

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

IV Year B.Tech. AU-II Sem

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**(A82410) ALTERNATE FUELS FOR AUTOMOBILES****Unit-I**

**Compressed Natural Gas(CNG)** : Introduction-History of CNG-Production of CNG- properties of CNG-CNG storage-Piping for CNG-Advantages and Disadvantages of CNG-CNG dispensing systems-CNG transportation-Material compatibility for CNG-CNG fuel kits-Engine modifications for CNG operations-CNG combustion- Stoichiometric vs. Lean burn CNG engines-Engine optimization- Vehicle emission from CNG- After treatment of CNG exhaust – CNG fuelling station safety systems- CNG standards and regulations - Third - party inspection for alternative fuels vehicles. CNG vehicles world wide –in India.

**Unit-II**[www.universityupdates.in](http://www.universityupdates.in)

**Liquefied Natural Gas (LNG)**: Introduction-history of LNG-production of LNG – properties-economics of LNG- Advantages and Disadvantages-transportation and storage of LNG-Piping for LNG-LNG dispensers LNG to CNG conversion system-regulations for LNG-LNG vehicle world wide-Vehicle performance characteristics for LNG- Vehicle emissions from LNG-LNG India.

**Liquefied Petroleum Natural Gas (LPG)**: Introduction-History of LPG-Production of LPG- properties, Storage of LPG-dispensing of LPG-LPG nozzles and receptacles-material compatibility for LPG- Piping, safety systems and transportation of LPG-Advantages and Disadvantages of LPG-LPG engine developments-LPG fuel kits and combustion, Emission from LPG-LPG Standards-LPG Vehicle world wide-LPG Scenario in India.

**Unit-III**[www.universityupdates.in](http://www.universityupdates.in)

**Liquefied Hydrogen**: Properties of Hydrogen- Production of hydrogen-photochemical production of Hydrogen – Algal production of Hydrogen(Bio Hydrogen)-On- board storage of Hydrogen-metal hydrates-compressed hydrogen gas- activates carbon storage-Hazards with  $LH_2$ - Advantages and Disadvantages of  $LH_2$ - Transportation of  $LH_2$ -Piping for  $LH_2$ - Dispensers for  $LH_2$  vehicle emissions from  $LH_2$ - BMW liquid hydrogen cars - liquid hydrogen in India.

**Bio-Fuels**: Bio gas – Methanol- Ethanol- Butanol- straight vegetable oil – bio diesels- properties – production- storage methods – power densities-advantages and disadvantages over conventional fuels- specific design criteria use in automobiles.

[www.universityupdates.in](http://www.universityupdates.in)

#### Unit-IV

**Electric vehicles:** Introduction- batteries electric vehicle-components of EV- EV batteries- EV chargers- EV drives- EV tractive force -EV transmission- EV motor design- EV Power devices and controllers-Advantages and Disadvantages-Performance characteristics- testing –EV challengers- EV scenario in India-Hybrid electric vehicles- International status of Hybrid EVs- HEV batteries- HEV ultra capacitors- HEV motors- HEV transmissions- drive train components, HEV performance specifications.

#### Unit V

**Fuel cell Power vehicles:** Fuel cell vehicle-Benefits of fuel cells for automotive industry- Basics, efficiency and types of fuel cells-Fuel cell options for fuel cell vehicle-fuel regulations- Fuel cell hybrid vehicle- Fuel cell solar vehicle, Solar photovoltaic cell, Solar car electrical system and drive train, solar array-solar car body and chassis-Hybrid gas turbine EV – Nuclear car-road map for alternative power trains.

[www.universityupdates.in](http://www.universityupdates.in)

#### TEXT BOOKS:

1. Alternative fuels/ SS Thipse/ JAICO Publishers/ 2010.
2. Alternative fuel technology/ Erjavec, Arias/ Yesdee Publications/ 2009.

#### REFERENCES:

1. A text book of alternative fuel of Automobile Engine, Ramireddy and Yousuf, Front line Publishers.
2. The Complete Idiot's Guide to Hybrid and Alternative Fuel Vehicles by Jack R. Nerad.
3. Hybrid and Alternative Fuel Vehicles (New Edition) by James D. Halderman.
4. Powering Your Vehicle With Straight Vegetable Oil by Forest Gregg.

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## (A82411) VEHICLE TRANSPORT MANAGEMENT (ELECTIVE - III)

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### UNIT - I

**Historical Background:** Introduction, the growth of a network, trams, trolley buses, private car's subsidies.

**The Infrastructure:** Road- Approach Road. Highways National, State, District, traffic condition, relief of congestion, pedestrians, zebra lines, margins, shopping centres. Bus-stops. shelters. Bus stations. Garages layout of premises, equipment, use of machinery, conveyance of staff, facilities for passengers. Maintenance -preventive, breakdown, overhauling -major, minor.

**Organisation and Management:** Forms of ownership, principle of transport, management -internal organisation, centralised condition, decentralised condition (Engineering, traffic and administration), staff administration: industrial relation, administration, recruitment and training, welfare, health and safety.

### UNIT - II

**Public relations divisions:** Dissemination of information, maintaining goodwill- handling complaints, traffic advisory. Committees- local contractors co-operation with the press news and articles- facilities for visitors- forms of publicity importance of quality -inter departmental liaison advertisements, signs, notice and directions general appearance of premises, specialized publicity.

**Prevention of accidents:** Emphasis of safe driving-annual awards bonus encouragement vehicle design platform, layout, location of steps, scheduled route hazards records elimination of accident prone devices.

### UNIT -III

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**Timing, bus working and schedules:** Time table layout uses of flat graph method of presentation preparation of vehicle and crew schedule preparation of the duty roster, co-operation with employers use of the vehicle running numbering determination of vehicle efficiency, checking efficiency of crew, duty arrangements.

**Route planning:** Source of traffic. town planning. turning points, stopping places, shelters survey of route preliminary schedule test runs elimination of hazards factors affecting. Frequency direction of traffic flow estimated traffic possibility single verses double deck.



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#### UNIT – IV

**Fare collections systems:** Principles of collection the way bill, bell punch system reduced ticket stocks wilk brew system T.I.M and straight /M/C/S. The verometerlensonparason coach tickets exchanges, box system personal and common stock flat fare platform control.

**The fare structure:** Basis of fares historical background effects of competition and control calculating average zone system straight and tapered scale elastic and inelastic demand coordination of fares concessions fares changes for workman. Anomalies double booking inter availability through booking and summation private hire charges.

#### UNIT- V

[www.universityupdates.in](http://www.universityupdates.in)

**Operating cost and types of vehicles:** Classification costs, average speed running costs supplementary costs depreciation obsolescence, life of vehicles sinking fund factor affecting post per vehicles mile incidence of wages and overheads 100 seats miles basis, average seating capacity vehicles size and spread over types of vehicle economic considerations authorization of trolley, bus services, statutory procedure taxes and hire cars.

#### TEXT BOOKS:

1. Bus Operation – L.D. Kitchen, Elms & Sons.
2. Bus & Coach Operation – Rex W. Faulks, Butterworth Version of 1987.

#### REFERENCES:

1. Compendium of Transport Terms, CIRT, Pune.
2. M.V. Act 1988 Central Law Agency, Allahabad.
3. The Elements Of Transportation –R.J. Eaton.
4. Goods Vehicle Operation –By C.S. Dubbar 5. Road Transport Law- L.D. Kitchen.
5. Road Transport Law – L.D. Kitchen.

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### (A81405) PRODUCT DESIGN AND ASSEMBLY AUTOMATION (ELECTIVE -III)

#### UNIT I

**Automatic Feeding And Orienting Devices:** Vibrator feeders, Mechanics of vibratory conveying, load sensitivity, solutions to load sensitivity, spiral elevators, balanced feeders. Types of oriental systems, effect of active orienting devices on feed rate, natural resting aspects of parts for automatic handling, out-of-bowl tooling. Reciprocating - tube hopper feeder.

#### UNIT II

[www.universityupdates.in](http://www.universityupdates.in)

**Automatic Assembly Transfer Systems:** Assembly machines classification, Continuous transfer, intermittent transfer, indexing mechanisms, and operator - paced free - transfer machine, choice of assemble method, advantages and disadvantages of automation

#### UNIT III

**Product design for High speed Automatic Assembly and Robot Assembly :** Introduction, design of parts for: high speed, feeding and orienting, example, additional feeding difficulties, high speed automatic insertion, example, analysis of an assembly, general rules for product design for automation, product design for robot assembly.

#### UNIT IV

**Design for Manual Assembly :** General design guidelines for manual assembly, development of the systematic DFA methodology, assembly efficiency, classification system for manual handling, classification system for manual insertion and fastening, effect of part symmetry on handling time, effect of part thickness and size on handling time, effect of weight on handling time, parts requiring two hands for manipulation, effect of symmetry effect of chamfer design on insertion operations, estimation of insertion time, reducing disk assembly problems.

#### UNIT V

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**Performance and Economics of Assembly Systems:** Indexing machines-effects of parts quality on down time and production time, free transfer machines- performance of free transfer machine, comparison of indexing and free - transfer machines.

#### TEXT BOOKS:

1. Geoffrey Boothroyd, "Assembly Automation and Product Design", Marcel Dekker Inc., NY, 1992.

2. Geoffrey Boothroyd, Peter Dewhurst, Winston Knight, "Product design for Manufacture and assembly", 2e, CRC Press.

#### REFERENCES:

1. A.K. Chitale, RC Gupta, "Product design and Manufacturing", PHI.
2. Geoffrey Boothroyd, "Hand Book of Product Design" Marcel and Dekken, N.Y. 1990.
3. A Delbainbre "Computer Aided Assembly London, 1992.

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**(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.

[www.universityupdates.in](http://www.universityupdates.in)

**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.

[www.universityupdates.in](http://www.universityupdates.in)

**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

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**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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**(A80241) RELIABILITY ENGINEERING**  
**(ELECTIVE – III)**

**Unit - I**

**Basic 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**

[www.universityupdates.in](http://www.universityupdates.in)

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

**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-III**

**System Reliability Models:** Introduction - Systems with series components - Systems with parallel components - k-out-of-m systems - Non series parallel systems - Systems with mixed mode failures - Fault- tree technique.

**Unit-IV**

**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.

**Reliability Improvement:** Introduction - Improvement components - Redundancy - Element redundancy - Unit redundancy - Stand by redundancy - Optimization - Reliability – cost trade – off.

**Unit-V**

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**Economics of Reliability Engineering:** Economic issues -Manufacture's cost- Customer's cost - Reliability achievement cost - models - Reliability utility cost models - Depreciation cost models - Availability – cost – model of parallel systems.

**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 Evaluation of Engineering Systems. R. Billington, RN Allan, BS Publications 2007.
2. Reliability, Maintenance and safety Engineering - Dr. A.K. Gupta, Laxmi Publications.

**REFERENCE BOOKS:**

[www.universityupdates.in](http://www.universityupdates.in)

1. Reliability Engineering- Patrick DTO-Wiley India.
2. Reliability Engineering and life testing -Naikan-PHI.
3. Engineering Maintenance a Modern Approach, B.S.Dhillon,2002 CRR Publications.
4. Maintenance Engineering and Management – RC Misra, PHI.
5. Reliability Engineering – Balaguruswamy- TMH.
6. Reliability Engineering- L.S.Srinath.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****IV Year B.Tech. AU-II Sem****L T/P/D C****4 -/- 4****(A80129) PRINCIPLES OF ENTREPRENEURSHIP  
(ELECTIVE-IV)****UNIT I**

Introduction to Entrepreneurship – The Entrepreneurial Process, What is Entrepreneurship, Why Become an Entrepreneur, Entrepreneurship importance, Economic impact of Entrepreneurial firms, Recognizing Opportunities and Generating ideas, Techniques for generating Ideas, Encouraging and protecting New ideas.

Feasibility Analysis – Industry / Market Feasibility Analysis, Organizational Feasibility Analysis, Financial Feasibility Analysis, Importance of Industry and firm – Specific Factors, Developing effective business models – partnering of success.

**UNIT II**[www.universityupdates.in](http://www.universityupdates.in)

Moving from an idea to an Entrepreneurial firm – building a new venture team, Assessing a new venture's financial strength and viability, Financial statements and forecasts, pro forma financial statements, preparing the proper ethical and legal foundation, choosing a form of business organization, the legal environment of the internet, procedure for SSI registration.

**UNIT III**

Writing a Business Plan, What is Business Plan, why Business Plan is important, Outline of Business Plan, Business Planning process, Implementing Business Plans, Marketing plan, financial plan and the organizational plan.

Sources of Finance, Sources of Equity funding, Sources of debt Financing, Creative sources of financing and funding, Capital Structure, venture capital industry – an overview.

**UNIT IV**[www.universityupdates.in](http://www.universityupdates.in)

Institutional Frame Work: Small Industries Development Bank of India(SIDBI), The National Institute of Entrepreneurship and Small Business Development (NISBUD), National Small Industries Corporation (NSIC), Entrepreneurship Development Institute of India, National Bank for Agricultural & rural Development (NABARD), The Indian Institute of Entrepreneurship (IIE), Small Scale Industries Board, Industrial Development Bank of India, Khadi and village Industries Commission, National Institute of Micro, Small & Medium Enterprises (NIMSME).



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## UNIT V

Organizing and Management, Working Capital Management, Purchasing and Inventory Management, Production and Operation Management, Issues in Small Business Marketing, Channels of Distribution, Profit Planning and Budgeting.

Labour legislation, Salient Provision under Indian Factories Act, Industrial Disputes Act, Employees State Insurance Act, Workmen's Compensation Act and payment of Bonus Act.

### TEXT BOOKS:

[www.universityupdates.in](http://www.universityupdates.in)

1. Bruce R. Barringer, Entrepreneurship, Pearson Education, 2009.
2. Madhurima Lall Shikha Sahai, Entrepreneurship, Excel Books, 2<sup>nd</sup> Edition, 2008.

### REFERENCES:

1. Vasant Desai: Fundamentals of Entrepreneurship and small business management, Himalaya Publishing House, 2010.
2. K. Ramachandran, Entrepreneurship Development, TMH 2010.
3. ND Kapoor: Industrial Law, Sultan Chand & Sons, 2009.
4. Robert D Hisrich, & Michael P Peters, Dean A Shepherd, Entrepreneurship, TMH, 6th Edition, 2009.
5. Poornima M Charantimath, Entrepreneurship Development Small Business Enterprises, Pearson Education, Fourth Impression 2009.
6. A Sahay & V. Sharma, Entrepreneurship and New Venture creation, Excel Books, 2008.
7. Agarwal :Indian Economy , Wishwa Prakashan 2010.
8. Dutt & Sundaram : Indian Economy. S. Chand, 2010.
9. Srivastava: Industrial Relations & Labour Laws, Vikas, 2009.

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**(A80336) AUTOMATION IN MANUFACTURING****(ELECTIVE – IV)****UNIT – I**[www.universityupdates.in](http://www.universityupdates.in)

**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 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 – IV**

**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:**[www.universityupdates.in](http://www.universityupdates.in)

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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## (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 tilted surface, Instruments for measuring solar radiation and sun shine, solar radiation data.

## UNIT - II

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**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

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**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 / 2<sup>nd</sup> Special Indian Edition.
2. Non- conventional Energy Sources / G.D. Rai / Dhanpat Rai and Sons.

[www.universityupdates.in](http://www.universityupdates.in)

**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.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****IV Year B.Tech. AU-II Sem****L T/P/D C****4 -/- 4****(A80365) PLANT LAYOUT AND MATERIAL HANDLING****(ELECTIVE - IV)****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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**(A80087) INDUSTRY ORIENTED MINI PROJECT**[www.universityupdates.in](http://www.universityupdates.in)**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

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**(A80089) SEMINAR****JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

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**(A80088) PROJECT WORK****JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

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**(A80090) COMPREHENSIVE VIVA**[www.universityupdates.in](http://www.universityupdates.in)