

(13A54303) PROBABILITY AND STATISTICS

Course Objective:

- To help the students in getting a thorough understanding of the fundamentals of probability and usage of statistical techniques like testing of hypothesis, ANOVA, Statistical Quality Control and Queuing theory

Learning Outcome:

- The student will be able to analyze the problems of engineering & industry using the techniques of testing of hypothesis, ANOVA, Statistical Quality Control and Queuing theory and draw appropriate inferences.

UNIT I

Conditional probability – Baye’s theorem. Random variables – Discrete and continuous Distributions – Distribution functions. Binomial and poisson distributions Normal distribution – Related properties.

UNIT II

Test of Hypothesis: Population and Sample - Confidence interval of mean from Normal distribution - Statistical hypothesis - Null and Alternative hypothesis - Level of significance - Test of significance - Test based on normal distribution - Z test for means and proportions; Small samples - t- test for one sample and two sample problem and paired t-test, F-test and Chi-square test (testing of goodness of fit and independence).

UNIT III

Analysis of variance one way classification and two way classification (Latic square Design and RBD)

UNIT IV

Statistical Quality Control: Concept of quality of a manufactured product -Defects and Defectives - Causes of variations - Random and assignable - The principle of Shewhart Control Chart-Charts for attribute and variable quality characteristics- Constructions and operation of X- bar Chart, R-Chart, P-Chart and C-Chart.

UNIT V

Queuing Theory: Pure Birth and Death process, M/M/1 & M/M/S & their related simple problems.

Text Books:

1. Probability & Statistics for engineers by Dr. J. Ravichandran WILEY-INDIA publishers.
2. Probability & Statistics by T.K.V. Iyengar, S.Chand publications.

Reference Books:

1. Probability & Statistics by E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher.
2. Statistical methods by S.P. Gupta, S.Chand publications.
3. Probability & Statistics for Science and Engineering by G.Shanker Rao, Universities Press.
4. Probability and Statistics for Engineering and Sciences by Jay L.Devore, CENGAGE.
5. Probability and Statistics by R.A. Jhonson and Gupta C.B.

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(13A01401) STRENGTH OF MATERIALS – II

Course Objective:

- Study of the subject provides the understanding of principal stress, strains, springs, columns and structures.

UNIT I

PRINCIPAL STRESSES AND STRAINS: Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions .

THEORIES OF FAILURES: Various Theories of failures like Maximum Principal stress theory – Maximum Principal strain theory – Maximum shear stress theory – Maximum strain energy theory – Maximum shear strain energy theory.

UNIT II

THIN CYLINDERS & THICK 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.

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.

UNIT III

TORSION OF CIRCULAR SHAFTS – Theory of pure torsion – Derivation of Torsion equations: – Assumptions made in the theory 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 IV

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.

UNIT V

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.

BEAMS CURVED IN PLAN: Introduction – circular beams loaded uniformly and supported on symmetrically placed Columns – Semicircular beam simply-supported on three equally spaced supports.

Text Books:

1. *A Text book of Strength of materials* by R.K.Bansal – Laxmi Publications (P) Ltd., New Delhi.
2. *Strength of Materials* by S.S. Bhavikatti – Vikas publishers
3. *Strength of Materials* by D.S. Prakasa rao, University press.

Reference Books:

1. *Strength of Materials* by Schaum's out line series – Mc.Graw hill International Editions.
2. *Strength of Materials* by S.Ramkrishna and R.Narayan – Dhanpat Rai Publications.
3. *Strength of Materials* by R.Subramanian, Oxford University Press.
4. *Strength of Materials* by L.S.Srinath et al., Macmillan India Ltd., Dew Delhi.
5. *Strength of Materials* by B.C.Punmia.- Laxmi publications.
6. *Fundamentals of Solid Mechancis* by M.L.Gambhir, PHI Learning Pvt. Ltd
7. *Mechanics of Structures*, by S.B.Junnarkar, Charotar Publishing House, Anand, Gujrat

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(13A01402) HYDRAULICS AND HYRAULIC MACHINERY

Course Objective:

- The main objective of this course is to deal with the concepts of flow through open channels and their applications and the principles of hydraulic machines and hydraulic models.

UNIT I

OPEN CHANNEL FLOW-UNIFORM FLOW: Introduction, Classification of flows, Types of channels; Flow analysis: The Chezy equation, Empirical formulae for the Chezy constant, Hydraulically efficient channel sections: Rectangular, Trapezoidal, Triangular and Circular channels; Velocity distribution; Energy and momentum correction factors. Application of Bernoulli's equation to open channel flow.

OPEN CHANNEL FLOW- NON – UNIFORM FLOW: Concept of specific energy; Specific energy curves; Critical flow; Critical flow in a rectangular channel; Critical slope; discharge curve, Different slope conditions; Channel transitions- Reduction in width of a rectangular channel, Raised bottom in a rectangular channel, venture flume, Momentum principle applied to open channel flow; Specific force; Specific force curve.

UNIT II

OPEN CHANNEL FLOW- GRADUALLY VARIED FLOW: Introduction, Dynamic equation; Dynamic equation for GVF in wide Rectangular channel, classification of channel bottom slopes, Surface Profiles; Characteristics of surface profiles, Back water Curves and Draw down curves; Examples of various types of water surface profiles; Control section, Computation of surface profiles by single step method.

OPEN CHANNEL FLOW- RAPIDLY VARIED FLOW: Hydraulic jump; Elements and characteristics of hydraulic jump; Hydraulic jump in rectangular channels, height and length of the jump, Energy loss in a hydraulic jump, Types of hydraulic jump; applications of hydraulic jump; Location of hydraulic jump.

UNIT III

IMPACT OF 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, Torque and head transferred in roto dynamic machines.

HYDRAULIC TURBINES-I: Introduction, head and efficiencies of hydraulic turbines, Classification of turbines; pelton wheel: parts, Velocity triangles, work done and efficiency, working proportions, design of pelton wheel. Radial flow reaction turbines: velocity triangles and work done for inward radial flow turbine, degree of reaction, discharge, speed ratio, flow ratio.

UNIT IV

HYDRAULIC TURBINES-II: Francis turbine: main components and working, work done and efficiencies, design proportions; design of Francis turbine runner. Kaplan turbine: main components and working, working proportions. Draft tube: theory and efficiency; specific speed, unit quantities, characteristic curves of hydraulic turbines. Cavitation: causes, effects.

CENTRIFUGAL PUMPS: Introduction, component parts and working of a centrifugal pump, work done by the impeller; heads, losses and efficiencies; minimum starting speed; Priming ;specific speed; limitation of suction lift, net positive suction head(NPSH);Performance and characteristic curves; Cavitation effects ;Multistage centrifugal pumps; troubles and remedies.

UNIT V

DIMENSIONAL ANALYSIS AND SIMILITUDE: Introduction, dimensions; Dimensional homogeneity; Methods of dimensional analysis- Rayleigh's method; Buckingham – Pi theorem;

model analysis; similitude-types of similarities; Dimensionless numbers; Model laws ;Partially submerged objects; types of models; Scale effect.

BOUNDARY LAYER THEORY& DRAG AND LIFT: Boundary layer – concepts, Prandtl's contribution, Characteristics of boundary layer along a thin flat plate, laminar and turbulent Boundary layers, separation of BL. expression for drag and lift; Lift and Drag Coefficients; pressure drag and friction drag; Streamlined and bluff bodies.

Text Books:

1. *Fluid Mechanics, Hydraulic and Hydraulic Machines* by Modi & Seth, Standard book house.
2. *A text of Fluid mechanics and hydraulic machines* by Dr.R.K.Bansal – Laxmi Publications (P) Ltd., New Delhi.

Reference Books:

1. *Fluid Mechanics & Fluid Machines* by Narayana Pillai, universities press.
2. *Open channel flow* by srinivasan, Oxford University Press
3. *Open Channel flow* by K.Subramanya.Tata Mc.Grawhill Publishers.
4. *Elements of Open channel flow* by Ranga Raju, Tata MC.Graw Hill, Publications.
5. *Fluid mechanics and fluid machines* by Rajput, S.Chand & Co.
6. *Open Channel flow* by V.T.Chow, Mc.Graw Hill book company
7. *Hydraulic Machines* by Banga & Sharma Khanna Publishers.
8. *Fluid Mechanics & Fluid Power Engineering* by D.S. Kumar Kataria & Sons.

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(13A01403) ENVIRONMENTAL SCIENCE

Course Objective:

- To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by the engineers.

UNIT I

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES: Definition, Scope and Importance – Need for Public Awareness.

NATURAL RESOURCES: Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT II

ECOSYSTEMS: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

- Forest ecosystem.
- Grassland ecosystem
- Desert ecosystem
- Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

BIODIVERSITY AND ITS CONSERVATION: Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT III

ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of :

- Air Pollution.
- Water pollution
- Soil pollution
- Marine pollution
- Noise pollution
- Thermal pollution
- Nuclear hazards

SOLID WASTE MANAGEMENT: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT IV

SOCIAL ISSUES AND THE ENVIRONMENT: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed

management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT V

HUMAN POPULATION AND THE ENVIRONMENT: Population growth, variation among nations. Population explosion – Family Welfare Programme – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

FIELD WORK: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, birds – river, hill slopes, etc.

Text Books:

1. *Text book of Environmental Studies for Undergraduate Courses* by Erach Bharucha for University Grants Commission, Universities Press, 2005.
2. *Environmental Studies* by Palanisamy, Pearson education, 2012.
3. *Environmental Studies* by R.Rajagopalan, Oxford University Press, 2nd edition, 2011.

Reference Books:

1. *Textbook of Environmental Studies* by Deeksha Dave and E.Sai Baba Reddy, Cengage Publications, 2nd edition, 2012.
2. *Text book of Environmental Science and Technology* by M.Anji Reddy, BS Publication, 2009.
3. *Comprehensive Environmental studies* by J.P.Sharma, Laxmi publications, 2nd edition, 2006.
4. *Environmental sciences and engineering* – J. Glynn Henry and Gary W. Heinke – Printice hall of India Private limited, 2nd edition, 1996.
5. *Introduction to Environmental engineering and science* by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited, 3rd edition, 2007.

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(13A01404) STRUCTURAL ANALYSIS – I

Course Objective:

- To make the students to understand the principles of analysis of structures of static and moving loads by various methods.

UNIT I

FIXED BEAMS & CONTINUOUS BEAMS: Introduction to statically indeterminate beams with 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 – Deflection of fixed beams effect of sinking of support, effect of rotation of a support.

UNIT II

SLOPE-DEFLECTION & MOMENT DISTRIBUTION METHOD: Introduction, derivation of slope deflection equation, application to continuous beams with and without settlement of supports. Introduction to moment distribution method- application to continuous beams with and without settlement of supports.

UNIT III

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-Deflections of simple beams and pin jointed trusses.

UNIT IV

MOVING LOADS & 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

UNIT V

ANALYSIS OF INDETERMINATE STRUCTURES: Indeterminate Structural Analysis – Determination of static and kinematic indeterminacies – Solution of trusses with upto two degrees of internal and external indeterminacies – Castigliano's theorem..

Text Books:

1. *Analysis of Structures – Vol-I&II* by V.N.Vazirani & M.M.Ratwani, Khanna Publications, New Delhi.
2. *Structural Analysis* by S S Bhavikatti – Vikas Publishing House.
3. *Analysis of Structures* by T.S. Thandavamoorthy, Oxford University Press, New Delhi.

Reference Books:

1. *Structural analysis – Hibbler – Pearson education*
2. *Introduction to structural analysis* by B.D.Nautiyal, New Age international publishers, New Delhi.
3. *Structural Analysis – D.S.Prakasa rao - Univeristy press.*
4. *Basic Structural Analysis* by K.U.Muthu et al., I.K.International Publishing House Pvt.Ltd.
5. *Strength of Materials and Mechanics of Structures* by B.C.Punmia, Khanna Publications, NewDelhi.
6. *Structual analysis Vol.I and II* by Dr. R.Vaidyanathan and Dr.P Perumal – Laxmi publications.
7. *Basic Structural Analysis* by C.S.Reddy., Tata McGraw Hill Publishers.

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(13A01405) SURVEYING - II

Course Objective:

- To ensure that the student develops knowledge in the working of advanced instruments, setting out of curves from the field measurements and basic knowledge on remote sensing.

UNIT I

TRIGONOMETRIC LEVELLING : Introduction; Determination of the level of the top of an object, When its base is accessible and When its base is not accessible; Determination of the height of the object when the two instrument stations are not in the same vertical plane; Axis signal correction; Difference in elevation by single observation and reciprocal observations.

UNIT II

TACHEOMETRIC SURVEYING: Definition, Advantages of Tacheometric surveying- Basic systems of tacheometric measurement , Principle of stadia measurements, Determination of constants K and C, Inclined sight with staff vertical; Inclined sight with staff normal to the line of sight, Movable hair method, Tangential method, Subtense bar, Errors in Tacheometry.

UNIT III

TRIANGULATION: Principles of triangulation, Uses of triangulation survey; Classification of triangulation; operations of triangulation survey; Signals and towers, Satellite station; Base line & Extension of the base line.

SETTING OUT WORKS: Introduction, Control stations; Horizontal control; Reference grid; Vertical control; Positioning of a structure; offset pegs, Setting out a foundation: reference pillars, batter boards, Setting out with a theodolite; Graded stakes; setting out a sewer; Setting out a culvert.

UNIT IV

CURVES: Simple curves-Definitions and Notations, designation of a curve, Elements of simple curves, location of tangent points, selection of peg interval, Methods of setting simple curves(based on equipment) – Rankines method, Two theodolite method. Compound curves – Elements of compound curve, setting out compound curve. Reverse curves – Elements of reverse curve, relationship between various elements.

UNIT V

ELECTRONIC DISTANCE MEASUREMENTS: Introduction, Basic concepts-electromagnetic waves, basic definitions, phase of the wave ,units, types of waves; distance from measurement of transit time, Computing the distance from the phase differences, , EDM instruments, electronic theodolites, total station-models, fundamental measurements, recording, traversing, data retrieval.

REMOTE SENSING: Introduction, Principle of Remote sensing, EM Radiation and the atmosphere, interaction of EM radiation with earth's surface, remote sensing observation platforms, sensors, applications of remote sensing. Geographical Information System: Introduction and principle of Geographical Information System, components of GIS, applications.

Text Books:

- Surveying Vol. 1 & II by Dr. K. R. Arora; Standard Book House;
- Surveying Vol-I&II by B.C. Punmia ,Laxmi Publications

Reference Books:

- Surveying Vol. 1 and 2 – By S.K. Duggal. Tata Mc. Graw Hill Publishing Co.
- Surveying and Levelling by Kanetkar T.P., and Kulkarni , Vols. I and II, United Book Corporation, Pune, 1994.

3. *Text book of Surveying*, Shahani, P.B., Vol.I & II, Oxford & IBH Publications, 1998
4. *Principles of GIS for land resource assessment* by P.A. Burrough –Clerendon Press, Oxford.
5. *Advanced Surveying* by Mahajan, Santhos K. Dhanpat Rai & Sons, Nai Sarak, Delhi, 1987.
6. *Remote sensing and Image Interpretation* by Lillesand, T.M., and Kiefer R.W., John Wiley and Sons, Inc, New York, 1997
7. *Advanced Surveying: Total Station, GIS and remote Sensing* by R. Sathikumar, Satheesh Gopi and N. Madhu, Pearson Education, India

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(13A01406) FLUID MECHANICS AND HYDRAULIC MACHINERY LAB**Course Objective:**

- *The objective of the course is to make the students understand the fluid flow concepts and get familiarity with flow measuring devices.*

LIST OF EXPERIMENTS:

1. Calibration of Venturimeter
2. Calibration of Orifice meter
3. Determination of Coefficient of discharge for a small orifice by a constant head method.
4. Determination of Coefficient of discharge for an external mouth piece by variable head method.
5. Calibration of contracted Rectangular Notch and /or Triangular Notch.
6. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
7. Varification of Bernoulli's equation.
8. Impact of jet on vanes.
9. Study of Hydraulic jump.
10. Performance test on Pelton wheel turbine.
11. Performance test on Francis turbine.
12. Efficiency test on centrifugal pump.

LIST OF EQUIPMENT:

1. Venturimeter Setup.
2. Orifice meter setup.
3. Small orifice setup.
4. External mouthpiece setup.
5. Rectangular and Triangular notch setups.
6. Friction factor test setup.
7. Bernoulli's theorem setup.
8. Impact of jets.
9. Hydraulic jump test setup.
10. Pelton wheel and Francis turbines.
11. Centrifugal pumps.

(13A01407) SURVEYING LAB – II

Course Objective:

- *To impart the practical knowledge in the field, it is essential to introduce in curriculum. Drawing of Plans and Maps and determining the area are pre requisites before taking up any Civil Engineering works.*

LIST OF EXPERIMENTS:

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 tachometric surveying (Two Exercises)
5. Curve setting – different methods. (Two Exercises)
6. Setting out works for buildings & pipe lines.
7. Determination of area using total station.
8. Traversing using total station.
9. Contouring using total station.
10. Determination of remote height using total station.
11. Distance, gradient, Diff. height between tow inaccessible points using total stations.

LIST OF EQUIPMENT:

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