ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

MECHANICAL ENGINEERING

FOR

B.TECH. FOUR YEAR DEGREE COURSE

(Applicable for batches admitted from 2010-2011)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India
MECHANICAL ENGINEERING

COURSE STRUCTURE

IV YEAR   **II SEMESTER**

S. No.	Subject	T	P	Credits
1	Interactive Computer Graphics	4	-	4
2	**Departmental Elective – II**	4	-	4
3	**Departmental Elective – III**	4	-	4
4	**Departmental Elective – IV**	4	-	4
5	Project Work			12
	Total			**28**

DEPARTMENTAL ELECTIVE- I	DEPARTMENTAL ELECTIVE- II
1. Automobile Engineering 2. Computational Fluid Dynamics 3. Condition Monitoring 4. Rapid Prototyping	1. Metal Corrosion 2. Nanotechnology 3. Automation in Manufacturing 4. Industrial Hydraulics & Pneumatics
DEPARTMENTAL ELECTIVE- III	DEPARTMENTAL ELECTIVE- IV
1. Non Destructive Evaluation 2. DBMS 3. Advanced Materials 4. Power Plant Engineering	1. Production Planning and Control 2. Advanced Optimization Techniques 3. Gas Dynamics & Jet Propulsion 4. Quality and Reliability Engineering

OPEN ELECTIVE

1. MEMS
2. Industrial Robotics(Except for Mechanical Students)

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

IV Year B.Tech. Mech. Engg. II-Sem.

INTERACTIVE COMPUTER GRAPHICS

UNIT-I
INTRODUCTION: Application areas of Computer graphics, overview of graphic system, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations, introduction to PHIGS &GKS and input devices, input device handling algorithms

UNIT-II
OUTPUT PRIMITIVES: Points and lines, line drawing algorithms, mid-point circle algorithm,
Filled area primitives: scan-line polygon fill algorithm, boundary-fill and flood-fill algorithm.

UNIT-III
2-D VIEWING : The viewing pipe-line, viewing coordinat4 reference frame, window to view-port co-ordinate transformations, viewing function, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland-Hodgeman polygon clipping algorithm, segments.

UNIT-IV
3-D OBJECT REPRESENTATION: spline representation, Hermite curve, Bezier curve and B-spline curve, Polygon surfaces, quadric surfaces, Solid modeling Schalars – wire frame, CSG, B-rep. Bezier and B-spline surfaces

UNIT –V
Illumination: Basic illumination models, Light sources, diffuse reflection- lambert's cosine law and point source illumination, specular reflection, Transparency and shadows.
Shading algorithms: Constant intensity algorithm, Phong's shading algorithm, gourand shading algorithm, Comparison of shading algorithms.

UNIT -VI
Visible surface detection methods: Classification, back-face detection, depth-buffer, scan-line, depth sorting

UNIT-VII
COMPUTER ANIMATION: Design of animation sequence, general computer animation functions, raster animation, computer animation language, key frame system, motion specification.

UNIT-VIII
MULTIMEDIA
Introduction: Multimedia-Systems, Technology, Architecture, Hardware trade-offs, contents, PC, Applications, Data compressions, Authoring System

MULTIMEDIA AUTHORING TOOLS

Introduction, types of authoring tools, page based/In card authoring tools, icon-based authoring tools,
Time-based and presentation tools, Object-oriented authoring tools, authorware professional for windows (APW).

TEXT BOOKS:

1. "Computer Graphics C version" Donald Hearn and M. Pauline Baker, Pearson/PHI
2. "Computer Graphics Principles & practice", second edition in C, Foley, VanDam, Feiner and Hughes, Pearson Education

REFERENCE BOOKS:

1. "Computer graphics a practical approach", Er. Rajiv Chopra, S.chand Publications.
2. "Computer Graphics Second edition", Zhigand xiang, Roy Plastock, Schaum's outlines,
   Tata   Mc-Graw hill edition.
3. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
IV Year B.Tech. Mech. Engg. II-Sem.

METAL CORROSION
(DEPARTMENTAL ELECTIVE – II)

UNIT-I
Corrosion –Theoretical aspects. Electrolysis. Principles. Faraday's laws and their application. Current efficiency. Energy efficiency. Ion conductivity. Equivalent and motor conductivities. Tonic mobilities and Transport Nos. Electrode potential, Equilibrium potentials – EMF series. Polarization, over voltage/over potential.

UNIT-II
Activation, concentration, Ohmic polarization. Effect of polarization on electrode processes. Corrosion as an irreversible electrode process. Tafels equation. Tafels slopes. Effect of Temperature, composition and concentration of the corrosive media. Kinetics of electrode process (briefly). Passivity

UNIT-III
Electronic processes. Cathodic Technical processes. Brief classification. Anodic technical process. Corrosion – Electrochemical aspects of Corrosion. Corrosion cells/Electro chemical cells, Concentration cells, Temperature cells. Determination of Electrode potential.

UNIT-IV
Thermodynamic aspects-Nerrnest equation, Helmholtz equation. Galvanic series. Displacement equilibrium and its significance in corrosion processes. Potential – pH, Fe-H_2O diagram. E- I diagrams for prediction of corrosion currents. Polarization resistance , Linear polarization technique for evaluation of I_{corr}.

UNIT-V
Corrosion – Practical aspects .Importance. Direct and indirect losses. Types and Forms of Corrosion. Uniform Corrosion, Pitting Corrosion, Galvanic Corrosion, and Integranular Corrosion, Stress Corrosion cracking. Cavitation Erosion, Erosion Corrosion. Corrosion Fatigue. Differential aeration corrosion. Corrosion rate expressions.

UNIT-VI
Testing methods. Effect of velocity, flow-rate, concentration, temperature and inhibitors on corrosion rates. Corrosion rate calculations.

UNIT-VII
Corrosion prevention, 1) Design aspects 2) Alteration of Environment inhibitors 3) Alteration of the material, pure metals alloys, Non-metallic as structural materials – Reinforcement of the material for reducing, Corrosion rates. 4) Surface protection. Electroplating, Principles – Throwing power and its evaluation.

UNIT-VIII
Commercial plating of Cu, Ni, Cr, Cd, Zn, Ag, Au. Electro-deposition of alloys plating structure of Electro deposits and testing of deposits. 5) Anodic oxidation of Aluminum and its alloys. Commercial anodizing process. Faults in the anodic coating and the remedies. Treatment after anodizing. 6) Cathodic and Anodic protection.

TEXT BOOKS:

1. An introduction to Electrometallurgy, Sharan and Narain, Standard Publishers
2. Corrosion Engineering, MG Fountana, Mc-Graw Hill book company

REFERENCE BOOK:

1. Electro Beam Analysis of Materials, Loretto.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
IV Year B.Tech. Mech. Engg. II-Sem.
NANO TECHNOLOGY
(DEPARTMENTAL ELECTIVE – II)

UNIT-I
GENERAL INTRODUCTION: Basics of Quantum Mechanics, Harmonic oscillator, magnetic Phenomena, band structure in solids, Mossbauer and Spectroscopy, optical phenomena bonding in solids, Anisotropy.

UNIT-II
SILICON CARBIDE: Application of Silicon carbide, nano materials preparation, Sintering of SiC, X-ray Diffraction data, electron microscopy sintering of nano particles,
NANO PARTICLES OF ALUMINA AND ZIRCONIA: Nano materials preparation, Characterization, Wear materials and nano composites,

UNIT-III
MECHANICAL PROPERTIES: Strength of nano crystalline SiC, Preparation for strength measurements, Mechanical properties, Magnetic properties,

Unit -IV
ELECTRICAL PROPERTIES: Switching glasses with nanoparticles,Electronic conduction with nano particles
OPTICAL PROPERTIES: Optical properties, special properties and the coloured glasses

UNIT-V
Process of synthesis of nano powders, Electro deposition, Important naon materials

UNIT-VI:
INVESTIGAING AND MANIPULATING MATERIALS IN THE NANOSCALE: Electron microscopics, scanning probe microscopics, optical microscopics for nano science and technology, X-ray diffraction.

UNIT-VII
NANOBIOLOGY: Interaction between bimolecules and naoparticle surface, Different types of inorganic materials used for the synthesis of hybrid nano-bio assemblies, Application of nano in biology, naoprobes for Analytical Applications-A new Methodology in medical diagnostics and Biotechnology, Current status of nano Biotechnology, Future perspectives of Nanobiology, Nanosensors.

UNIT-VIII

NANOMEDICENS: Developing of Nanomedicens Nanosytems in use,Protocols for nanodrug Administration, Nanotechnology in Diagnostics applications, materials for used in Diagnostics and Therapeutic applications, Molecular Nanomechanics, Molecular devices, Nanotribology, studying tribology at nanoscale, Nanotribology applications.

TEXT BOOKS:

1.   Nano Materials- A.K.Bandyopadhyay/ New Age Publishers.
2.   Nano Essentials- T.Pradeep/TMH

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

IV Year B.Tech. Mech. Engg. II-Sem.

AUTOMATION IN MANUFACTURING
(DEPARTMENTAL 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.

UNIT – II
AUTOMATED FLOW LINES: Methods of part transport, transfer mechanism, buffer storage, control function, design and fabrication considerations.

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
ADAPTIVE CONTROL SYSTEMS: Introduction, adaptive control with optimization, Adaptive control with constraints, Application of A.C. in Machining operations. Use of various parameters such as cutting force, temperatures, vibration and acoustic emission.

UNIT – VIII
Automated inspection: Fundamentals, types of inspection methods and equipment, CMM, machine vision.

TEXT BOOK:
1. Automation, Production Systems and Computer Integrated Manufacturing: M.P. Groover./ PE/PHI

REFERENCE BOOKS:
1. Computer Control of Manufacturing Systems by Yoram Coren.
2. CAD / CAM/ CIM by Radhakrishnan.
3. Automation by W. Buekinsham.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

IV Year B.Tech. Mech. Engg. II-Sem.

INDUSTRIAL HYDRAULICS & PNEUMATICS
(DEPARTMENTAL ELECTIVE – II)

UNIT – I
Fundamentals of Fluid Power Systems-Introduction-types advantages, disadvantages & applications-fluid characteristics-terminologies used in fluid power-hydraulic symbols-hydraulic systems and components-sources-pumping theory-gear, vane & piston pumps.

UNIT-II
Fluid Power Actuators: Introduction-hydraulic actuators-hydraulic cylinders-types, construction, specifications and special types. Hydraulic motors- Working principle-selection criteria for various types-Hydraulic motors in circuits- Formulae-numerical problems

UNIT-III
Hydraulic elements in the design of circuits- Introduction-control elements-direction control valve-check valve-Pressure control valve-Relief valve-Throttle valve-Temperature & Pressure compensation-locations of flow control valve

UNIT-IV
Accumulators & Intensifiers-Types, size &function of accumulators-application & circuits of accumulators- Intensifiers-circuit & Applications.

UNIT-V
Design & drawing of hydraulic circuits-Introduction-case study & specifications-method of drawing a hydraulic circuit-hydraulic cylinder-quick return of a hydraulic cylinder

UNIT-VI
Pneumatic systems-Introduction-symbols used-concepts & components- comparision-types & specifications of compressors-arrangement of a complete pneumatic system-compressed air behaviour- understanding pneumatic circuits-direction control valves

UNIT-VII
Electro pneumatics- Introduction-Pilot operated solenoid valve-electrical connections to solenoids-electro pneumatic circuit switches-relays-solenoids-P.E converter-concept of latching

UNIT-VIII
Applications-Servo systems-Introduction-closed loop, hydro-mechanical and electro hydraulic – conventional and proportional valves-characteristics of proportional and servo valves- PLC applications in fluid power – selected pneumatic / electro pneumatic circuit problems – failure and trouble shooting in fluid power systems.

TEXT BOOKS:

1. Introduction to Hydraulics and Pneumatics by S. Ilango and V. Soundararajan, PHI , New Delhi
2. Applied hydraulics and pneumatics-T. Sunder Selwyn & R. Jayendiran, Anuradha Publications.

REFERENCE BOOKS:

1. Oil Hydraulic Systems, S.R .Majumdar, McGrawHill Companies
2. Pneumatic Systems: Principles and Maintenance, Majumdar, McGrawHill

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
IV Year B.Tech. Mech. Engg. II-Sem.

NON - DESTRUCTIVE EVALUATION
(DEPARTMENTAL ELECTIVE – III)

UNIT – I

ULTRA SONIC HARDNESS TESTING: Flaw Detection Using Dye Penetrants. Magnetic Particle Inspection introduction to electrical impedance, Principles of Eddy Current testing, Flaw detection using eddy currents.

UNIT – II

INTRODUCTION TO X-RAY RADIOGRAPHY: The Radiographic process, X-Ray and Gamma-ray sources, Geometric Principles, Factors Governing Exposure, Radio graphic screens, Scattered radiation, Arithmetic of exposure, Radiographic image quality and detail visibility, Industrial X-Ray films

UNIT – III

X-RAY RADIOGRAPHY PROCESSES: Fundamentals of processing techniques, Process control, The processing Room, Special Processing techniques, Paper Radiography, Sensitometric characteristics of x-ray films, Film graininess signal to noise ratio in radiographs, The photographic latent image, Radiation Protection

UNIT – IV

INTRODUCTION TO ULTRASONIC TESTING: Generation of ultrasonic waves, Horizontal and shear waves, Near field and far field acoustic wave description, Ultrasonic probes-straight beam, direct contact type, Angle beam, Transmission/reflection type, and delay line transducers, acoustic coupling and media

UNIT – V

ULTRASONIC TESTS: Transmission and pulse echo methods, A-scan, B-scan, C-scan, F-scan and P- scan modes, Flaw sizing in ultrasonic inspection: AVG, Amplitude, Transmission, TOFD, Satellite pulse, Multi-modal transducer, Zonal method using focused beam. Flow location methods, Signal processing in Ultrasonic NDT; Mimics, spurious echos and noise. Ultrasonic flaw evaluation.

UNIT – VI

HOLOGRAPHY: Principles and practices of Optical holography, acoustical, microwave, x-ray and electron beam holography techniques.

UNIT – VII
APPLICATIONS - I: NDT in flaw analysis of Pressure vessels, piping

UNIT – VIII
APPLICATIONS - II: NDT in Castings, Welded constructions, etc., Case studies.

TEXT BOOKS:

1. Ultrasonic testing by Krautkramer and Krautkramer
2. Ultrasonic inspection 2 Training for NDT: E. A. Gingel, Prometheus Press,
3. ASTM Standards, Vol 3.01, Metals and alloys

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
IV Year B.Tech. Mech. Engg. II-Sem.

DATA BASE MANAGEMENT SYSTEMS
(DEPARTMENTAL ELECTIVE – III)

UNIT – I

Data base System Applications, data base System VS file System – View of Data – Data Abstraction – Instances and Schemas – data Models – the ER Model – Relational Model – Other Models – Database Languages – DDL – DML – database Access for applications Programs – data base Users and Administrator – Transaction Management – data base System Structure – Storage Manager – the Query Processor

UNIT – II

History of Data base Systems.Data base design and ER diagrams – Beyond ER Design Entities, Attributes and Entity sets – Relationships and Relationship sets – Additional features of ER Model – Concept Design with the ER Model – Conceptual Design for Large enterprises.

UNIT – III

Introduction to the Relational Model – Integrity Constraint Over relations – Enforcing Integrity constraints – Querying relational data – Logical data base Design – Introduction to Views – Destroying /altering Tables and Views.
Relational Algebra – Selection and projection set operations – renaming – Joins – Division – Examples of Algebra overviews – Relational calculus – Tuple relational Calculus – Domain relational calculus – Expressive Power of Algebra and calculus.

UNIT – IV

Form of Basic SQL Query – Examples of Basic SQL Queries – Introduction to Nested Queries – Correlated Nested Queries Set – Comparison Operators – Aggregative Operators – NULL values – Comparison using Null values – Logical connectivity's – AND, OR and NOT – Impact on SQL Constructs – Outer Joins – Disallowing NULL values – Complex Integrity Constraints in SQL Triggers and Active Data bases.

UNIT – V

Schema refinement – Problems Caused by redundancy – Decompositions – Problem related to decomposition– reasoning about FDS – FIRST, SECOND, THIRD Normal forms – BCNF – Lossless join Decomposition – Dependency preserving Decomposition – Schema refinement in Data base Design – Multi valued Dependencies – FORTH Normal Form.

UNIT – VI

Transaction Concept- Transaction State- Implementation of Atomicity and Durability – Concurrent – Executions – Serializability- Recoverability – Implementation of Isolation – Testing for serializability- Lock – Based Protocols – Timestamp Based Protocols- Validation- Based Protocols – Multiple Granularity.

UNIT – VII

Recovery and Atomicity – Log – Based Recovery – Recovery with Concurrent Transactions – Buffer Management – Failure with loss of nonvolatile storage-Advance Recovery systems- Remote Backup systems.

UNIT – VIII

Data on External Storage – File Organization and Indexing – Cluster Indexes, Primary and Secondary Indexes – Index data Structures – Hash Based Indexing – Tree base Indexing – Comparison of File Organizations – Indexes and Performance Tuning- Intuitions for tree Indexes – Indexed Sequential Access Methods (ISAM) – B+ Trees: A Dynamic Index Structure.

TEXT BOOKS:

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill 3rd Edition
2. Data base System Concepts, Silberschatz, Korth, McGraw hill, V edition.

REFERENCE BOOKS:

1. Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate Pearson Education
3. Introduction to Database Systems, C.J.Date Pearson Education

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
IV Year B.Tech. Mech. Engg. II-Sem.

ADVANCED MATERIALS
(DEPARTMENTAL ELECTIVE – III)

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 layup, pultrusion, RTM.

UNIT-IV
MACROMECHANICAL ANALYSIS OF A LAMINA: Introduction, Generalized Hooke's Law, Reduction of Hooke's Law in Three Dimensions to Two Dimensions, Relationship of Compliance and Stiffness Matrix to Engineering Elastic Constants of an orthotropic Lamina, Laminate-Laminate code.

UNIT-V
METAL MATRIX AND CERAMIC MATRIX COMPOSITES: Manufacturing of C.M.C & metal matrix composites and their applications, stress strain relations for MMC and CMC.

UNIT-VI
FUNCTIONALLY GRADED MATERIALS: Types of Functionally graded materials-classification- different systems-Preparation-Properties and applications of Functionally graded materials.

UNIT-VII
SHAPE MEMORY ALLOYS: Introduction-Shape memory effect-Classification of shape memory alloys-Composition-Properties and applications of shape memory alloys.

UNIT-VIII
NANO MATERIALS: Introduction-Properties at nano scales-advantages & disadvantages- applications in comparison with bulk materials (Nano – structure, wires, tubes, composites). State of art nano advanced- topic delivered by student.

TEXT BOOKS:

1. Nano material by A.K. Bandyopadyay, New age Publishers
2. Material science and Technology- Cahan
3. Engineering Mechanics of Composite Materials by Isaac and M Daniel, Oxford University Press

REFERENCE BOOKS:

1. R. M. Jones, Mechanics of Composite Materials, Mc Graw Hill Company, New York, 1975.
2. L. R. Calcote, Analysis of Laminated Composite Structures, Van Nostrand Rainfold.
3. B. D. Agarwal and L. J. Broutman, Analysis and performance of fibre Composites, Wiley-Interscience, New York, 1980
4. Mechanics of Composite Materials, Second Edition (Mechanical Engineering), Autar K.Kaw, Publisher: CRC

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
IV Year B.Tech. Mech. Engg. II-Sem.

POWER PLANT ENGINEERING
(DEPARTMENTAL ELECTIVE – III)

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 handling equipments, types of coals, coal handling, choice of handling equipment, coal storage, Ash handling systems.

UNIT II
STEAM POWER PLANT: Combustion: 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 AND GAS TURBINE POWER PLANTS:
DIESEL POWER PLANT: Plant layout with auxiliaries – fuel supply system, air starting equipment, super charging.

GAS TURBINE PLANT: Introduction – classification – construction–layout with auxiliaries, combined cycle power plants and comparison.

UNIT – IV
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 – V
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 – VI
COMBINED OPERATIONS OF DIFFERENT POWER PLANTS: Introduction, advantages of combined working, load division between power stations, storage type hydro-electric plant in combination with steam plant, run-of-river plant in combination with steam plant, pump storage plant in combination with steam or nuclear power plant, co-ordination of hydro-electric and gas

turbine stations, co-ordination of hydro-electric and nuclear power stations, co-ordination of different types of power plants.

UNIT – VII
POWER PLANT INSTRUMENTATION AND CONTROL: Importance of measurement and instrumentation in power plant, measurement of water purity, gas analysis, O_2 and CO_2 measurements, measurement of smoke and dust, measurement of moisture in carbon dioxide circuit, nuclear measurements.

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 BOOKS:

1. A course in Power Plant Engineering – Arora and Domkundwar, Dhanpatrai & Co.
2. Power Plant Engineering – P.C.Sharma / S.K.Kataria Pub

REFERENCE BOOKS:

1. Power Plant Engineering: P.K.Nag/ II Edition /TMH.
2. Power station Engineering – ElWakil / McHill.
3. An Introduction to Power Plant Technology / G.D. Rai.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
IV Year B.Tech. Mech. Engg. II-Sem.
PRODUCTION PLANNING AND CONTROL
(DEPARTMENTAL ELECTIVE – IV)

UNIT – I
Introduction: Definition – Objectives and functions of production planning and control – Elements of production control – Types of production – Organization of production planning and control department – Internal organization of department.

UNIT – II
Forecasting – Importance of forecasting – Types of forecasting, their uses – General principles of forecasting – Forecasting techniques – qualitative methods and quantitive methods.

UNIT – III
Inventory management – Functions of inventories – relevant inventory costs – ABC analysis – VED analysis – EOQ model – Inventory control systems – P–Systems and Q-Systems –

UNIT – IV
Introduction to MRP I, MRP II, ERP, LOB (Line of Balance), JIT and KANBAN system.

UNIT – V
Routing – definition – routing procedure –route sheets – bill of material – factors affecting routing procedure, schedule –definition – difference with loading

UNIT – VI
Scheduling policies – techniques, standard scheduling methods.

UNIT – VII
Line Balancing, aggregate planning, chase planning, expediting, controlling aspects.

UNIT – VIII
Dispatching – Activities of dispatcher – dispatching procedure – follow up – definition – Reason for existence of functions – types of follow up, applications of computer in production planning and control.

TEXT BOOKS:

1. Elements of Production Planning and Control / Samuel Eilon.
2. Manufacturing, Planning and Control, Partik Jonsson Stig-Arne Mattsson, TataMcGrawHill

REFERENCE BOOKS:

1. Inventory Control Theory and Practice / Martin K. Starr and David W. Miller.
2. Production Planning and Control, Mukhopadyay, PHI.
3. Production Control A Quantitative Approach / John E. Biegel.
4. Production Control / Moore.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
IV Year B.Tech. Mech. Engg. II-Sem.

ADVANCED OPTIMIZATION TECHNIQUES
(DEPARTMENTAL ELECTIVE – IV)

UNIT I
INTRODUCTION TO OPTIMIZATION: Engineering applications of optimization- Statement of an optimization problem- Classification of optimization problem- Optimization techniques.

UNIT-II
CLASSICAL OPTIMIZATION TECHNIQUES: Single variable optimization- Multivariable optimization with equality constraints- Multivariable optimization with inequality constraints.

UNIT-III
NONLINEAR PROGRAMMING: One-Dimensional Minimization: Unimodal function- Elimination methods- Unrestricted search- Exhaustive search- Dichotomous search- Fibonacci method- Golden section method- Interpolation methods- Quadratic interpolation method- Cubic interpolation method- direct root method.

UNIT-IV
NONLINEAR PROGRAMMING: Unconstrained Optimization Techniques: Direct search methods- Random search methods- Univariate method- Pattern search method- Rosenbrock's method of rotating coordinates- The simplex method- Descent methods- Gradient of function- Steepest descent method- Conjugate gradient method (Fletcher-Reeves method)- Quasi-Newton methods- Variable metric method (Davidon- Fletcher-Powell method).

UNIT-V
NONLINEAR PROGRAMMING: Constrained Optimization Techniques: Characteristics of a constrained problem- Direct method- The complex method- Cutting plane method- Methods of feasible directions- Indirect methods- Transformation techniques- Basic approach in the penalty function method- Interior penalty function method- Convex programming problem- Exterior penalty function method.

UNIT-VI
GEOMETRIC PROGRAMMING (G.P): Solution of an unconstrained geometric programming, differential calculus method and arithmetic method. Primal dual relationship and sufficiency conditions. Solution of a constrained geometric programming problem (G.P.P). Complimentary geometric programming (C.G.P)

UNIT-VII
DYNAMIC PROGRAMMING (D.P): Multistage decision processes. Concepts of sub optimization, computational procedure in dynamic programming calculus method and tabular methods. Linear programming as a case of D.P., Continuous D.P.

UNIT-VIII
INTEGER PROGRAMMING (I.P): Graphical representation. Gomory's cutting plane method. Bala's algorithm for zero-one programming problem. Integer non linear programming.

TEXT BOOK:
1. Optimization Theory and Applications, by S.S.Rao, Wiley Eastern Limited, New Delhi.

REFERENCE BOOKS:

1. Engineering Optimization By Kalyanmanai Deb, Prentice Hall of India, New Delhi.
2. Optimization Techniques,C.Mohan, Kusum Deep.
3. Operations Research by S.D.Sharma

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
IV Year B.Tech. Mech. Engg. II-Sem.
GAS DYNAMICS AND JET PROPULSION
(DEPARTMENTAL ELECTIVE – IV)

UNIT-I
Introduction to gas dynamics: control volume and system approaches acoustic waves and sonic velocity - Mach number - classification of fluid flow based on mach number - mach cone-compressibility factor - General features of one dimensional flow of a compressible fluid - continuity and momentum equations for a control volume.

UNIT-II
Isentropic flow of an ideal gas: basic equation - stagnation enthalpy, temperature, pressure and density-stagnation, acoustic speed - critical speed of sound- dimensionless velocity-governing equations for isentropic flow of a perfect gas - critical flow area - stream thrust and impulse function.

UNIT-III
Steady one dimensional isentropic flow with area change-effect of area change on flow parameters- chocking- convergent nozzle - performance of a nozzle under decreasing back pressure -De lavel nozzle - optimum area ratio effect of back pressure - nozzle discharge coefficients - nozzle efficiencies.

UNIT- IV
Simple frictional flow: adiabatic flow with friction in a constant area duct-governing equations - fanno line limiting conditions - effect of wall friction on flow properties in an Isothermal flow with friction in a constant area duct-governing equations - limiting conditions.

UNIT-V
Steady one dimensional flow with heat transfer in constant area ducts- governing equations - Rayleigh line entropy change caused by heat transfer - conditions of maximum enthalpy and entropy.

UNIT-VI
Effect of heat transfer on flow parameters: Intersection of Fanno and Rayleigh lines. Shock waves in perfect gas- properties of flow across a normal shock - governing equations - Rankine Hugoniat equations - Prandtl's velocity relationship - converging diverging nozzle flow with shock thickness - shock strength.

UNIT- VII

Propulsion: Air craft propulsion: - types of jet engines - energy flow through jet engines, thrust, thrust power and propulsive efficiency turbojet components-diffuser, compressor, combustion chamber, turbines, exhaust systems.

UNIT-VIII

Performance of turbo propeller engines, ramjet and pulsejet, scramjet engines. Rocket propulsion - rocket engines, Basic theory of equations - thrust equation - effective jet velocity - specific impulse - rocket engine performance - solid and liquid propellant rockets - comparison of various propulsion systems.

TEXT BOOKS:

1.   Compressible fluid flow - A. H. Shapiro
2.   Fundamentals of compressible flow with aircraft and rocket propulsion- S. M. Yahya

REFERENCE BVOOKS:

1.   Elements of gas dynamics - Liepman & Roshko
2.   Aircraft & Missile propulsion - Zucrow
3.   Gas dynamics - M.J. Zucrow & Joe D.Holfman

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

IV Year B.Tech. Mech. Engg. II-Sem.
QUALITY AND RELIABILITY ENGINEERING
(DEPARTMENTAL ELECTIVE – IV)

UNIT-I
Quality value and engineering – quality systems – quality engineering in product design and production process – system design – parameter design – tolerance design, quality costs – quality improvement.

UNIT-II
Statistical Pprocess control   X, R, p, c charts, other types of control charts, process capability, process capability analysis, process capability index. (SQC tables can be used in the examination)

UNIT-III
Acceptance sampling by variables and attributes, design of sampling plans, single, double, sequential and continuous sampling plans, design of various sampling plan.

UNIT-IV
Loss function, tolerance design – N type, L type, S type; determination of tolerance for these types. online quality control – variable characteristics, attribute characteristics, parameter design.

UNIT-V
Quality function deployment – house of quality, QFD matrix, total quality management concepts. quality information systems, quality circles, introduction to ISO 9000 standards.

UNIT-VI
Reliability – Evaluation of design by tests - Hazard Models, Linear, Releigh, Weibull. Failure Data Analysis, reliability prediction based on weibull distribution, Reliability improvement.

UNIT-VII
Complex system, reliability, reliability of series, parallel & standby systems & complex systems & reliability prediction and system effectiveness.

UNIT-VIII
Maintainability, availability, economics of reliability engineering, replacement of items, maintenance costing and budgeting, reliability testing.

TEXT BOOKS:

1. Eugene Grant, Richard Leavenworth "Statistical Process Control",McGraw Hill.
2. G Taguchi, 'Quality Engineering in Production Systems', - McGraw Hill, 1989.
3. W.A. Taylor, 'Optimization & Variation Reduction in Quality', Tata McGraw Hill, 1991, 1st Edition.

REFERENCE BOOKS:

1. Frank.M.Gryna Jr. "Jurans Quality planning & Analysis", McGraw Hill.
2. Philipposs, 'Taguchi Techniques for Quality Engineering', McGraw Hill, 1996, 2nd Edition.
3. LS Srinath, 'Reliability Engineering', Affiliated East West Pvt. Ltd., 1991, 3rd Edition.
4. E.Bala Guruswamy, 'Reliability Engineering', Tata McGraw Hill, 1994.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

IV Year B.Tech. Mech. Engg. II-Sem.

PROJECT WORK

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