B.Tech Civil Engineering (AKU Syllabus) SEMESTER- IV

FIELD MEASUREMENT Credit : 5

1. Introduction : Types of surveying, scale, principle of surveying, shrinkage of Maps. Lecture : 4
2. Chain surveying : Types of chain, Handling .Erroneous chain Equipments .Principle of chain and equipments, Method of chain survey .Obstacles ,Field book and recording. Lecture : 7
3. Compass surveying : Prismatic compass Bearings Traversing ,Local attraction, Adjustment .Plane Table survey .Equipments and uses principle of surveying .Closing error and adjustment methods of locating features .Two point problem and three point problem .Advantages and disadvantage Telescopic alidade. Lecture : 9
4. Leveling : Scope terms ,Equipments ,Types of level, Adjustment of dumpy level .Methods of leveling book and computation, missing data, Curvature and refraction correction. Reciprocal leveling contouring : Definition, Methods of contour survey, and plotting of contour. Area and volume. Lecture : 9
5. Theodolite : Scope, Types, Adjustment of transit theodolite. Measurement of horizontal angles ,Errors and elimination, Methods of traversing, computation of bearings. Coordinate system Gale's traverse table, Missing data, plotting Lecture : 8
6. Tachometry : Instrument, Tachometric constant. Analytic lens, principle, Computation, Beaman's Stadia arc, Subtense bar and subtense method, Tachometric plane table, Traversing, plotting. Lecture : 8

MECHANICS OF SOLID – I Credit : 5

1. Rigid and deformable solids; Stress and strain : Tension, compression and shear. Lecture : 4
2. Analysis of stresses, Basic Equilibrium equations, analysis of Strain Deformation, Strain Displacement Relations, Normal and shear Strains. Lecture : 7
3. Transformation, principal stresses and strains, Maximum Stresses & Strains, Mohr's Circle, volumetric Strain, compatibility Equations and boundary conditions, Strain rosettes, Velocity Field and Strain Rates. Generalized Hook's Law & Constitutive Relations for Solids, Elastic constants and their relations. Lecture : 6
4. Method of sections for evaluating internal forces in bodies, review of free body diagrams; axial force, shear and bending moment diagram. Lecture : 4
5. Axially loaded members force and deflections; Thermal Stresses. Lecture : 3
6. Bending & shear : classical theory, various cross-sectional shapes and composite sections of beams, shear stresses in beams. Lecture : 4
7. Deflection of beams : Bending deflection of simple beams by direct integration, singularity function method, Moment – Area Methods, deflection due to shear. Lecture : 4
8. Torsion : torsion of circular shift, close coiled helical springs, Torsion of thin walled open and closed sections and non-circular sections. Lecture : 6
9. Combined stress; principle of superposition and its limitations. Lecture : 4
10. Introduction to energy methods. Lecture : 3

Hydraulics & Open Channel Flow Credit : 3

1. Concepts of boundary layer flow : Introduction, boundary layer growth over a flat plate, Boundary layer thickness, laminar boundary layer, turbulent boundary layer, transition from laminar to turbulent flow. Lecture : 8
2. Basic concepts of Open Channel flow : Effect of gravity and viscosity on the flow behaviour, prismatic and non-prismatic channels. Lecture : 5
3. Uniform flow : Theoretical uniform flow equations; hydraulically efficient sections, velocity distribution in open channels, equation for velocity distribution, velocity distribution coefficients. Lecture : 6
Non-uniform flow : specific energy, Critical flow in a rectangular channel, Discharge curve, Dimensionless specific energy and discharge curve, applications of specific energy, momentum principle applied to open channel flow, specific force, small waves and surges applied to an open channel. Lec : 8
4. Gradually varied flow : Equation of gradually varied flow, classification of channel slopes; classification and examples of surface profiles, computation methods for length of surface profile. Lecture : 10
5. RVF. Hydraulic jump : Formation, length and loss of energy in a hydraulic jump, Location, elements, characteristics and types of a hydraulic jump. Lecture : 6
6. Introduction to Unsteady flow. Lecture : 2

OBJECT ORIENTED PROGRAMMING Credit : 5

1. Introduction to C++ : Object Oriented Technology, Advantages of OOP, Input- output in C++, Tokens, Keywords, Identifiers, Data Types C++, Derives data types. The void data type, Type Modifiers, Typecasting, Constant, Operator, Precedence of Operators, Strings. Lecture : 3
2. Control Structures : Decision making statements like if-else, Nested if-else, goto, break, continue, switch case, Loop statement like for loop, nested for loop, while loop, do-while loop. Lecture : 3

3. Functions : Parts of Function, User- defined Functions, Value- Returning Functions, void Functions, Value Parameters, Function overloading, Virtual Functions. Lecture : 3
4. Classes and Data Abstraction : Structure in C++, Class, Build- in Operations on Classes, Assignment Operator and Classes, Class Scope, Reference parameters and Class Objects (Variables), Member functions, Accessor and Mutator Functions, Constructors, default Constructor, Destructors. Lecture : 15
5. Overloading & Templates : Operator Overloading, Function Overloading, Function Templates, Class Templates. Lecture : 5
6. Inheritance : Single and Multiple Inheritance, virtual Base class, Abstract Class, Pointer and Inheritance, Overloading Member Function. Lecture : 5
7. Pointers and Arrays : Void Pointers, Pointer to Class, Pointer to Object, The this Pointer, Void Pointer, Arrays. Lecture : 6
8. Exception Handling : The keywords try, throw and catch. Creating own Exception Classes, Exception Handling Techniques (Terminate the Program, Fix the Error and Continue, Log the Error and Continue), Stack Unwinding. Lecture : 5

NUMERICAL METHOD & COMPUTATIONAL TECHNIQUE Credit : 4

1. Introduction to computer language : Machine language, assembly language, higher level language, compilers, problem solving using computer algorithm, flow chart, examples. Lecture : 5
2. C/C++ Programming : Constant & variables, arithmetic expression, I/O statement, specification statement, control statements, subscripted variables, logical expression, function and subroutines, examples of programming should include numerical as well as non numeric applications, matrix operations, searching , sorting etc. Lecture : 15
3. Iterative Techniques for solution of equations :
i. Solution of non linear equation - Simple iteration scheme, Bisection method, Regula-falsi method, Newton - Raphson method, Secant method, their rates of convergence, order of errors etc. Lecture : 5
ii. Solution of linear equation – Gaussian elimination, matrix inversion by Gaussian method, computation of determinants, Jacobi and Gauss Seidel iteration method. Lecture : 4
4. Polynomial approximation : Interpolation, several form of interpolating polynomials like Lagrangian interpolation of polynomial and Newtons forward and backward difference formula, curve fitting(least square) Lecture : 6
5. Numerical integration : Trapezoidal method, Simpson's rule, order of errors in integration. Lecture : 4
6. Solution of initial value problem : Euler's method, Runge-Kutta second order and fourth order methods, solution of boundary value problem - Finite difference method.

THERMODYNAMICS Credit : 4

1. Basic concept : Thermodynamic system and their properties, thermodynamic equilibrium, quasi-static and non quasi-static process, zeroth law and temperature equilibrium concepts. Lec: 3
2. First law of thermodynamics : concept of heat and work, first law applied to closed and open system, internal energy and enthalpy, flow work, laws of perfect gas, specific heat, first law applied to flow & non flow process. Lecture : 5
3. Second law of thermodynamics : concept of heat engine, refrigerator, heat pump and their range of working temperature, Kelvin-planck's and claussius' statements and their equivalence, Entropy, calculation of entropy change for processes, reversibility, entropy principles, in equality of claussius, available and unavailable energy. Lecture : 8
4. Properties of pure substances : Properties of steam and process with steam, Use of steam tables and mollier charts. Lecture : 4
5. Helmhotz and Hibb's function, Maxwell's relation. Lecture : 3
6. Ideal cycles : Air standard cycles, Otto, Diesel, Dual and Brayton cycle, Comparison of Otto, Diesel and Dual cycle. Lecture : 6
7. Vapour cycle : Carnot and Rankine cycle, Regenerative and reheat cycle. Lecture : 6
8. Non reacting mixture : Mixture of two ideal gases and their properties. Lecture : 2
9. Psychometry : Air and water-vapour mixture and their properties, adiabatic saturation, Use of psychrometry charts, Simple introduction to psychrometric process. Lecture : 5