copy devices, storage devices.

UNIT – II

Computer Graphics: Raster scan graphics coordinate system, database structure for graphics modeling, transformation of geometry, 3D transformations, mathematics of projections, clipping, hidden surface removal.

UNIT – III

Geometric modeling: Requirements, geometric models, geometric construction models, curve representation methods, surface representation methods, modeling facilities desired.

UNIT – IV

Drafting and Modeling systems: Basic geometric commands, layers, display control commands, editing, dimensioning, solid modeling.

UNIT – V

Numerical control: NC, NC modes, NC elements, NC machine tools, structure of CNC machine tools, features of Machining center, turning center, **CNC Part Programming** : fundamentals, manual part programming methods, Computer Aided Part Programming.

UNIT – VI

Group Tech: Part family, coding and classification, production flow analysis, advantages and limitations, Computer Aided Processes Planning, Retrieval type and Generative type.

UNIT – VII

Computer aided Quality Control: Terminology in quality control, the computer in QC, contact inspection methods, noncontact inspection methods-optical, noncontact inspection methods-nonoptical, computer aided testing, integration of CAQC with CAD/CAM.

UNIT – VIII

Computer integrated manufacturing systems: Types of Manufacturing

systems, Machine tools and related equipment, material handling systems, computer control systems, human labor in the manufacturing systems, CIMS benefits.

TEXT BOOKS:

1. CAD / CAM A Zimmers & P Groover / PE/PHI
2. CAD / CAM Theory and Practice / Ibrahim Zeid / TMH

REFERENCES:

1. Automation, Production systems & Computer integrated Manufacturing Groover/PE
2. Computer Aided Design and Manufacturing – Lalit Narayan, Rao/PHI
3. CAD / CAM / CIM / Radhakrishnan and Subramanian / New Age
4. Principles of Computer Aided Design and Manufacturing / Farid Amirouche / Pearson
5. CAD/CAM: Concepts and Applications/ Alavala/ PHI
6. Computer Numerical Control Concepts and programming / Warren S. Seames / Thomson

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IV Year B.Tech. ME -I Sem	L	T/P/D	C
	4	-/-/-	4

(57025) INSTRUMENTATION AND CONTROL SYSTEMS

UNIT – I : Definition – Basic principles of measurement – Measurement systems, generalized configuration and functional descriptions of measuring instruments – examples. Dynamic performance characteristics – sources of error, Classification and elimination of error.

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.

Measurement Of Temperature: Classification – Ranges – Various Principles of measurement – Expansion, Electrical Resistance – Thermistor – Thermocouple – Pyrometers – Temperature Indicators.

UNIT – III : Measurement Of Pressure: Units – classification – different principles used. Manometers, Piston, Bourdon pressure gauges, Bellows – Diaphragm gauges. Low pressure measurement – Thermal conductivity gauges – ionization pressure gauges, Mcleod pressure gauge.

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

Flow Measurement: Rotameter, magnetic, Ultrasonic, Turbine flow meter, Hot – wire anemometer, Laser Doppler Anemometer (LDA)

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

Measurement of Acceleration and Vibration: Different simple instruments – Principles of Seismic instruments – Vibrometer and accelerometer using this principle.

UNIT – VI : Stress Strain Measurements: Various types of stress and strain measurements – electrical strain gauge – gauge factor – method of usage of resistance strain gauge for bending compressive and tensile strains – usage for measuring torque. Strain gauge Rosettes.

UNIT – VII : Measurement Of Humidity. Moisture content of gases, sling psychrometer, Absorption psychrometer, Dew point meter.

Measurement Of Force,Torque And Power: Elastic force meters, load cells, Torsion meters, Dynamometers.

UNIT – VIII : Elements Of Control Systems: Introduction, Importance – Classification – Open and closed systems Servomechanisms – Examples with block diagrams – Temperature, speed and position control systems.

Pre-Requisite:

Objective: This subject provides insight into the different mechanical measurement systems and working and testing procedures.

TEXT BOOKS:

1. Measurement Systems, Applications & Design by D.S.Kumar, Anuradha Agencies
2. Instrumentation, measurement & analysis by B.C.Nakra & K.K.Choudhary, TMH

REFERENCE BOOKS:

1. Instrumentation and Control systems/ S.Bhaskar/ Anuradha Agencies
2. Experimental Methods for Engineers / Holman
3. Mechanical and Industrial Measurements / R.K. Jain/ Khanna Publishers
4. Mechanical Measurements/Sirohi and Radhakrishna / New Age
5. Instrumentation &mech. Measurements by A.K. Tayal ,Galgotia Publications.

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IV Year B Tech ME -I Sem

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3	1/-/-	3

(57026) ROBOTICS

(ELECTIVE - I)

UNIT – I

Introduction: Automation and Robotics – An overview of Robotics – classification by coordinate system and control systems – **Components of the Industrial Robotics:** Degrees of freedom – End effectors: Mechanical gripper – Magnetic – Vacuum cup and other types of grippers – General consideration on gripper selection and design.

UNIT – II

Motion Analysis: Basic rotation matrices – Composite rotation matrices – Euler Angles – Equivalent Angle and Axis – Homogeneous transformation – Problems.

UNIT – III

Manipulator Kinematics: D-H notations – Joint coordinates and world coordinates – Forward and inverse kinematics – problems.

UNIT – IV

Differential Kinematics : Differential Kinematics of planar and spherical manipulators – Jacobians – problems.

UNIT – IV

Robot Dynamics: Lagrange – Euler formulations – Newton-Euler formulations – Problems on planar two link manipulators.

UNIT VI

Trajectory planning: Joint space scheme – cubic polynomial fit – Avoidance of obstacles – **Types of motion:** Slow motion - joint interpolated motion – straight line motion – problems.

UNIT VII

Robot actuators and Feed back components: Actuators: Pneumatic and Hydraulic actuators. **Electric Actuators:** DC servo motors - stepper motors. **Feedback components:** position sensors – potentiometers, resolvers and encoders – Velocity sensors – Tactile sensors.

UNIT VIII

Robot Application in Manufacturing: Material handling – Assembly and inspection.

TEXT BOOKS :

1. Industrial Robotics / Groover M P /Pearson Edu
2. Introduction to Robotic Mechanics and Control by JJ Craig: Pearson, 3rd edition.

REFERENCES :

1. Robotics / Fu K S/ McGraw Hill
2. Robotic Engineering / Richard D. Klafter, Prentice Hall
3. Robot Analysis and Intelligence / Asada and Slotine / Wiley Inter-Science
4. Robot Dynamics & Control - Mark W. Spong and M. Vidyasagar / John Wiley & Sons (ASIA) Pte Ltd.
5. Robotics and Control / Mittal R K & Nagrath I J / TMH

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IV Year B.Tech. ME -I Sem	L	T/P/D	C
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(57027) MECHANICAL VIBRATIONS (ELECTIVE – I)

Unit I : Single degree of Freedom systems - I: Undamped and damped free vibrations; forced vibrations coulomb damping; Response to excitation; rotating unbalance and support excitation; vibration isolation and transmissibility.

Unit II : Single degree of Freedom systems - II: 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 III : Vibration measuring instruments: Vibrometers, velocity meters & accelerometers.

Unit IV : Two degree freedom systems: Principal modes- undamped and damped free and forced vibrations; undamped vibration absorbers.

Unit V : 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.

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

Unit VII : Continuous system: Free vibration of strings, longitudinal oscillations of bars, traverse vibrations of beams; Torsional vibrations of shafts.

Unit VIII : Critical speeds of shafts: Critical speeds without and with damping, secondary critical speed.

TEXT BOOKS:

1. Elements of Vibration Analysis by Meirovitch, TMH, 2001
2. Mechanical Vibrations by G.K.Grover

REFERENCES:

1. Mechanical Vibrations by SS Rao, Pearson, 2008, Ed. 4
2. Mechanical Vibration - Rao V Dukkipati & J Srinivas, PHI, 2010
3. Mechanical Vibrations - V. Ram Murthy
4. Vibration problems in Engineering by S.P. Timoshenko
5. Mechanical Vibrations- S. Graham Kelly, Schaum's Outlines, TMH

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IV Year B.Tech. ME -I Sem	L	T/P/D	C
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(57028) MECHATRONICS

(ELECTIVE – I)

UNIT – I Introduction: Definition - Trends - Control Methods: Stand-alone, PC Based (Real Time Operating Systems, Graphical User Interface, Simulation) - Applications: SPM, Robot, CNC, FMS, CIM.

UNIT – II Signal Conditioning: Introduction – Hardware - Digital I/O , Analog Input – ADC , resolution , speed channels Filtering Noise using passive components – Resistors, capacitors - Amplifying signals using OP amps - Software - Digital Signal Processing – Low pass , high pass , notch filtering.

UNIT – III Precision Mechanical Systems: Pneumatic Actuation Systems - Electro-pneumatic Actuation Systems - Hydraulic Actuation Systems - Electro-hydraulic Actuation Systems - Timing Belts - Ball Screw and Nut - Linear Motion Guides - Linear Bearings - Harmonic Transmission - Bearings- Motor / Drive Selection.

UNIT – IV Electronic Interface Sub systems: TTL, CMOS interfacing - Sensor interfacing - Actuator interfacing – solenoids , motors Isolation schemes- opto coupling, buffer ICs - Protection schemes – circuit breakers , over current sensing , resettable fuses , thermal dissipation - Power Supply - Bipolar transistors / mosfets.

UNIT – V Electromechanical Drives : Relays and Solenoics - Stepper Motors - DC brushed motors – DC brushless motors - DC servo motors - 4-quadrant servo drives. PWMs - Pulse Width Modulation – Variable Frequency Drives. Vector Drives - Drive System load calculation.

UNIT – VI Microcontrollers Overview: 8051 Microcontroller , micro processor structure – Digital Interfacing - Analog Interfacing - Digital to Analog Convertors - Analog to Digital Convertors - Applications, Programming –Assembly/ C | LED Blinking , Voltage measurement using ADC).

UNIT – VII Programmable Logic Controllers: Basic Structure - Programming - Ladder diagram - Timers, Internal Relays and Counters - Shift Registers - Master and Jump Controls - Data Handling - Analog

input / output - PLC Selection - Application

Unit – VIII Programmable Motion Controllers : Introduction - System Transfer Function – Laplace transform and its application in analysing differential equation of a control system - Feedback Devices : Position , Velocity Sensors - Optical Incremental encoders - Proximity Sensors : Inductive , Capacitive , Infrared - Continuous and discrete processes - Control System Performance & tuning - Digital Controllers - P , PI , PID Control - Control modes – Position , Velocity and Torque - Velocity Profiles – Trapezoidal - S. Curve - Electronic Gearing - Controlled Velocity Profile - Multi axis Interpolation , PTP , Linear , Circular - Core functionalities – Home , Record position , Go to Position - Applications : SPM, Robotics.

TEXT BOOKS:

1. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering by W Bolton, Pearson Education Press, 3rd edition, 2005.
2. Mechatronics/M.D.Singh/J.G.Joshi/PHI.

REFERENCES:

1. Mechatronics Source Book by Newton C Braga, Thomson Publications, Chennai.
2. Mechatronics – N. Shanmugam / Anuradha Agencies Publisers.
3. Mechatronics System Design / Devdas shetty/Richard/Thomson.

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IV Year B.Tech. ME -I Sem

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(57029) 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 Reinforcements: Fibres- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and born carbide fibres. Particulate composites, Polymer composites, Thermoplastics, Thermosetts, Metal matrix and ceramic composites.

Unit-III Manufacturing methods: Autoclave, tape production, moulding methods, filament winding, man lay up, pultrusion, RTM.

Unit-IV Macromechanical 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 Hooke's Law for a Two-Dimensional Angle Lamina, Engineering Constants of an Angle Lamina, Invariant Form of Stiffness and Compliance Matrices for an Angle Lamina Strength Failure Envelopes, Maximum Strain Failure Theory, Tsai-Hill Failure Theory, Tsai-Wu Failure Theory Comparison of Experimental Results with Failure Theories. Hygrothermal Stresses and Strains in a Lamina: Hygrothermal Stress-Strain Relationships for a Unidirectional Lamina, Hygrothermal Stress-Strain Relationships for an Angle Lamina.

Unit-VI Micromechanical Analysis of a Lamina: Introduction, Volume and Mass Fractions, Density, and Void Content, Evaluation of the Four Elastic Moduli, Strength of Materials Approach, Semi-Empirical Models, Elasticity Approach, Elastic Moduli of Lamina with Transversely Isotropic Fibers, Ultimate Strengths of a Unidirectional Lamina, Coefficients of Thermal Expansion, Coefficients of Moisture Expansion.

UNIT-VII Macromechanical 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

UNIT-VIII Failure Analysis and Design of Laminates: Introduction, Special Cases of Laminates, Failure Criterion for a Laminate, Design of a Laminated Composite, Other Mechanical Design Issues

TEXTBOOKS

1. Engineering Mechanics of Composite Materials by Isaac and M.Daniel, Oxford University Press, 1994.
2. R. M. Jones, Mechanics of Composite Materials, McGraw Hill Company, New York, 1975.

REFERENCES

1. B. D. Agarwal and L. J. Broutman, Analysis and performance of fibre Composites, Wiley- Interscience, New York, 1980.
2. Mechanics of Composite Materials, Second Edition (Mechanical Engineering), By Autar K. Kaw, Publisher: CRC
3. Ever J. Barbero, Finite Element Analysis of Composite Materials, CRC Press, 2007.
4. 3.L. R. Calcote, Analysis of Laminated Composite Structures, Van Nostrand Rainfold, New York, 1969.
5. Madhujit Mukhopadhyay, Mechanics of Composite Materials and Structures, University Press, 2009.
6. Krishan K. Chawla, Composite Materials Science and Engineering, Springer, 2009, Ed. 6. Robert M. Jones, Mechanics of Composite Materials, 1999, Ed. 2.

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IV Year B.Tech. ME -I Sem

L	T/P/D	C
3	1/-/-	3

(57036) UNCONVENTIONAL MACHINING PROCESSES

(ELECTIVE – II)

UNIT – I

Introduction: Need for non-traditional machining methods-Classification of modern machining processes – considerations in process selection. Materials. Applications.

UNIT II

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

UNIT - III

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

UNIT - IV

Electro–Chemical Processes: Fundamentals of electro chemical machining, electrochemical grinding, electro chemical honing and deburring process, metal removal rate in ECM, Tool design, Surface finish and accuracy economic aspects of ECM – Simple problems for estimation of metal removal rate. Fundamentals of chemical machining, advantages and applications.

UNIT - V

Thermal Metal Removal Processes: General Principle and applications of Electric Discharge

Machining, Electric Discharge Grinding and electric discharge wire cutting processes – Power circuits for EDM, Mechanics of metal removal in EDM, Process parameters, selection of tool electrode and dielectric fluids, methods surface finish and machining accuracy characteristics of spark eroded surface and machine tool selection. Wire EDM, principle, applications.

UNIT – VI

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-VII

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.

UNIT – VIII

Magnetic abrasive finishing, Abrasive flow finishing, Electro stream drilling, Shaped tube electrolytic machining.

TEXT BOOKS:

1. Advanced machining processes/ VK Jain/ Allied publishers
2. Manufacturing Engineering and Technology, Serope Kalpakjian and Steven R. Schmid, Ed. 4, Pearson Publications, 2001

REFERENCES:

1. Modern Machining Process / Pandey P.C. and Shah H.S / TMH.
2. New Technology / Bhattacharya A/ The Institution of Engineers, India 1984.
3. Unconventional Machining Processes/ C. Elanchezhian, B. Vijaya Ramnath and M.Vijayan/ Anuradha Publications/ 2005.

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IV Year B.Tech. ME -I Sem

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(57031) CNC TECHNOLOGIES

(ELECTIVE – II)

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 N/C Machine Tools, design consideration of NC machine tool, methods of improving machine accuracy.

UNIT II:

CNC Machines Elements: Machine Structure- Guide ways - feed drives- spindles - spindle bearings - measuring systems-Tool monitoring systems.

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.

UNIT V:

Compute-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 VI:

DNC Systems and Adaptive Control: Introduction, type of DNC systems, advantages and disadvantages of DNC, adaptive control with optimization, Adaptive control with constraints, Adaptive control of machining processes like turning, grinding.

UNIT VII

Micro Controllers: Introduction, Hardware components, I/O pins, ports, external memory, counters, timers and serial data I/O interrupts, Selection

of Micro Controllers, Embedded Controllers, Applications and Programming of Micro Controllers.

UNIT VIII:

Programming Logic Controllers (PLC's): Introduction, hardware components of PLC, System, basic structure, principle of operations, Programming mnemonics timers, Internal relays and counters, Applications of PLC's in CNC Machines.

TEXT BOOKS:

1. Computer Control of Manufacturing Systems / Yoram Koren / Mc Graw Hill Int. 1983.
2. CAD/CAM - Michel P.Groover, TMH.

REFERENCES:

1. Machining Tools Hand Book Vol 3, (Automation & Control)/ Manfred Weck / John Wiley and Sons, 1984.
2. Mechatronics – HMT, TMH.

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IV Year B.Tech. ME -I Sem

L	T/P/D	C
3	1/-/-	3

(57032) AUTOMATION IN MANUFACTURING

(ELECTIVE – II)

UNIT – I : Introduction: Types and strategies of automation, pneumatic and hydraulic components circuits, Automation in machine tools, Mechanical feeding and tool changing and machine tool control transfer the automation.

UNIT – II : Automated flow lines: Methods or work part transport transfer Mechanical buffer storage control function, design and fabrication consideration.

UNIT – III : Analysis of Automated flow lines: General terminology and analysis of transfer lines without and with buffer storage, partial automation, implementation of automated flow lines.

UNIT – IV : Assembly system and line balancing: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

UNIT – V : Automated material handling: Types of equipment, functions, analysis and design of material handling systems conveyor systems, automated guided vehicle systems.

UNIT -VI : Automated storage systems, Automated storage and retrieval systems, work in process storage, interfacing handling and storage with manufacturing.

UNIT – VII : Fundamentals of Industrial controls: Review of control theory, logic controls, sensors and actuators, Data communication and LAN in Manufacturing.

UNIT – VIII : Business process Re-engineering: Introduction to BPE logistics, ERP, Software configuration of BPE, concurrent Engineering, Techniques of Rapid Proto typing.

TEXT BOOK:

1. Automation, Production Systems and Computer Integrated Manufacturing, M.P. Groover 3e /PE/PHI, 2009.

REFERENCES:

1. Computer Aided Manufacturing, Tien-Chien Chang, Richard A. Wysk and Hsu-Pin Wang, Pearson, 2009.
2. Automation by W. Buckinsham.

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IV Year B.Tech. ME -I Sem

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3	1/-/-	3

(57033) DESIGN FOR MANUFACTURING

(Elective - II)

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:

Materials: **Selection of Materials for design – Developments in Material Technology – Criteria for material selection – Material selection interrelationship with process selection – process selection charts.**

UNIT III:

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 IV:

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 V:

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 – Design of brazed joints.**

UNIT VI:

Forging: Design factors for Forging – Closed die forging design – parting lines of dies – Drop forging die design – General design recommendations

UNIT VII:

Extrusion, Sheet Metal Work & Plastics Design guidelines for Extruded sections - Design principles for Punching, Blanking, Bending, Deep Drawing – Keeler Goodman Forming Limit Diagram – Component Design for Blanking.

UNIT VIII:

Design For Assembly General design guidelines for Manual Assembly- Development of Systematic DFA Methodology- Assembly Efficiency- Classification System for Manual handling- Classification System for Manual Insertion and Fastening- Effect of part symmetry on handling time-

TEXT BOOKS:

1. Product design for Manufacture and Assembly/ Geoffrey Boothroyd/ Marcel Dekker Inc. NY. 2006
2. Product Design/ Kevin Otto and Kristin Wood/ Pearson Education, 2004

REFERENCE BOOK:

1. Product design and Manufacturing / A.K. Chitale and R.C. Gupta / Prentice – Hall of India. New Delhi, 2003.

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IV Year B.Tech. ME -I Sem

L	T/P/D	C
0	-/3/-	2

(57605) 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 scanning and plotting. Study of script, DXE AND IGES FILES.
2. **Part Modeling** : Generation of various 3D Models through Protrusion, revolve, shell sweep. Creation of various features. Study of parent child relation. Feature based and Boolean based modeling surface and Assembly Modeling. Study of various standard Translators. Design simple components.

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

b) Determination of deflections component and principal and Von-mises stresses in plane stress, plane strain and Axisymmetric components.

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

d) Estimation of natural frequencies and mode shapes, harmonic response of 2D beam.

e) Steady state heat transfer Analysis of plane and Axisymmetric components.

4.a) Development of process sheets for various components based on tooling Machines.

b) Development of manufacturing and tool management systems.

c) Study of various post processors used in NC Machines.

d) Development of CNC part program for turnig components and milling components.

e) Machining of simple components on NC lathe and Mill by transferring NC Code / from a CAM package Through RS 232.

f) Quality Control and inspection.

Any Six Software Packages from the following: use of Auto CAD, Micro Station, CATIA, Pro-E, I-DEAS, ANSYS, NISA, CAEFEM, Gibbs CAM, Master CAM etc.

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IV Year B.Tech. ME -I Sem

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(57606) 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.

UNIT – II

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

UNIT – III

Form and Positional Tolerances: Introduction and indication of the tolerances of from and position on drawings, deformation of runout and total runout and their indication.

UNIT – IV

Surface roughness and its indication: Definitions – finishes obtainable from various manufacturing processes, recommended surface roughness on mechanical components.

UNIT – V

Heat treatment and surface treatment symbols used on drawings.

UNIT – VI

Detailed and Part drawings: Drawing of parts from assembly drawings with indications of size, tolerances, roughness, form and position errors etc.

UNIT – VII

Part drawing 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:

1. Geometric dimensioning and tolerancing: James D. Meadows/ B.S. Publications

2. Engineering Metrology, R.K. Jain, Khanna Publications

(b) INSTRUMENTATION LAB

1. Calibration of Pressure Gauges
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.
6. Calibration of capacitive transducer for angular displacement.
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 roto meter 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.

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IV Year B Tech. ME -II Sem	L	T/P/D	C
	3	1/-/-	3

(58015) PRODUCTION PLANNING AND CONTROL

UNIT-I : Introduction Definitions – objectives of production planning and control- functions of production planning and control-elements of production control- types of production- organization of production planning and control – internal organizations department

UNIT-II : Forecasting – Importance of forecasting – types of forecasting, their uses- general principles of forecasting techniques- Qualitative methods and quantitative methods.

UNIT-III : Inventory management – Functions inventory- Relevant inventory cost- ABC analysis- VED Analysis- EOQ model – inventory control systems – P- Systems and Q – Systems

UNIT – IV : Introduction to MRP And ERP, LOB(Line of balance), JIT inventory, Japanese concepts.

UNIT- V : Routing – Definition – routing procedure- Route sheets – Bill of material- factors affecting routing procedure, Schedule – definition – difference with loading

UNIT-VI : Scheduling polices – techniques, standard scheduling methods- job shop, flow shop.,

UNIT-VII : Line balancing, aggregate planning- methods for aggregate planning- Chase planning, expediting, control aspects.

UNIT-VIII : Dispatching – Activities of dispatcher- Dispatching procedure - follow up – definition – reasons for existence of functions – types of follow up, applications of computer in production planning control

TEXT BOOKS:

1. Production Planning and Control – V Mahajan- Dhanpat rai & Co
2. Production Planning and Control- Jain & Jain – Khanna publications

REFRENCE BOOKS:

1. Production Planning and Control- Text & cases- SK Vaithyanathan, Khanna
2. Production and operations Management – R Panneer Selvam – PHI
3. Operations Management by Chase PHI
4. Management Science – A R Aryasri- 4e – TMH
5. Operations management – Heizer- Pearson

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IV Year B.Tech. ME -II Sem	L	T/P/D	C
	3	1/-/-	3

(58016) ARTIFICIAL NEURAL NETWORKS

(Elective – IV)

UNIT I

Introduction - what is a neural network? Human Brain, Models of a Neuron, Neural networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks

UNIT II

Learning Process – error Correction learning, Memory based learning, Hebbian learning, Competitive, Boltzmann learning, Credit Assignment Problem, Memory, Adaption, Statistical nature of the learning process

UNIT III

Single layer perceptrons – Adaptive filtering problem, Unconstrained Organization Techniques, Linear least square filters, least mean square algorithm, learning curves, Learning rate annealing techniques, perceptron –convergence theorem, Relation between perceptron and Bayes classifier for a Gaussian Environment

UNIT IV

Multilayer Perceptron – Back propagation algorithm XOR problem, Heuristics, Output representation and decision rule, Computer experiment, feature detection

UNIT V

Back Propagation - back propagation and differentiation, Hessian matrix, Generalization, Cross validation, Network pruning Techniques, Virtues and limitations of back propagation learning, Accelerated convergence, supervised learning

UNIT VI

Self Organization Maps – Two basic feature mapping models, Self organization map, SOM algorithm, properties of feature map, computer simulations, learning vector quantization, Adaptive patter classification

UNIT VII

Neuro Dynamics – Dynamical systems, stability of equilibrium states, attractors, neuro dynamical models, manipulation of attractors as a recurrent network paradigm

UNIT VIII

Hopfield models – Hopfield models, computer experiment

TEXT BOOK:

1. Neural networks: A comprehensive foundation, Simon Heaykin, PHI edition.

REFERENCES:

1. Artificial neural networks - B.Vegnanarayana Prentice Hall of India P Ltd 2005
2. Neural networks in Compiler Intelligence, Li Min Fu TMH 2003
3. Neural networks James A Freeman David M S kapura Pearson education 2004
4. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006

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IV Year B.Tech. ME -II Sem	L	T/P/D	C
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(58017) RELIABILITY ENGINEERING

(ELECTIVE – III)

Unit - I

Basics concepts of reliability: Introduction. Reliability and quality. Failures and failure modes. Causes of failures and reliability. Maintainability and availability. History of reliability, reliability literature.

Unit-II

Reliability mathematics: Introduction. Random experiment. Probability. Random variables, Distribution functions. Discrete distribution. Continuous distribution. Numerical characteristics of random variables. Laplace transform.

Unit-III

Component reliability and hazard models: Introduction. Component reliability from test data. Mean time to failure. Time – dependent hazard models. Stress- Dependent hazard models. Derivation of reliability function using Markov. Treatment of field data.

Unit-IV

System reliability models: Introduction – Systems with components in series – Systems with parallel components – k-out-of-m systems – Non series-parallel systems – Systems with mixed – mode failures – Fault- tree technique.

Unit-V

Maintainability and availability concepts: Introduction – Maintainability function – Availability function – Frequency of failures – Two unit parallel systems with repair – k-out-of-m systems – Preventive maintenance.

Unit-VI

Reliability improvement: Introduction – Improvement components – Redundancy – Element redundancy – unit redundancy – Stand by redundancy – Optimization – Reliability – cost trade off.

Unit-VII

Economics of reliability engineering: Economics issues – Manufacturer's cost – Customer's cost – Reliability achievement cost – models – Reliability utility cost models – Depreciation cost models – Availability cost – model of parallel systems.

Unit-VIII

Reliability management: Reliability programming – Management policies and decision – Reliability management by objectives – Reliability group – Reliability data – Acquisition and analysis – Managing people for reliability.

TEXT BOOKS :

1. Reliability Engineering – Balaguruswamy – TMH
2. Reliability Engineering – L S Srinath

REFERENCE BOOKS

1. Reliability Engineering- Patrick DTO-Wiley Comm-India
2. Reliability Engineering and life testing – Naikan-PHI

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IV Year B.Tech. ME -II Sem	L	T/P/D	C
	3	1/-/-	3

(58018) MAINTENANCE AND SAFETY ENGINEERING

(Elective - III)

UNIT-I

INTRODUCTION: Need for Maintenance, Facts and Figures, Modern Maintenance, Problem and Maintenance Strategy for the 21st Century, Engineering Maintenance Objectives and Maintenance in Equipment Life Cycle, Terms and Definitions.

UNIT-II

Maintenance Management And Control: Maintenance Manual, Maintenance, FacilityEvaluation, Functions of Effective Maintenance Management, Maintenance Project Control Methods, Maintenance Management Control Indices.

UNIT-III

Types of maintainance: Preventive Maintenance, Elements of Preventive, Maintenance Program, Establishing Preventive Maintenance Program PM Program Evaluation and Improvement, PM Measures,PM Models, Corrective Maintenance, Corrective Maintenance Types, Corrective Maintenance Steps and Downtime Components, Corrective Maintenance Measures, Corrective Maintenance Models.

UNIT-IV

Inventory Control In Maintenance: Inventory Control Objectives and Basic Inventory Decisions, ABC Inventory Control Method, Inventory Control Models Two-Bin Inventory Control and Safety Stock, Spares Determination Factors Spares Calculation Methods.

UNIT-V

Quality And Safety In Maintenance: Needs for Quality Maintenance Processes, Maintenance Work Quality, Use of Quality Control Charts in Maintenance Work Sampling, Post Maintenance Testing, Reasons for Safety Problems in Maintenance, Guidelines to Improve Safety in Maintenance Work, Safety Officer's Role in Maintenance Work, Protection of Maintenance Workers.

UNIT-VI

Maintenance Costing: Reasons for Maintenance Costing, Maintenance Budget Preparation Methods and Steps, Maintenance Labor Cost Estimation, Material Cost Estimation, Equipment Life Cycle Maintenance Cost Estimation, Maintenance Cost Estimation Models.

UNIT-VII

Reliability, Reliability Centered Maintenance, RCM: Goals and Principles, RCM Process and Associated Questions, RCM Program Components Effectiveness Measurement Indicators, RCM Benefits and Reasons for Its Failures, Reliability Versus Maintenance and Reliability in Support Phase, Bathtub Hazard Rate Concept, Reliability Measures and Formulas, Reliability Networks, Reliability Analysis Techniques.

UNIT-VIII

Maintainability, Maintainability Importance and Objective, Maintainability in Systems Life Cycle, Maintainability Design Characteristics, Maintainability Functions and Measures, Common Maintainability Design Errors.

TEXT BOOKS

1. Reliability, Maintenance and Safety Engineering by Dr. A.K.Gupta/ Laxmi Publications.
2. Industrial Safety Management by L.M. Deshmukh/TMH

REFERENCES:

1. Maintenance Engineering & Management by R.C.Mishra/ PHI
2. Reliability Engineering by Elsayed/ Pearson
3. Engineering Maintenance a modern approach, B.S Dhillon, 2007, C.R.R publishers

JAWAHAR LAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. ME -II Sem	L	T/P/D	C
	3	1/-	3

(58010) PLANT LAYOUT AND MATERIAL HANDLING
(Elective - III)

UNIT – I : Introduction, Classification of Layout, Advantages and Limitations of different layouts, Layout design procedures, Overview of the plant layout

UNIT – II : Process layout & Product layout: Selection, specification, implementation and follow up, comparison of product and process layout

UNIT – III : Heuristics for Plant layout - ALDEP, CORELAP, CRAFT

UNIT – IV : Group Layout, Fixed position layout- Quadratic assignment model. Branch and bound method

UNIT – V : Introduction, Material handling systems, Material Handling principles, Classification of Material Handling Equipment, Relationship of material handling to plant layout

UNIT – VI : Basic Material Handling systems: Selection, Material Handling method- path, Equipment, function oriented systems

UNIT – VII : Methods to minimize cost of material handling- Maintenance of Material Handling Equipments, Safety in handling

UNIT – VIII : Ergonomics of Material Handling equipment. Design, Miscellaneous equipments

TEXT BOOKS:

1. Operations Management/ PB Mahapatra/PHI
2. Aspects of Material Handling/ Dr. KC Arora & Shinde, Lakshmi Publications

REFERENCES:

1. Facility Layout & Location an analytical approach/ RL Francis/LF Mc Ginnis Jr, White/ PHI
2. Production and Operations Management/ R. Panneerselvam/ PHI
3. Introduction to Material Handling/ Ray, Siddhartha/ New Age

JAWAHAR LAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. ME -II Sem	L	T/P/D	C
	3	-/-/-	3

(58020) RENEWABLE ENERGY SOURCES
(ELECTIVE - IV)

UNIT – I

PRINCIPLES OF SOLAR RADIATION: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT-II

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT-III

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT-IV

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

UNIT-V

BIO-MASS: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

UNIT-VI

GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy, potential in India.

UNIT-VII

OCEAN ENERGY: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT-VIII

DIRECT ENERGY CONVERSION: Need for DEC, Carnot cycle, limitations, [illegible]

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. ME -II Sem

	L	T/P/D	C
	3	1/-/-	3

(58010) PLANT LAYOUT AND MATERIAL HANDLING

(Elective - III)

UNIT – I : Introduction, Classification of Layout, Advantages and Limitations of different layouts, Layout design procedures, Overview of the plant layout

UNIT – II : Process layout & Product layout: Selection, specification, implementation and follow up, comparison of product and process layout

UNIT – III : Heuristics for Plant layout - ALDEP, CORELAP, CRAFT

UNIT – IV : Group Layout, Fixed position layout, Quadratic assignment model, Branch and bound method

UNIT – V : Introduction, Material Handling systems, Material Handling principles, Classification of Material Handling Equipment, Relationship of material handling to plant layout

UNIT – VI : Basic Material Handling systems: Selection, Material Handling method- path, Equipment, function oriented systems

UNIT – VII : Methods to minimize cost of material handling- Maintenance of Material Handling Equipments, Safety in handling

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TEXT BOOKS:

1. Operations Management/ PB Mahapatra/PHI
2. Aspects of Material Handling/ Dr. KC Arora & Shinde, Lakshmi Publications

REFERENCES:

1. Facility Layout & Location an analytical approach/ RL Francis/ LF Mc Ginnis Jr, White/ PHI
2. Production and Operations Management/ R. Panneerselvam/ PHI
3. Introduction to Material Handling/ Ray, Siddhartha/ New Age

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. ME -II Sem

	L	T/P/D	C
	3	-/-/-	3

(58020) RENEWABLE ENERGY SOURCES

(ELECTIVE - IV)

UNIT – I

PRINCIPLES OF SOLAR RADIATION: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT-II

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT-III

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications: solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT-IV

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

UNIT-V

BIO-MASS: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation and economic aspects.

UNIT-VI

GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy, potential in India.

UNIT-VII

OCEAN ENERGY: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT-VIII

DIRECT ENERGY CONVERSION: Need for DEC, Carnot cycle, limitations [illegible]

principles of DEC. Thermo-electric generators: seebeck, peltier and Joule-Thomson effects. Figure of merit, materials, applications. MHD generators: principles, dissociation and ionization, hall effect, magnetic flux. MHD accelerator, MHD Engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells: principles, faradays law's, thermodynamic aspects, selection of fuels and operating conditions.

TEXT BOOKS:

1. Renewable energy resources/ Twidell and Ghosal/ Narosa
2. Non-Conventional Energy Sources /G.D. Rai

REFERENCES:

1. Renewable Energy Sources /Twidell & Weir
2. Solar Energy /Sukhatme
3. Solar Power Engineering / B.S.Magal Frank Krieth & J.F Kreith
4. Principles of Solar Energy / Frank Krieth & John F Kreider
5. Non-Conventional Energy / Ashok V.Desai /Wiley Eastern
6. Non-Conventional Energy Systems / K Mittal /Wheeler
7. Renewable Energy Technologies /Ramesh & Kumar /Narosa

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IV Year B.Tech. ME -II Sem	L	T/P/D	C
	3	1/-/-	3

(58021) JET PROPULSION AND ROCKET ENGINEERING
(ELECTIVE-IV)

UNIT-I : Elements of Gas Turbine theory-Thermo dynamic Cycles, open closed and semi-closed - parameters of performances -cycle modifications for improvement of performance.

UNIT-II : Jet propulsion: Historical sketch-reaction principle -essential features of propulsion devices Thermal Engines, Classification of -Energy flow thrust, Thrust power and propulsion efficiency-Need for Thermal Jet Engines and applications.

UNIT-III : Turboprop and Turbojet-I: Thermo dynamic cycles, plant layout, essential components, principles of operation -performance evaluation.

UNIT-IV : Turboprop and Turbojet-II: Thrust Augmentation and Thrust reversal-Contrasting with piston Engine Propeller plant.

UNIT-V : Ramjet: Thermo dynamic Cycle, plant lay-out, essential components -principle of operation-performance evaluation -comparison among atmospheric thermal jet engines- serqujet and pulse jet, elementary treatment.

UNIT-VI : Rocket Engines: Need for, applications -Basic principles of operation and parameters of performance - classification ,solid and liquid propellant rocket engines advantages, domains of application - propellants -comparison of propulsion systems.

UNIT-VII : Rocket Technology-I: Flight mechanics, Application Thrust profiles, Acceleration -staging of Rockets ,need for -Feed systems, injectors and expansion nozzles -Rocket heat transfer and ablative cooling.

UNIT-VIII : Rocket Technology- II: Testing & instrumentation -Need for Cryogenics -Advanced propulsion Systems elementary treatment of Electrical Nuclear and plasma Arc propulsion.

TEXT BOOKS:

1. Gas Turbines and propulsion systems-P.Khajuha& S.P.Dubey/ Dhanpatrai pub
2. Gas Dynamics & Space Propulsion M.C.Ramaswamy / Jaico Publishing House

REFERENCE BOOKS:

1. Rocket propulsion -Sutton
2. Gas Turbines /Cohen, Rogers & Sarvana Mutoo/Addison Wosley & Longman
3. Gas Turbines/V.Ganesan /TMH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. ME -II Sem

L	T/P/D	C
3	1/-/-	3

(58022) COMPUTATIONAL FLUID DYNAMICS (ELECTIVE – IV)

UNIT-I : Elementary details in numerical techniques: Number system and errors, representation of integers, fractions, floating point arithmetic, loss of significance and error propagation, condition for instability, computational methods for error estimation, convergence of sequences.

UNIT - II : Applied Numerical Methods: Solution of a system of simultaneous Linear Algebraic Equations, iterative schemes of Matrix Inversion, Direct Methods for Matrix Inversion, Direct Methods for banded matrices.

UNIT - III : Finite Difference Applications in Heat conduction and Convection – Heat conduction, steady heat conduction in a rectangular geometry, transient heat conduction, Finite difference application in convective heat transfer, closure.

UNIT - IV : Finite Differences, discretization, consistency, stability, and Fundamentals of fluid flow modeling: Introduction, elementary finite difference quotients, implementation aspects of finite-difference equations, consistency, explicit and implicit methods.

UNIT - V : Introduction to first order wave equation, stability of hyperbolic and elliptic equations, fundamentals of fluid flow modeling, conservative property, the upwind scheme.

UNIT - VI : Review of Equations Governing Fluid Flow and Heat Transfer: Introduction, conservation of mass, Newton's second law of motion, expanded forms of Navier-stokes equations, conservation of energy principle, special forms of the Navier-stokes equations.

UNIT - VII : Steady flow, dimensionless form of Momentum and Energy equations, Stokes equation, conservative body force fields, stream function - Vorticity formulation.

UNIT-VIII : Finite volume method: Approximation of surface integrals, volume integrals, interpolation and differentiation practices, upwind interpolation, [illegible]

TEXT BOOKS

1. Numerical heat transfer and fluid flow / Suhas V. Patankar [illegible] Publishers corporation & Mc Graw Hill
2. Computational Fluid Flow and Heat Transfer / Muralidaran / Narosa Publications

REFERENCES

1. Computational Fluid Dynamics: Basics with Applications / John. D. Anderson / Mc Graw Hill.
2. Fundamentals of Computational Fluid Dynamics / Tapan K. Sengupta / Universities Press.

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IV Year B.Tech. ME -II Sem

L	T/P/D	C
	1/-/-	3

(58023) GAS DYNAMICS (ELECTIVE - IV)

Unit-I : Introduction: Concept of continuum and control volume, continuity equation, momentum equation, streamline, steady one dimensional dynamic equation of a fluid flow with and without friction, energy equation.

Unit-II : Properties of atmosphere, standard atmosphere, relative pressure, use of air and gas tables. Condition for neglecting compressibility. Compressible flow, acoustic velocity, Mach number, Mach cone, Mach angle.

UNIT-III : Isentropic flow: Stagnation enthalpy, density, pressure and temperature, local acoustic speed, maximum speed, variation of Compressibility with mach number.

UNIT-IV : Variable area flow, criteria for acceleration and deceleration, critical condition, nozzle discharge co-efficient, nozzle efficiency, operation of nozzles under varying backpressures.

UNIT-V : Flow in constant area duct: Adiabatic and isothermal flow, calculation of pressure, temperature, density, Mach number relationships. Limiting length of duct for adiabatic and isothermal flow. Fanno line.

UNIT-VI : Diabatic flow: Flow of perfect gases in constant area duct with heat exchange, density temperature, pressure and mach number relationships. Limiting conditions Rayleigh line.

UNIT-VII : Wave phenomenon: Pressure disturbances in compressible fluid, type of shock waves - normal shock. Pressure - density-velocity-temperature and Mach number relations for a plane normal shock.

UNIT-VIII : Shock intensity- Rayleigh- Pitot and Prandtl- Pitot equation for normal shock. Introduction to oblique shockwaves and hypersonic flow.

TEXT BOOKS

1. S.V. Yahya, "Fundamentals of Compressible Flow", New Age International Publishers, 2004.
2. Zoeb Hussain, "Gas dynamics through problems", WILEY EASTERN LTD.

REFERENCES

1. Gas dynamics- E. Radha Krishnan - PHI Publications, 2009
2. H.W. Liepman and A. Roshko, " Gas Dynamics", John Wiley, 1983
3. Cambel and Jennings, "Gas Dynamics", McGraw Hill, 1958

JAWAHAR LAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. ME -II Sem	L	T/P/D	C
	0	-/-/-	2

(58609) INDUSTRY ORIENTED MINI PROJECT

JAWAHAR LAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. ME -II Sem	L	T/P/D	C
	0	-/6/-	2

(58610) SEMINAR

JAWAHAR LAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. ME -II Sem	L	T/P/D	C
	0	-/15/-	10

(58611) PROJECT WORK

JAWAHAR LAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. ME -II Sem	L	T/P/D	C
	0	-/-/-	2

(58612) COMPREHENSIVE VIVA