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

ADVANCED SURVEYING Credit : 5

1. Curve : (a) simple curve - Scope, degree of curve, characteristics, offset from tangent, offset from chord produced. Rankine's method, obstacles.
(b) Compound and reverse curve – introduction of cases.
(c) Transition curve –compound curve, super elevation, length of transition curve, characteristics equations, shift, tangent length and curve length of combined curve. Computation for setting out of combined curve
(d) Vertical curve – scope, assumption of vertical curve, equations, computations for setting out curve, summit and valley curve. Lecture : 10
2. Electronic Distance meter : Scope, electromagnetic curve, basic definitions, phase of wave, types of waves, distance by transit time and phase difference, carrier wave, method of modulation. Electro-optical EDM measurement, infra-red EDM instrument, microwave EDM instruments, effect of atmospheric conditions and corrections, slope and height corrections, use of total station. Lecture : 9
3. Triangulation : Scope, classification, inter-visibility, satellite station, eccentricity of signals, base line and extension of base line. Theory of error terms, laws of weight, determination of M.P.V., M.P.E, adjustment of geodetic triangle with central station, adjustment of level line, adjustment of spherical triangle. Lecture : 10
4. Astronomical Survey : Terms, spherical triangle, spherical trigonometry. Time, sidereal time, apparent time, mean solar time, equation of time, universal time, standard time, conversion of time, determination of time, determination of azimuth, Latitude, Longitude. Lecture : 4
5. Geodetic Leveling : Scope, curvature and refraction correction, axis-signal correction, single angle observation, reciprocal leveling. Lecture : 8
6. Hydrographic Surveying : Scope, methods of sounding, locating of sounding, three-point problem and shoreline survey. Lecture : 5

SOIL MECHANICS – I Credit : 5

1. Introduction, Origin and Classification of soils, soil weight volume relationships, Index properties of soil, soil structures and Clay Minerals. Lec : 8
2. Effective stress principle, Surface tension and capillarity, Permeability of soils, Darcy's law, test for determination of permeability, engineering use of permeability. Factors affecting permeability. Lecture : 4
3. Seepage analysis, flow nets, flow through dams. Lecture : 4
4. Effective stress distribution in soils under hydrodynamic conditions. Quick sand, Piping, Prevention of piping failures. . Lecture : 4
5. Compressibility and Consolidation:- Consolidation Process- Spring analogy, Definition, measurement of consolidations- Determination of void ratio at various load increments, Terzaghi's theory of one dimensional consolidation, Determination of Coefficient of consolidation, Analysis of consolidation data. Lecture : 10

6. Vertical stress below applied load in soils (Boussinesq, Westergaard, and graphical solutions), one and twodimensional cases. Lecture : 5
7. Compaction characteristics, water content – dry unit weight relationships, OMC, max, Dry unit weight field compaction control. Lecture : 5
8. Soil stabilization Lecture : 2

STRUCTURAL ANALYSIS – I Credit : 4

1. Basic introductory concepts : structural systems, elements, joints, stability, equilibrium, compatibility, indeterminacy, types of loading. Lecture : 3
2. Force-displacement relation, free-body diagrams; analysis of forces in statically determinate structures : trusses (including compound and complex trusses), beams and frames (including internal hinges), cables and threehinged Lecture : 10
3. Stability of Walled Structures Lecture : 3
4. Influence lines for beams and trusses under moving loads; Criteria for maxima. Lecture : 7
5. Work and energy principles : principle of virtual work, potential energy and Clastingliano's theorems, complementary energy theorems, reciprocal theorems and Mueller Breslau's principle with applications. Lecture: 7
6. Analysis of displacements in statically determinate structures : Unit (dummy) load and energy methods, moment area and conjugate beam methods, Williot-Mohr diagram. Lecture : 5
7. Introduction to Matrix Methods for determinate structures : Flexibility & Stiffness Methods. Lecture : 7

ENGINEERING HYDROLOGY Credit : 4

1. Introduction : Hydrologic cycle and processes, Precipitation, Infiltration and Evapotranspiration, Forms of precipitation, measurement, analysis, depth-area-duration and intensity-duration frequency relations. Lecture : 7
2. Evaporation : Process, measurement and estimation, Infiltration process, measurement and estimation, Evapotranspiration measurement and estimation, Stream flow measurements. Lecture : 6
3. Runoff and Hydrographs, Factors affecting flow hydrograph, Rainfall Runoff correlations, Flow duration curve, Mass curve, Unit hydrograph, its analysis and S-curve hydrograph. synthetic and instantaneous unit hydrographs. Lecture : 7
4. Statistical analysis, flood frequency studies, Rational method, time Area curves, Design flood, Design Storm, Risk, reliability and safety factor. Lec : 8
5. Channel and flood routing, time series analysis of droughts and floods. L : 4
6. Groundwater hydrology, flow equations confined and unconfined flow, Well hydraulics Steady and unsteady flow, Well losses, Specific capacity. Lecture : 6

MECHANICS OF SOLID – II Credit : 3

1. Introduction to elasticity theory; Simple 2D/3D problems and their solutions. Lecture : 6
2. Pure bending of beams with unsymmetrical section; Shear Centre; Torsion of noncircular members. Lecture : 6

3.Curved Beams : Beams on elastic foundation. Lecture : 6
4.Plastic Theory, plastic hinges and shape factor, uniqueness, upper bound and lower bound theorems; Failure theories. Lecture : 6
5.Energy methods : Introduction to viscoelasticity and viscoplasticity; Numerical methods Lecture : 6
6.Stability of Equilibrium : columns, Euler's formula, Eccentric loading, end conditions and effective length,
Practical Design formulae. Lecture : 6
7.Coupled axial force and bending moment problems; coupled torsion and bending moment problems. Lecture : 6

FLUID MACHINERY Credit : 5
1. Introduction – classification of fluid machinery. Lecture : 1
2. Dynamic action of fluid jet – Impact of fluid jet on fixed and moving flat places, impact of jet on fixed and moving curved vanes, flow over radial vanes, jet propulsions. Lecture : 4
3. Euler's fundamental equation , degree of reaction. Lecture : 2
4. Hydraulic turbines, introduction, classification, impulse turbine, construction details, velocity triangles, power and efficiency calculations, reaction turbines; constructional details, working principle, velocity triangles, power and efficiency calculations, draft tube, cavitation, governing. Lecture : 10
5. Principle of similarity in fluid machinery; unit and specific quantities, testing models and selection of hydraulic turbines. Lecture : 3
6. Positive displacement pumps : Reciprocating pump; working principle, classification, slip, indicator diagram, effect of friction and acceleration, theory of air vessel, performance characteristics gas gear oil pump and screw pump. Lecture : 4
7. Rotodynamic pumps : Introduction, classification, centrifugal pump; main components, working principle velocity triangle, effect of shape of blade specific speed, heats, power and efficiency, calculations minimum steering speed, multi stage pumps, performance characteristic, comparison with reprobating pump. Lecture : 7
8. Air compressor : Reciprocating compressor, introduction, P-V diagram, calculation of isothermal and adiabatic work and efficiency, free air delivery, slippage, volumetric efficiency, effect of clearance, multistage compression, inter cooling. Lecture : 5
9. Rotary compressor : Introduction fans, blower and compressor, state and total head, centrifugal compressor, velocity triangles, slip factor, losses and efficiencies, performance characteristic. Lecture : 6