

**R21**

**B.TECH III YEAR II SEM R21 OPEN ELECTIVE-I SYLLABUS  
DATA STRUCTURES  
(COMPUTER SCIENCE AND ENGINEERING)**

Dept. of CSE/JNTUHCEH

B.Tech. (Reg), w.e.f. 2018-19 Academic Year

**DATA STRUCTURES**

II Year B.Tech. I-Sem

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**Prerequisites**

1. A course on "Programming for Problem Solving"

**Objectives**

1. Exploring basic data structures such as stacks and queues.
2. Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs.
3. Introduces sorting and pattern matching algorithms

**Outcomes**

1. Ability to select the data structures that efficiently model the information in a problem.
2. Ability to assess efficiency trade-offs among different data structure implementations or combinations.
3. Implement and know the application of algorithms for sorting and pattern matching.
4. Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.

**UNIT - I**

Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

**UNIT - II**

**Dictionaries:** linear list representation, skip list representation, operations - insertion, deletion and searching.

**Hash table representation:** hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

**UNIT - III**

**Search Trees:** Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, Red–Black, Splay Trees.

**UNIT - IV**

**Graphs:** Graph Implementation Methods. Graph Traversal Methods.

**Sortings:** Heap Sort, External Sorting- Model for external sorting, Merge Sort.

**UNIT - V**

**Pattern matching and Tries:** Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

# DISASTER MITIGATION AND MANAGEMENT (CIVIL ENGINEERING)

R 21 B. Tech (Reg). Civil Engineering

JNTUHUCESTH

## DISASTER MITIGATION AND MANAGEMENT (Open Elective – I)

**III Year B.Tech. II-Sem**

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**Course Objectives:**

The objectives of the course are

- To Understand basic concepts in Disaster Management.
- To Understand definitions and Terminologies used in Disaster Management.
- To Understand types and Categories of Disasters.
- To Understand the Challenges posed by Disasters.
- To understand impacts of Disasters key Skills.

**UNIT I:**

**Introduction** - Concepts and definitions: disaster, hazard, vulnerability, resilience, risks severity, frequency and details, capacity, impact, prevention, mitigation.

**UNIT II**

**Disasters**- Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

**UNIT III**

**Disaster Impacts**- Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

**UNIT IV**

**Disaster Risk Reduction (DRR)** - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

**UNIT V**

**Disasters, Environment and Development**- Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, landuse changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

**Course Outcomes:**

The student will able to

- Apply Disaster Concepts to Management
- Analyze Relationship between Development and Disasters.
- Understand Categories of Disasters and realization of the responsibilities to society.

**Text Books:**

1. Disaster Risk Reduction in South Asia, Pradeep Sahni, 2004, Prentice Hall.
2. Handbook of Disaster Management: Techniques & Guidelines, Singh B.K., 2008, Rajat Publication.

## **ENTERPRENUERSHIP (HUMANITIES & SOCIAL SCIENCES)**

Dept. of CSE/JNTUH UCEH

B.Tech. (Reg), w.e.f. 2021-22 Academic Year

5. Art of Software Testing, Meyers, John Wiley.

### **ENTREPRENEURSHIP (Open Elective - I)**

**III Year B.Tech. CSE II-Semester**

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**Course Objective:** The aim of this course is to have a comprehensive perspective of inclusive learning, ability to learn and implement the Fundamentals of Entrepreneurship.

**Course Outcome:** It enables students to learn the basics of Entrepreneurship and entrepreneurial development which will help them to provide vision for their own Start-up.

#### **UNIT – I**

##### **Entrepreneurial Perspectives**

Introduction to Entrepreneurship – Evolution - Concept of Entrepreneurship - Types of Entrepreneurs - Entrepreneurial Competencies, Capacity Building for Entrepreneurs. Entrepreneurial Training Methods - Entrepreneurial Motivations - Models for Entrepreneurial Development - The process of Entrepreneurial Development.

#### **UNIT - II**

##### **New Venture Creation**

Introduction, Mobility of Entrepreneurs, Models for Opportunity Evaluation; Business plans – Purpose, Contents, Presenting Business Plan, Procedure for setting up Enterprises, Central level - Startup and State level - T Hub, Other Institutions initiatives.

#### **UNIT – III**

##### **Management of MSMEs and Sick Enterprises**

Challenges of MSMEs, Preventing Sickness in Enterprises – Specific Management Problems; Industrial Sickness; Industrial Sickness in India – Symptoms, process and Rehabilitation of Sick Units.

#### **UNIT – IV**

##### **Managing Marketing and Growth of Enterprises**

Essential Marketing Mix of Services, Key Success Factors in Service Marketing, Cost and Pricing, Branding, New Techniques in Marketing, International Trade.

#### **UNIT – V**

##### **Strategic perspectives in Entrepreneurship**

Strategic Growth in Entrepreneurship, The Valuation Challenge in Entrepreneurship, The Final Harvest of New Ventures, Technology, Business Incubation, India way – Entrepreneurship; Women Entrepreneurs – Strategies to develop Women Entrepreneurs, Institutions supporting Women Entrepreneurship in India.

#### **TEXT BOOKS:**

1. Entrepreneurship Development and Small Business Enterprises, Poornima M. Charantimath, 2e, Pearson, 2014.
2. Entrepreneurship, a South – Asian Perspective, D.F. Kuratko and T. V. Rao, 3e, Cengage, 2012.

**ENVIRONMENTAL HEALTH AND SAFETY**  
(CENTRE FOR ENVIRONMENTAL)

<b>Course Title</b>	<b>Environment, Health and Safety</b>
<b>Course Code</b>	C32OH
<b>Offering Department</b>	Centre for Environment, UCEST, JNTUH, Hyderabad
<b>Program Name</b>	B.Tech IIIrd year IInd Semester (Open Elective –I)
<b>Couse outcomes</b>	The course will provide a holistic learning of basic safety guidelines to be followed and course outcomes are listed below: CO 1: Knowledge about environment, health and safety, basic safety guidelines to be followed aiming to avoid accidents in laboratories, in and outside industry CO 2: Explaining industrial best work practices, Occupational health hazards, assessment of risk and hazard analysis, Reporting of an accident and mitigation strategies CO 3: Firefighting techniques, Proper handling of chemicals and knowledge of short and long term effects of exposure to hazardous materials CO 4: Interactive sessions on industrial case studies and strategy planning to combat the incidents

**Syllabus - Open Elective –I (Environment, Health and Safety)**

**UNIT – I: Introduction to Environment Health and Safety**

What is EHS, Cost to accidents, Accidents occurrence and reporting in industry, Responsibilities of safety officers, supervisors and employee, Safety Committee.

**UNIT-II: Work practices in Industries:**

Occupational Health Hazards, Hazard Identification and Risk Assessment (HIRA), FMEA, Fault tree analysis, HAZOP study, Hazards with materials handling, lifting heavy machineries, working in rotating machineries, Machine guarding, High pressure vessel safety, Leakage or release hazards, safety valves, Material safety and data sheet, Storage practices of hazardous chemicals, Electrical, mechanical safety practices, Noise in industry and Noise abatement methods, Contractor management

**UNIT III: FIRE Safety**

Basic elements, Causes of fire, Industrial fire, Explosions, Case studies, Effects on human and environment, Types of fire and fire extinguishers, Fire balls, property and human loss, building design, contingency plan, Emergency evacuation plan

**UNIT IV: Risk Management and Industrial Hygiene**

Environmental stress, Exposure to heat, heat stress, Chemicals causing chronic and acute health hazards, Air sampling and evaluation methods, Carcinogenic and toxic chemicals, Oxidants, toxic gases, Prevention and control techniques, Principles of ventilation

**UNIT V: Safety Management Standards and Acts**

Central Acts, Factory Acts, AP Factory rules, Construction Safety Regulations, Electrical Act and Rules, Indian Standards, CE certification, OSHA certification

**Books Recommended:**

1. Handbook of Environment Health and Safety, Vol I & II, Herman Koorean, MichaelBisesi, Jaico Publishing House, 1999.
2. Chemical process industry safety by K S N Raju, Mc-Graw Hill education (India) Pvt Ltd, 2014.

# INTELLECTUAL PROPERTIES AND PATENT RIGHTS (Chemistry)

Open Elective B.Tech III Year – II semester

Intellectual Property Rights & Patents

Credits - 3

(Common to CSE, Civil, EEE, Mechanical Engg., Mett. Engg.)

Course objectives:

- To make the students aware of their rights for the protection of their invention done in their project work.
- To register their inventions in our country or foreign countries.
- To gain knowledge about patents, copyrights, trade marks, designs and GIs etc.

## Syllabus

Unit-I: IPRs – Introduction, History -. Classification, Types – Copyright and related rights, Industrial property - patents, trade marks, Trade secrets, Industrial Designs, Geographical indications (GIs).

Unit-II: Patent rights – Introduction, Historical development , conditions for patenting, type of inventions which can be patented (patentability), inventions which cannot be patented. Role of patents in R and D. Revocation of patents. Advantages and disadvantages, case studies

Unit-III: Copy rights and trade marks – Origin – Types of copy rights, piracy, infringement . Nature of trade marks, Trademark benefits. Registration, offences relating to trade marks.

Unit-IV:GIs and Industrial Designs: Importance of GIs with examples, significance of GIs. Registration of designs. Functions of designs. Layout Design Act 2000.

Unit-V: Patent laws – International regime relating to IPRs-TRIPs, WIPO, WTO, GATTs. Patent acts – 1970, (amendments) Basic tenets of IT Act 2000. Digital signature and electronic signature, cyber crimes. Filing of patent.

Course outcomes:

- The students after their course get awareness of acquiring the patent.
- They learn to have copyright for their innovative works
- They get the knowledge of plagiarism in their innovations which can be questioned legally.

Text Books:

- 1) What everybody should know about patents. N.Subbaram – Himalaya publications.
- 2) Intellectual Property rights by P.Narayanan

B. N. Pauli  
30/01/2024.  
(Dr. B. Rama Devi)  
Dept. of Chemistry.

**METALLURGY FOR NON METALLURGIST**  
(METALLURGICAL ENGINEERING)

Dept. of METALLURGICAL ENGG

B.Tech. (Reg), w.e.f. 2021-22 Academic Year

**METALLURGY FOR NON METALLURGISTS**  
(Open Elective - I)

**III B.Tech. Met. Engg. II-Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Pre-Requisites:** Nil

**Course Objectives:**

1. To describe the basic principles of metallurgy and the importance of metallurgy in various disciplines of engineering.
2. Gain thorough knowledge about heat treatment of steels.
3. Gain knowledge about properties and uses of cast irons and non ferrous metals.
4. Gain working knowledge of basic testing methods for metals.

**UNIT-I**

Introduction: Crystal structure and defects, Crystal structure of metals, Classification of steels, Carbon steels.

**UNIT-II**

Heat Treatment of Steels: The Iron carbon systems, Common phases in steels, Annealing, Normalizing, Hardening and tempering.

**UNIT-III**

Cast irons: Properties and applications of Ductile irons, Malleable irons, Compacted graphite iron.

**UNIT-IV**

Non Ferrous Metals: Properties and applications of Light Metals (Al, Be, Mg, Ti), Super alloys.

**UNIT-V**

Testing of Metals: Hardness testing, Tensile Testing, Impact Testing, Fatigue Testing.

**Text Books:**

1. Materials Science and Engineering: An introduction, 9<sup>th</sup> edition - William D. Callister Jr., David G. Rethwisch, published by John Wiley, 2013.
2. Introduction to Physical Metallurgy, 2<sup>nd</sup> edition – Sidney H Avner, published by Tata Mc Graw-Hill ,1997.

# NUMERICAL TECHNIQUES (MATHEMATICS)

## Numerical Techniques (Open Elective for CIVIL, MECH, CSE, CHEM and METT)

L	T	P	C
2	1	0	3

**Pre-requisites:** Mathematics courses in first two years of B. Tech study

**Objectives:** To learn

- The importance of numerical methods.
- Identifying the root of an equation geometrically and finding its approximate value by different techniques.
- The concept of interpolation and fitting a interpolating polynomial.
- Finding the derivatives and proper integrals of given functions.
- Solving initial value problems using numerical methods.
- Solving boundary value problems involving PDE's using finite difference methods

**UNIT-I: Solution of Equations and Finite Differences** **6 L**

Bisection method, Regula-Falsi method, Iteration method, Newton-Raphson method.

Finite differences: Forward, Backward and Central differences, Other difference operators and relations between them.

**UNIT-II: Interpolation** **6 L**

Newton's forward and backward interpolation formulae, Central difference interpolation formulae: Gauss's forward and backward interpolation formulae, Interpolation with unequal intervals: Lagrange's interpolation formula.

**UNIT-III: Numerical Differentiation and Integration** **6 L**

Numerical differentiation: Derivatives using Newton's interpolation formulae. Numerical integration: Newton-cotes quadrature formula, Trapezoidal rule, Simpson's one-third rule, Simpson's three-eighth rule.

**UNIT-IV: Numerical Solution of First Order Ordinary Differential Equations** **6 L**

Taylor's series method, Picard's method, Euler's and modified Euler's Method, Runge-Kutta method.

**UNIT- V : Numerical Solution of Partial Differential Equations** **6 L**

Finite difference approximations to partial derivatives – Classification of second order partial differential equation - Parabolic equations: Solution of one dimensional Heat equation by Schmidt explicit method and Crank-Nicolson implicit method.

**Course outcomes:**

After learning the contents of this paper the student is able to

- Find a better approximate root of a given equation.
- Find the finite difference operators for a given data or value of the dependent variable for a given independent variable
- Evaluate the derivative at a given value and integral of a given function.
- Solve the initial value problems
- Solve parabolic equations with given boundary conditions.

### Text Books

1. B S Grewal, Higher Engineering Mathematics, 43<sup>rd</sup> Edition, Khanna Publishers, New Delhi, 2014.
2. S S Sastry, Introductory Methods of Numerical Analysis, Fifth Edition, PHI Learning Pvt. Ltd, New Delhi, 2012.
3. M K Jain and S R K Iyengar, Numerical Methods for Scientific and Engineering Computation, 5<sup>th</sup> Edition, New Age International Publishers, New Delhi, 2007.

### References

1. B V Ramana, Higher Engineering Mathematics, Tata McGraw Hill Education Private Limited, New Delhi, 29<sup>th</sup> Reprint, 2017.
2. T K V Iyengar, B Krishna Gandhi & Others, Numerical Methods, Second Revised Edition, New Delhi, S.Chand & Co. Ltd, 2013.



# PROBABILITY AND DISTRIBUTIONS (MATHEMATICS)

## Probability Distributions (Open Elective for EEE, ECE)

L	T	P	C
2	1	0	3

**Pre-requisites:** Mathematics courses in first two years of study

**Objectives:** To learn

- The theory of Probability, and probability distributions of single and multiple random variables
- The sampling theory and testing of hypothesis and making inferences

6 L

**UNIT-I: Probability**

**Probability :** Introduction – Definition – Addition law of probability – Independent events – Conditional probability – Multiplication law of probability – Baye's theorem.

**UNIT-II: Random Variable and Discrete probability distribution** 8 L

**Random Variables and Probability Distributions:** Concept of a Random Variable – Discrete Probability Distributions – Continuous probability distribution – Mean and variance of a random variable

**Discrete Probability Distributions:** Introduction – Binomial distribution and Poisson distribution.

**UNIT-III: Continuous Probability Distribution and Sampling distribution** 6 L

Normal Distribution – Area under the Normal Curve – Applications of Normal Distribution – Normal Approximation to the Binomial distribution.

**Sampling Distribution:** Random Sampling – Sampling Distributions: Sampling Distribution of Means – Central Limit Theorem (only statement).

**UNIT-IV: Test of hypothesis (Large sample)** 6 L

Statistical Hypotheses: General Concepts – Testing a Statistical Hypothesis – Tests of significance – Single mean – Single proportion – Two means – Two proportions.

**UNIT- V : Tests of Hypotheses (Small sample)** 6 L

Tests of significance – Single mean – Two means. Chi-square test – Single variance – Goodness of fit. F-Distribution: ratio of variances

**Course outcomes:**

After learning the contents of this paper the student must be able to

- Apply the concepts of probability to real time problems
- Apply the concepts of distributions to some case studies
- Apply the concept of sampling in drawing the samples
- Test the hypothesis and making inferences

**Text Books**

1. B S Grewal, Higher Engineering Mathematics, 43<sup>rd</sup> Edition, Khanna Publishers, New Delhi, 2014.
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics For Engineers & Scientists, 9<sup>th</sup> Ed. Pearson Publishers.
3. S C Gupta and V K Kapoor, Fundamentals of Mathematical Statistics, Khanna publications.

**References**

1. T.T. Soong, Fundamentals Of Probability And Statistics For Engineers, John Wiley & Sons, Ltd, 2004. .

# **RENEWABLE ENERGY SOURCES**

## **(ELECTRICAL AND ELECTRONICS ENGINEERING)**

Dept. of EEE, JNTUHCEH

B.Tech. – EEE - (Reg.) w.e.f. 2021-22

**JNTUH COLLEGE OF ENGINEERING HYDERABAD**

**III Year B.Tech. EEE II-Sem**

**L T P C**  
**3 0 0 3**

### **RENEWABLE ENERGY SOURCES** **(Open Elective-I)**

**Pre-requisites:** None

**Course Objectives:**

- To recognize the awareness of energy conservation in students
- To identify the use of renewable energy sources for electrical power generation
- To collect different energy storage methods
- To detect about environmental effects of energy conversion

**Course Outcomes:** At the end of the course the student will be able to:

- Understand the principles of wind power and solar photovoltaic power generation, fuel cells.
- Assess the cost of generation for conventional and renewable energy plants
- Design suitable power controller for wind and solar applications
- Analyze the issues involved in the integration of renewable energy sources to the grid

**UNIT-I:**

**INTRODUCTION**

Renewable Sources of Energy-Grid-Supplied Electricity-Distributed Generation-Renewable Energy Economics-Calculation of Electricity Generation Costs –Demand side Management Options –Supply side Management Options-Modern Electronic Controls of Power Systems.

**WIND POWER PLANTS:**

Appropriate Location -Evaluation of Wind Intensity -Topography -Purpose of the Energy Generated -General Classification of Wind Turbines-Rotor Turbines-Multiple-Blade Turbines Drag Turbines -Lifting Turbines-Generators and Speed Control used in Wind Power Energy Analysis of Small Generating Systems.

**UNIT-II:**

**PHOTOVOLTAIC POWER PLANTS**

Solar Energy-Generation of Electricity by Photovoltaic Effect -Dependence of a PV Cell Characteristic on Temperature-Solar cell Output Characteristics-Equivalent Models and Parameters for Photovoltaic Panels-Photovoltaic Systems-Applications of Photovoltaic Solar Energy-Economical Analysis of Solar Energy.

**FUEL CELLS:** The Fuel Cell-Low and High Temperature Fuel Cells-Commercial and Manufacturing Issues Constructional Features of Proton Exchange-Membrane Fuel Cells –Reformers-Electrolyzer Systems and Related Precautions-Advantages and Disadvantages of Fuel Cells-Fuel Cell Equivalent Circuit-Practical Determination of the Equivalent Model Parameters -Aspects of Hydrogen as Fuel.

**UNIT-III:**

**INDUCTION GENERATORS**

Principles of Operation-Representation of Steady-State Operation-Power and Losses Generated-Self-Excited Induction Generator-Magnetizing Curves and Self-Excitation Mathematical Description of the Self-Excitation Process-Interconnected and Stand-alone operation -Speed and Voltage Control -Economic Aspects.

**UNIT-IV:**

**STORAGE SYSTEMS**

Energy Storage Parameters-Lead-Acid Batteries-Ultra Capacitors-Flywheels –Superconducting Magnetic Storage System-Pumped Hydroelectric Energy Storage - Compressed Air Energy Storage -Storage Heat -Energy Storage as an Economic Resource.

**UNIT-V:**

**INTEGRATION OF ALTERNATIVE SOURCES OF ENERGY**

Principles of Power Injection-Instantaneous Active and Reactive Power Control Approach Integration of Multiple Renewable Energy Sources-Islanding and Interconnection Control-DG Control and Power Injection.

# SOLID WASTE MANAGEMENT

## (CHEMICAL ENGINEERING)

Dept. of Chem. Engg. / JNTUHCEH

B.Tech. (Reg), w.e.f.2021-22 Academic Year

### SOLID WASTE MANAGEMENT

#### (Open Elective – I)

III Year B.Tech. II-Sem

L T P C  
3 0 0 3

**Pre Requisites:** NIL

**Course Objectives:**

1. To understand the sense of onsite handling storage and collection systems including transportation
2. To understand the various processing technologies with mechanical volume reduction and thermal volume reduction corporate land filling, deep well injections.
3. Learn to estimate material recovery a energy recovery from a given waste data using case standing

#### UNIT- I

**Introduction:** Definition, characteristics and perspectives of solid waste. Types of solid waste. Physical and chemical characteristics. Variation of composition and characteristics. Municipal, industrial, special and hazardous wastes, E-waste and importances.

**General aspects:** Overview of material flow in society. Reduction in raw material usage. Reduction in solid waste generation. Reuse and material recovery. General effects on health and environment. Legislations.

#### UNIT- II

**Engineered systems:** Typical generation rates. Estimation and factors effecting generation rates. On site handling. Storage and processing. Collection systems and devices. Transfer and transport.

#### UNIT- III

**Processing Techniques:** Mechanical volume reduction. Thermal volume reduction. Component separation. Land filling and land forming. Deep well injection.

#### UNIT- IV

**Material recovery:** Mechanical size alteration. Electromagnetic separation. Drying and dewatering. Other material recovery systems. Recovery of biological conversion products. Recovery of thermal conversion products. E-waste material recovery.

**Energy recovery:** Energy recovery systems and efficiency factors. Determination of output and efficiency. Details of energy recovery systems. Combustion incineration and heat recovery. Gasification and pyrolysis. Refuse derived fuels (RDF).

#### UNIT- V

**Case studies:** Major industries and management methods used in typical industries – Coal fired power stations, textile industry, oil refinery, distillery, sugar industry, and radioactive waste generation units. E-waste case study- batteries.