

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

II Year B.Tech. CE-II Sem

L	T/P/D	C
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**(A40008) PROBABILITY AND STATISTICS**

**Objectives: To learn**

- Understand a random variable that describes randomness or an uncertainty in certain realistic situation. It can be of either discrete or continuous type.
- In the discrete case, study of the binomial and the Poisson random variables and the Normal random variable for the continuous case predominantly describe important probability distributions. Important statistical properties for these random variables provide very good insight and are essential for industrial applications.
- Most of the random situations are described as functions of many single random variables. In this unit, the objective is to learn functions of many random variables through joint distributions.
- The types of sampling, Sampling distribution of means, Sampling distribution of variance, Estimations of statistical parameters, Testing of hypothesis of few unknown statistical parameters.
- The mechanism of queuing system, The characteristics of queue, The mean arrival and service rates
- The expected queue length, The waiting line
- The random processes, The classification of random processes, Markov chain, Classification of states
- Stochastic matrix ( transition probability matrix ), Limiting probabilities, Applications of Markov chains

**UNIT-I:**

**Single Random variables and probability distributions:** Random variables – Discrete and continuous. Probability distributions, mass function/ density function of a probability distribution. Mathematical Expectation, Moment about origin, Central moments Moment generating function of probability distribution. Binomial, Poisson & normal distributions and their properties. Moment generating functions of the above three distributions. and hence finding the mean and variance.

**UNIT-II**

**Multiple Random variables, Correlation & Regression:** Joint probability distributions- Joint probability mass / density function, Marginal probability mass / density functions, Covariance of two random variables, Correlation - Coefficient of correlation, The rank correlation. Regression- Regression

Coefficient, The lines of regression and multiple correlation & regression.

**UNIT-III:**

**Sampling Distributions and Testing of Hypothesis : Sampling:** Definitions of population, sampling, statistic, parameter. Types of sampling, Expected values of Sample mean and variance, sampling distribution, Standard error, Sampling distribution of means and sampling distribution of variance.

**Parameter estimations** – likelihood estimate, interval estimations .

**Testing of hypothesis:** Null hypothesis, Alternate hypothesis, type I, & type II errors – critical region, confidence interval, Level of significance. One sided test, Two sided test,

**Large sample tests:**

- Test of Equality of means of two samples equality of sample mean and population mean (cases of known variance & unknown variance, equal and unequal variances)
- Tests of significance of difference between sample S.D and population S.D.
- Tests of significance difference between sample proportion and population proportion & difference between two sample proportions.

**Small sample tests:** Student t-distribution, its properties; Test of significance difference between sample mean and population mean; difference between means of two small samples

Snedecor's F- distribution and it's properties. Test of equality of two population variances

Chi-square distribution, it's properties, Chi-square test of goodness of fit

**UNIT-IV**

**Queuing Theory:** Structure of a queuing system, Operating Characteristics of queuing system, Transient and steady states, Terminology of Queuing systems, Arrival and service processes- Pure Birth-Death process Deterministic queuing models- M/M/1 Model of infinite queue, M/M/1 model of finite queue .

**UNIT-V**

**Stochastic processes:** Introduction to Stochastic Processes – Classification of Random processes, Methods of description of random processes, Stationary and non-stationary random process, Average values of single random process and two or more random processes. Markov process, Markov chain, classification of states – Examples of Markov Chains, Stochastic Matrix.

**TEXT BOOKS:**

- Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna



Publishers

2. Probability and Statistics for Engineers and Scientists by Sheldon M. Ross, Academic Press
3. Operations Research by S.D. Sarma,

#### REFERENCE BOOKS:

1. Mathematics for Engineers by K.B. Datta and M.A.S. Srinivas, Cengage Publications
2. Probability and Statistics by T.K.V. Iyengar & B. Krishna Gandhi Et
3. Fundamentals of Mathematical Statistics by S C Gupta and V.K. Kapoor
4. Probability and Statistics for Engineers and Scientists by Jay I. Devore.
5. Probability Theory & Stochastic Processes by P. Sri Hari, Hi-Tech Publishers.
6. Probability & Statistics by Ahmed Waheedullah, M. Ahmed Mohiuddin, Sultan Ali, HI-TECH Publishers

#### Outcomes:

- Students would be able to identify distribution in certain realistic situation. It is mainly useful for circuit as well as non-circuit branches of engineering. Also able to differentiate among many random variable involved in the probability models. It is quite useful for all branches of engineering.
- The student would be able to calculate mean and proportions (small and large sample) and to make important decisions from few samples which are taken out of unmanageably huge populations. It is mainly useful for non-circuit branches of engineering.
- The students would be able to find the expected queue length, the ideal time, the traffic intensity and the waiting time. These are very useful tools in many engineering and data management problems in the industry. It is useful for all branches of engineering.
- The student would be able to understand about the random process, Markov process and Markov chains which are essentially models of many time dependent processes such as signals in communications, time series analysis, queuing systems. The student would be able to find the limiting probabilities and the probabilities in  $n^{\text{th}}$  state. It is quite useful for all branches of engineering

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#### (A40114) STRENGTH OF MATERIALS – II

##### UNIT – I

**Torsion of Circular Shafts :** Theory of pure torsion – Derivation of Torsion equations :  $T/J = q/r = N\theta/L$  – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.

**Springs:** Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple – springs in series and parallel – Carriage or leaf springs.

##### UNIT – II

**Columns and Struts :** Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns- assumptions- derivation of Euler's critical load formulae for various end conditions – Equivalent length of a column – slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – Long columns subjected to eccentric loading – Secant formula – Empirical formulae – Straight line formula – Prof. Perry's formula.

**Beams Curved in Plan:** Introduction – circular beams loaded uniformly and supported on symmetrically placed Columns – Semi-circular beam simply-supported on three equally spaced supports.

##### UNIT - III

**Beam Columns:** Laterally loaded struts – subjected to uniformly distributed and concentrated loads – Maximum B.M. and stress due to transverse and lateral loading.

**Direct and Bending Stresses:** Stresses under the combined action of direct loading and bending moment, core of a section – determination of stresses in the case of chimneys, retaining walls and dams – conditions for stability – stresses due to direct loading and bending moment about both axis.

##### UNIT – IV

**Unsymmetrical Bending:** Introduction – Centroidal principal axes of section – Graphical method for locating principal axes – Moments of inertia referred to any set of rectangular axes – Stresses in beams subjected to unsymmetrical bending – Principal axes – Resolution of bending moment into two rectangular axes through the centroid – Location of neutral axis -



Deflection of beams under unsymmetrical bending.

**Shear Centre:** Introduction - Shear centre for symmetrical and unsymmetrical (channel, I, T and L) sections

#### UNIT - V

**Thin Cylinders:** Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin cylinders – Thin spherical shells.

**Thick Cylinders:** Introduction Lamé's theory for thick cylinders – Derivation of Lamé's formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage – Thick spherical shells.

#### TEXT BOOKS:

- 1) Strength of Materials by R.K.Bansal, Lakshmi Publications House Pvt. Ltd.
- 2) Strength of Materials by R.K Rajput, S.Chand & Company Ltd.
- 3) Mechanics of Materials by Gere, Cengage Learning Pvt. Ltd.

#### REFERENCES:

- 1) Fundamentals of Solid Mechancis by M.L.Gambhir, PHI Learning Pvt. Ltd
- 2) Introduction to Strength of Materials by U.C.Jindal, Galgotia Publications Pvt. Ltd.
- 3) Strength of Materials by Bhattacharya, Cengage Learning
- 3) Strength of Materials by D.S Prakash Rao, Universities Press Pvt. Ltd.
- 4) Strength of Materials by S.S.Rattan, Tata McGraw Hill Education Pvt. Ltd.
- 5) Strength of Materials by R.Subramanian, Oxford University Press.
- 6) Mechanics of Materials by Ferdinand P. Beer *et al.*, Tata McGraw Hill Education Pvt. Ltd.

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#### (A40111) HYDRAULICS AND HYRAULIC MACHINERY

#### UNIT - I

**Open Channel Flow:** Types of flows - Type of channels – Velocity distribution – Energy and momentum correction factors – Chezy's, Manning's; and Bazin formulae for uniform flow – Most Economical sections. Critical flow: Specific energy-critical depth – computation of critical depth – critical sub-critical and super critical flows.

Non uniform flow-Dynamic equation for G.V.F., Mild, Critical, Steep, horizontal and adverse slopes-surface profiles-direct step method- Rapidly varied flow, hydraulic jump, energy dissipation.

#### UNIT - II

**Dimensional Analysis and Similitude:** Dimensional analysis-Rayleigh's method and Buckingham's pi theorem-study of Hydraulic models – Geometric, kinematic and dynamic similarities-dimensionless numbers – model and prototype relations.

#### UNIT-III

**Hydrodynamic Force on Jets :** Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency-Angular momentum principle, Applications to radial flow turbines. Layout of a typical Hydropower installation – Heads and efficiencies.

#### UNIT-IV

**Hydraualic Turbines:** Classification of turbines-pelton wheel-Francis turbine-Kaplan turbine-working, working proportions, velocity diagram, work done and efficiency, hydraulic design, draft tube – theory and function efficiency.

Governing of turbines-surge tanks-unit and specific turbines-unit speed-unit quantity-unit power-specific speed performance characteristics-geometric similarity-cavitation.

#### UNIT - V

**Centrifugal-Pumps:** Pump installation details-classification-work done-Manometric head-minimum starting speed-losses and efficiencies-specific speed, multistage pumps-pumps in parallel- performance of pumps-characteristic curves- NPSH-cavitation.

Classification of Hydropower plants – Definition of terms – load factor, utilization factor, capacity factor, estimation of hydropower potential.



**TEXT BOOKS:**

1. Open Channel flow by K,Subramanya . Tata Mc.Grawhill Publishers.
2. Fluid Mechanics, Hydraulic and Hydraulic Machines by Modi & Seth, Standard book house.
3. Fluid Mechanics & Fluid machines by Narayana pillai, Universities press.

**REFERENCES :**

1. Fluid Mechanics and Machinery, CSP OJHA, Oxford University Press
2. Elements of Open channel flow by Ranga Raju, Tata Mc.Graw Hill, Publications.
3. Fluid mechanics and fluid machines by Rajput, S.Chand &Co.
4. Open Channel flow by V.T.Chow, Mc.Graw Hill book company.
5. Fluid Mechanics and Machinery by D. Ramdurgaia New Age Publications.
6. Mechanics of Fluids by Merle C. Potter, David C. Wiggert,Bassem H. Ramadan, Cengage Learning.

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**(A40009) ENVIRONMENTAL STUDIES****Objectives:**

1. Understanding the importance of ecological balance for sustainable development.
2. Understanding the impacts of developmental activities and mitigation measures.
3. Understanding the environmental policies and regulations

**UNIT-I :**

**Ecosystems:** Definition, Scope and Importance of ecosystem. Classification, structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

**UNIT-II:**

**Natural Resources: Classification of Resources:** Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

**UNIT-III:**

**Biodiversity and Biotic Resources:** Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

**UNIT-IV:**

**Environmental Pollution and Control Technologies: Environmental Pollution:** Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and



characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Problems and Global Efforts:** Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol and Montréal Protocol.

#### UNIT-V:

**Environmental Policy, Legislation & EIA:** Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

#### SUGGESTED TEXT BOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

#### REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T.Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M.Masters and Wendell P. Ela .2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B.Botkin & Edward A.Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4<sup>th</sup> Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

#### Outcomes:

Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which inturn helps in sustainable development

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#### (A40115) STRUCTURAL ANALYSIS – I

##### UNIT – I

**Analysis Of Perfect Frames:** Types of frames- Perfect, Imperfect and Redundant pin jointed frames. - Analysis of determinate pin jointed frames using method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads.

##### UNIT – II

**Energy Theorems:** Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem-Unit Load Method. Deflections of simple beams and pin- jointed plane trusses. Deflections of statically determinate bent frames.

**Three Hinged Arches – Introduction – Types of Arches – Comparison between Three hinged and Two hinged Arches. Linear Arch. Eddy's theorem. Analysis of Three hinged arches. Normal Thrust and radial shear in an arch. Geometrical properties of parabolic and circular arch. Three hinged circular arch at different levels. Absolute maximum bending moment diagram for a three hinged arch.**

##### UNIT-III

**Propped Cantilever and Fixed Beams:** Analysis of Propped cantilever and fixed beams, including the beams with varying moments of inertia, subjected to uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads - Shear force and Bending moment diagrams for Propped Cantilever and Fixed Beams-Deflection of Propped cantilever and fixed beams; effect of sinking of support, effect of rotation of a support.

##### UNIT – IV

**Slope-Deflection Method and Moment Distribution Method:** Introduction-Continuous beams. Clapeyron's theorem of three moments- Analysis of continuous beams with constant and variable moments of inertia with one or both ends fixed-continuous beams with overhang. Effects of sinking of supports. Derivation of slope-deflection equation, application to continuous beams with and without settlement of supports. Analysis of continuous beams with and without settlement of supports using Moment Distribution Method. Shear force and Bending moment diagrams, Elastic curve.



**UNIT – V**

**Moving Loads and Influence Lines:** Introduction maximum SF and BM at a given section and absolute maximum S.F. and B.M due to single concentrated load U.D load longer than the span, U.D load shorter than the span, two point loads with fixed distance between them and several point loads-Equivalent uniformly distributed load-Focal length. Definition of influence line for SF, Influence line for BM- load position for maximum SF at a section-Load position for maximum BM at a section - Point loads, UDL longer than the span, UDL shorter than the span- Influence lines for forces in members of Pratt and Warren trusses.

**TEXT BOOKS:**

- 1) Structural Analysis Vol –I & II by Vazarani and Ratwani, Khanna Publishers.
- 2) Structural Analysis Vol I & II by Pundit and Gupta., Tata McGraw Hill Publishers.

**REFERENCES:**

- 1) Basic Structural Analysis by K.U.Muthu *et al.*, I.K.International Publishing House Pvt.Ltd.
- 2) Structural Analysis by Hibbeler, pearson Education Ltd
- 3) Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Publishers.
- 4) Fundamentals of structural Analysis by M.L.Gamhir, PHI.

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**(A40109) BUILDING MATERIALS, CONSTRUCTION AND PLANNING****UNIT – I**

**Stones and Bricks, Tiles:** Building stones – classifications and quarrying – properties – structural requirements – dressing Bricks – Composition of Brick earth – manufacture and structural requirements.

**Wood, Aluminum, Glass and Paints:** Wood - structure – types and properties – seasoning – defects; alternate materials for wood – GI / fibre – reinforced glass bricks, steel & aluminum.

**UNIT-II**

**Cement & Admixtures :** Ingredients of cement – manufacture – Chemical composition – Hydration - field & lab tests Admixtures – mineral & chemical admixtures – uses.

**UNIT-III**

**Building Components :** Lintels, Arches, walls, vaults – stair cases – types of floors, types of roofs – flat, curved, trussed ; foundations – types ; Damp Proof Course ; Joinery – doors – windows – materials – types.

**Building Services :** Plumbing Services : Water Distribution, Sanitary – Lines & Fittings ; Ventilations : Functional requirements systems of ventilations. Air-conditioning - Essentials and Types ; Acoustics – characteristic – absorption – Acoustic design ; Fire protection – Fire Hazards – Classification of fire resistant materials and constructions

**UNIT -IV**

**Masonry and Finishing's :** Brick masonry – types – bonds ; Stone masonry – types ; Composite masonry – Brick-stone composite ; Concrete, Reinforced brick.

Finishers : Plastering, Pointing, Painting, Claddings – Types – Tiles - ACP

**Form work :** Requirements – Standards – Scaffolding – Design ; Shoring, Underpinning.

**UNIT –V**

**Building Planning :** Principles of Building Planning, Classification of buildings and Building by laws.

**TEXT BOOKS:**

1. Building Materials and Construction – Arora & Bindra, Dhanpat Roy Publications.



2. Building Construction by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) Ltd., New Delhi

**REFERENCES:**

1. Building Materials by Duggal, New Age Internations.
2. Building Construction by PC Verghese PHI.
3. Construction Technology – Vol – I & II by R. Chuddy, Longman UK.
4. Basics of Civil Engg by Subhash Chander; Jain Brothers.
5. Alternate Building materials and Technology, K.S.Jagadish, Venkatarama Reddy and others; New Age Publications.

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**(A40186) COMPUTER AIDED DRAFTING OF BUILDINGS**

1. Introduction to computer aided drafting
2. Software for CAD – Introduction to different softwares
3. Practice exercises on CAD software
4. Drawing of plans of buildings using software
  - a) single storeyed buildings
  - b) multi storeyed buildings
5. Developing sections and elevations for
  - a) single storeyed buildings
  - b) multi storeyed buildings
6. Detailing of building components like Doors, Windows, Roof Trusses etc. using CAD softwares
7. Exercises on development of working of buildings

**TEXT BOOKS :**

1. Computer Aided Design Laboratory by M. N. Sesa Praksh & Dr. G. S. Servesh – Laxmi Publications.
2. Engineering Graphics by P. J. Sha – S. Chand & Co.

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**(A40190) SURVEYING LAB – II**

**LIST OF EXERCISES :**

1. Study of theodolite in detail - practice for measurement of horizontal and vertical angles.
2. Measurement of horizontal angles by method of repetition and reiteration.
3. Trigonometric Leveling - Heights and distance problem (Two Exercises)
4. Heights and distance using Principles of tacheometric surveying (Two Exercises)
5. Curve setting – different methods. (Two Exercises)
6. Setting out works for buildings & pipe lines.
7. Determine of area using total station
8. Traversing using total station
9. contouring using total station
10. Determination of remote height using total station
11. State-out using total station
12. Distance, gradient, Diff, height between tow inaccessible points using total stations

**LIST OF EQUIPMENT:**

1. Theodolites and leveling staffs.
2. Tachometers.
3. Total station.