Course Title: Mathematics (Calculus) I

Class Hours: 48

Course Credits: 3 (theory)

Course Description:

Laplace Transform: Definition, derive the Laplace transform for simple functions, initial conditions using the method of Laplace transforms, applications of Laplace transforms, derive the inverse Laplace transforms of standard functions, and use the Laplace transform to solve linear differential equation

Fourier series: Definition, determine the Fourier series coefficients, Fourier series for even and odd functions, extend function to Fourier sine and cosine series
Partial Differential Equations: Definition, derive a partial differential equation, solving partial differential equations by separation of variables, solving first and second-order differential equations

Solving some non-linear Equations-Complex Valued Functions: Definition of Complex function and derivative of an analytic function, exponential series, and integration of complex functions, Maclaurin series, Residue theorem, and its applications.

Prerequisite(s): None

Course Title: General Chemistry

Class Hours: 64

Course Credits: 3 (2 theory + 1 practical)

Course Description:

Introduction: chemistry, Dalton's atomic theory, laws of chemical combination, the atomic weight, Avogadro number, mole definition, chemical calculations.

Atomic structure: electrical nature of matter, atomic structure and the effect of ford, electromagnetic radiation, quantum theory, ray spectroscopy and atomic number, quantum mechanics, a hydrogen atom, energy level, periodic table, ion energy, atomic radius, isotopic study, radioactivity.

Thermochemistry STD: originally thermochemistry STD, spontaneous reactions, free energy and entropy, Helmholtz.

Gas mode: gas laws, kinetic theory of gases, natural gas, distribution of molecular velocities, the specific heat of gases. Chemical bonds: ionic bonding and covalent, atomic and molecular orbitals, bond length, bond angles, the octet rule, multiple bonds, polarity of bonds, resonance hydrogen bonds, metal bonds, semiconductors, insulators, liquids.

Solids and solutions: evaporation, vapor pressure, boiling point, freezing point, the vapor pressure of solids, treatment dissolution mechanism, vapor pressure of solutions and their rules.

Equilibrium in chemical systems: reversible reactions and chemical equilibrium, le chatelaine's principle, speed of chemical reactions: the effect of concentration on rate, catalysts, acids, and bases.

Ionic balance: weak electrolytes, buffered solutions.

Oxidation and reduction: oxidation state, half-reaction theory, balancing redox reactions, galvanic cell Nernst equation, other chemical cells.

Prerequisite(s): None

The original version of the syllabus in Farsi can be seen on the website of the Iranian Ministry of Science, Research and Technology.

Course Title: Physics I

Class Hours: 64

Course Credits: 3 (2 theory + 1 practical)

Course Description:

Measurement, vectors, moving in one dimension, moving a page, particle dynamics, work, energy conservation, rotational kinematics and dynamics, particle, definitions of temperature and heat, terms of zero, one and two of thermodynamics, kinetic theory of gases.

Prerequisite(s): None

The original version of the syllabus in Farsi can be seen on the website of the Iranian Ministry of Science, Research and Technology.

Course Title: Mathematics (Calculus) II

Class Hours: 48

Course Credits: 3 (theory)

Course Description:

parametric equations, spatial coordinates, vector space, scalar multiplication, the 3 × 3 matrix, system of linear equations three unknowns, inverse matrix, solve the system of equations, two basic linear independence, determinant 3 × 3, vector multiplication, equations of lines and surface, two vector functions and their derivatives, speed and acceleration curvature, vectors perpendicular to the curve, multivariate function, tangent plane and the vertical gradient, chain rule, fully differential, double and triple integrals and their applications, cylindrical and spherical coordinates, vector field curvilinear integrals.

Prerequisite(s): Mathematics (Calculus) I

Course Title: Mathematics III (Differential Equations)

Class Hours: 48

Course Credits: 3 (theory)

Course Description:

Definition of differential equations and solve them, curves and vertical directions, physical models, separable equation, first-order linear differential equation, homogeneous equation, second-order linear differential equations, homogeneous equations with constant coefficients, the method of undetermined coefficients, the method of changing parameters, application of second-order equations in physics and mechanics, series solution of the differential equation, bell and gamma functions, Legendre polynomial, introduction to differential equations, Laplace transform and its application in solving differential equations.

Prerequisite(s): Mathematics (Calculus) I

Course Title: Computer Programming

Class Hours: 64

Course Credits: 3 (2 theory + 1 practical)

Course Description:

Introduction and history of computers: hardware components, language, and its variations, software definition, software applications.
Steps to problem-solving: defining the problem, problem analysis, decompose the problem into smaller problems and determine their relationship.
Algorithm: definition of the algorithm, generalize the solution and algorithm design, express the
algorithm using flowchart, express the algorithm using pseudocode, following algorithm, the concept of sub-algorithm.
Programming and problem solving: program definition, the overall structure of the program, the basic structure.
Programming: logical construction, simple and complex data types, subroutine, understanding the concept of files, file processing, input and output operations, concepts of functional languages such as Pascal, FORTRAN, C++ or another language.

Prerequisite(s): None

The original version of the syllabus in Farsi can be seen on the website of the Iranian Ministry of Science, Research and Technology.

Course Title: Statics

Class Hours: 64

Course Credits: 3 (2 theory + 1 practical)

Course Description:

An overview of the quantities, vector algebra, Newton's laws of individual systems, determine the resultant force direction, balance laws, moment of a force about a line or around a point multiplying the inner and outer vectors, force pairs, consequence of a general system of forces, determine the equivalent force from surface forces, the system of parallel and general forces, the equilibrium of rigid bodies, determine the support forces, free body forces, conditions of static equilibrium, static uncertain.

Structures: trusses, frames, machine components, distributed forces, beams, cable, moments of area, multiple inertias, friction, virtual work and energy methods.

Prerequisite(s): Mathematics I, Physics I

Course Title: Technical Drawing (Engineering Drawing & Drafting)

Class Hours: 48

Course Credits: 2 (1 theory + 1 practical)

Course Description:

Theoretical:

An introduction to origin of industrial drafting and its application; definition of projection; drawing of projection, point, line, plane; object on a projection plane; introduction of main pages of projection; three projections drawing principles; geometrical relation between different projections; drafting tools and their application; standard dimensions of drafting papers; different types of lines and their application; table of map specifications; geometrical drawings; different methods and introduction of 1st and 3rd order of dihedron; method of drawing three images of a substance in 3rd order of dihedron; method of drawing six images of a substance in 1st order of dihedron; dihedron transform; image drawing from simple models; measure writing and application of letters and figures; drawing image of a substance through its determined images using method of identification of surfaces and volumes; definition of shear and contracts thereto related; simple shear (symmetric & asymmetric); broken shear; slant and radial broken shear; simple semi-shear; broken semi-shear; local shear; circulation and transformed shears; exceptional in shear; definition of concrete projection and its application; classification of concrete projections; normal concrete projection (isometric, diametric, trimetric); slant concrete projection including isometric slant (cavalier) and diametric slant (cabinet); bolt and nut junctions; rivet, welding and method of drawing of their different types; method of drawing of modulated maps in brief.

Practical:

Practical lesson and introduction to drawing software such as AutoCAD

Prerequisite(s): None

The original version of the syllabus in Farsi can be seen on the website of the Iranian Ministry of Science, Research and Technology.

Course Title: General Pedology

Class Hours: 64

Course Credits: 3 (2 theory + 1 practical)

Course Description:

Theoretical:

Definition of soil formation, soil-forming factors, the physical properties of the soil, chemical properties of soil, biological properties of soil, organic materials and their relationship with soil characteristics, soil fertility, identification and classification, an overview of soil degradation.

Practical:

Sampling and sample preparation, measurements of soil moisture, bulk density and true, soil texture, soil color, measurement of soil organic matter, determination of soil reaction, determining soil salinity, visit a few profiles, visit the local soil.

Prerequisite(s): General Chemistry

Note: This course was translated wrong in the Transcript. It was translated wrongly to General Agrology.

The original version of the syllabus in Farsi can be seen on the website of the Iranian Ministry of Science, Research and Technology.

Course Title: Numerical Methods (Computations)

Class Hours: 32

Course Credits: 2 (theory)

Course Description:

Errors and mistakes, interpolation and extrapolation, find the roots of equations by various methods, numerical differentiation and integration, finite differences, numerical methods for solving first and second-order differential equations, operations on matrices and finding their eigenvalues, solving the systems of linear and nonlinear equations, method of least squares.

Prerequisite(s): Mathematics III, Computer Programming

The original version of the syllabus in Farsi can be seen on the website of the Iranian Ministry of Science, Research and Technology.

Course Title: Statistics and Probability

Class Hours: 48

Course Credits: 3 (theory)

Course Description:

Theoretical:
Statistical definitions include: population, frequency distribution table; histogram, concentration and dispersion parameters, possibilities include: total probability, compound probability, conversion and composition, mathematical expectation, binomial and normal distributions; estimation of population parameters, mean reliability, hypothesis testing, test of differences between two means, correlation and regression, chi-square test, analysis of variance, non-parametric methods.

Practical:

Solving problems and exercises.

Prerequisite(s): Mathematics I

Course Title: Physics II

Class Hours: 48

Course Credits: 3 (theory)

Course Description:

Charge and material, Gauss's law, amber law, Maxwell's equations, electric field, electric potential, capacitor dielectric, the flow resistance and propulsion, electrical circuits, the magnetic field electromagnetic fluctuations, alternating currents, electromagnetic waves, Faraday’s law in induction, magnetic properties of materials, inductance.

Prerequisite(s): Physics I

The original version of the syllabus in Farsi can be seen on the website of the Iranian Ministry of Science, Research and Technology.

Course Title: Introduction to Specialized Software

Class Hours: 48

Course Credits: 2 (1 theory + 1 practical)

Course Description:

Theoretical:
An introduction to software concern the following subjects: computer modeling, hydrological data analyzing, surface water profiles of channels and rivers, crop production, water and soil, infiltration and pollution, irrigation and drainage, piping.

Practical:

Work with the software using field data.

Prerequisite(s): None

The original version of the syllabus in Farsi can be seen on the website of the Iranian Ministry of Science, Research and Technology.

Course Title: Project (Water)

Class Hours: 64

Course Credits: 2 (practical)

Course Description:

Project must be determined by professor or educational board.

Prerequisite(s): None

Course Title: Botany I (Physiology & Anatomy)

Class Hours: 64

Course Credits: 3 (2 theory + 1 practical)

Course Description:

Theoretical:

Variety of plant tissues, primary and secondary structures of roots, stems, leaves, flowers, fruits, Plant Cell Physiology, transpiration, absorb and transmit of materials, respiration and biological oxidation mechanisms, enzymes and their role in metabolism, organic compounds and their significance, nitrogen metabolism and its metabolism of plant material, physiology of growth, plant hormones.

Practical:

Observation of types of tissues, the structure of root, stem, leaves, flowers, a phenomenon of geotropism, measurement of osmotic pressure, transpiration and carbon intensity measurements, measurement of in vitro plants.

Prerequisite(s): None

Course Title: General Agronomy

Class Hours: 64

Course Credits: 3 (2 theory + 1 practical)

Course Description:

The role of environmental factors such as light, heat and moisture production of crops, planting, the role of management in crop production crop rotation scheme, seed biology, the nature of plant breeding in agriculture, the operation, dry sows and its importance in agriculture, harvesting operations.

Prerequisite(s): None

The original version of the syllabus in Farsi can be seen on the website of the Iranian Ministry of Science, Research and Technology.

Course Title: Meteorology and Climatology (Water Eng.)

Class Hours: 64

Course Credits: 3 (2 theory + 1 practical)

Course Description:

Theoretical:

General concepts: definition of meteorology and climatology, meteorological parameters and their application in agriculture, natural resources and environment, national and international meteorological monitoring networks, pans of meteorological science, weather history in Iran and the world, statistical sources of weather information, the structure of the atmosphere, structure and composition of gaseous emissions, changes in ozone and carbon dioxide, air pollutants and impurities, the temperature structure of the atmosphere and the different layers of the atmosphere, the effective height of the atmosphere.

Meteorology and climatology factors: air pressure (vertical changes in air pressure, conversion to sea-level pressure, low pressure and high pressure), winds (Coriolis force and gradient, the movement of air, plot the Wind rose), temperature (the heating and cooling of air near the ground, the impact of long-and short-wavelength radiation, climatic parameters of air temperature, isothermal lines), soil temperature (soil temperature regime and its laws), humidity (humidity sensing parameters and their calculation, circadian and annual changes of humidity), evaporation (surface and internal evaporation, potential and actual evapotranspiration, pan evaporation, factors affecting evaporation, the role of cooling air process on cloud formation, types of clouds), precipitation (rain and snow formation, precipitation types, climatic parameters, rainfall, precipitation curves), climate classification (classification of climate, humidity and drought indices, different methods of estimating agronomic potential).

Practical:

Understanding the structure and function of meteorological instruments (mercury manometer, barograph, thermometers of air and soil, humidity meters, evaporation gauges, anemometers, and wind facades), analysis of meteorological data, draw temperature regimes, visit a weather station and provide a report.

Prerequisite(s): Physics I

Course Title: Fluid Mechanics

Class Hours: 48

Course Credits: 3 (theory)

Course Description:

Fluid properties: definition of fluid, viscosity, perfect gas, modulus of elasticity, vapor pressure, surface tension.

Static fluids: fluid Static fundamental equation, unit and scale of measuring pressure, manometers, pressure forces on submerged surfaces, buoyancy force, stability of floating and submerged bodies, relative equilibrium of liquids.

The basic equations of fluid flow: concepts and volume control system, equation of continuity, Euler's equation, Bernoulli's equation, reversible and irreversible fluids, losses, the energy equation and its application, the momentum equation, the coefficient of kinetic energy, the quantity factor.

Dimensional analysis and dynamic similarity: dimensional homogeneity, dimensionless ratios, dimensions and units, Buckingham theory, the dimensionless parameters.

viscosity effects: laminar and turbulent flow rules, steady incompressible flow, laminar flow in a pipe, the Reynolds number, velocity distribution, boundary layers, flow resistance, flow in curvilinear paths.

Prerequisite(s): Mathematics III, Statics

Course Title: Surveying I (Surveying & Mapping)

Class Hours: 64

Course Credits: 3 (2 theory + 1 practical)

Course Description:

Theoretical:

introduction to surveying, baseline levels, measuring and implementing direct extensions, measuring devices, plane surveying, providing the plan, calculate the area in different ways, types of leveling devices, leveling instruction, simple leveling, surveying and drawing the longitudinal and transverse profiles, leveling the surface, providing elevation plan, vertical and horizontal angle measurements, the lines, angles, azimuth, yaw angle, optical measurement of length, measure and draw the polygon, tachometer geodesy, level curves, simple horizontal arcs, preliminary interpretation of aerial photographs.

Practical:

familiarity with surveying instruments, implementation and measurement of straight direction with ground obstacles, measurement by tape measure and oblique prism, area calculation in different ways, surveying and leveling the longitudinal and transverse profiles, tachometric polygon, implementing horizontal arc using the yaw angle, familiarity with a stereoscope and preliminary interpretation of aerial photographs.

Prerequisite(s): Mathematics I

Course Title: General Irrigation (Principles and Methods of Irrigation)

Class Hours: 64

Course Credits: 3 (2 theory +1 practical)

Course Description:

Theoretical:

Introduction, water resources for irrigation, water supply and its transmission, measurement of water, water and soil and plant relationships, irrigation efficiency, water and irrigation issues in Iran, introduction to irrigation methods.

Practical:

The apparent specific weight of soil and real bulk density measurement, measuring soil moisture, measuring irrigation water, measurement of dynamic soil coefficients, determining water requirements.

Prerequisite(s): General Pedology, General Agronomy

Course Title: Strength of Materials

Class Hours: 48

Course Credits: 3 theory

Course Description:

General concepts of stress: stress, Stress definition and its kinds, tensor. Stress analysis on bars under axial load: stress in bended sections, Shear stresses, allowed stress in repetitive loads, safety factor, endurance stress in fasteners, rivet, bolt, and knot.

Strain and distortion in axially loaded members: strain definition and tensor, strain, stress relations, single axial law, Hook's Law, Inspection of stress curve. Strain for various materials, heat strain, and application of the compatibility equation of location change for solving problems. Poisson coefficient, Hook's general equations homogenize isotope materials, volumetric stress and bulk modulus, the stress in thin cylinder and sphere under the effect of internal pressure.

Torsion of circular elastic bars: concepts and basic assumptions, torsion equations for shear stress and torsion angle in can-shaped sections, axial force, shear force and bending moment in certain beams, internal forces by sectioning method.

Pure bending: basic assumptions, a curvature formula, section moment and its calculation, stress formula as a result of pure bending, stress concentration, section composed of two or several materials, bending in beams with asymmetrical section, compound bending as a result of off-center axial load.

Shear stress as a result of shear force: shear flow, shear stress formula in beams; shear center, the composition of shear stresses and inspection of design notes because of shear.

Creep in certain beams: determination of creep equation by bending moment equation or load distribution equation, the unit functions method (Macaulay) Determination of creep by principles of effective composition.

Prerequisite(s): Statics

Course Title: Soil Mechanics

Class Hours: 64

Course Credits: 3 (2 theory +1 practical)

Course Description:

Theoretical:

Definition of terms of soil and rock, weight and volume relationships, soil gradation, grading curve, soil plasticity, soil structure, coarse-grained and fine-grained soils, mixed soil, soil compaction, proctor method, soil compaction curve, soil compaction machine, soil classification, tensions in the soil, Boussinesq's method, Westgard's method, Newmark's method, the approximate method, water in the soil, the flow net, elastic settlement, settlement due to consolidation, factors affecting soil strength, Mohr's circle, determine soil strength, determine the allowable strength, determine the lateral pressure,

Rankine's theory, retaining walls, ramp testing.

Practical:

Determine gradation (sieve and hydrometer), liquid limit and plastic limit in soil, CBR test, consolidation test, uniaxial and triaxial compression tests, simple shear test.

Prerequisite(s): Strength of Materials

Course Title: Advanced (Supplementary) Surveying

Class Hours: 64

Course Credits: 3 (2 theory + 1 practical)

Course Description:

Theoretical:

Coordinate systems, the theory of errors, adjustments to correct errors, setting leveling devices, setting the Theodolite, measuring the angles, rangefinders, polygon classification, polygon coordinates calculation, triangulation measurement and calculation, measurement of height, topography maps, methods of land leveling, calculating and implementing curve, preparation of longitudinal and transverse profiles, calculate the volume of excavation and embankment, interpretation of aerial photographs.

Practical:

Triangulation, preparation of longitudinal and transverse profile, topography maps, implementing arc, calculate the volume of cut and fill, leveling maps.

Prerequisite(s): Surveying I

Course Title: Surface Water Hydrology

Class Hours: 48

Course Credits: 3 (theory)

Course Description:

Theoretical:

Introduction (definition of hydrology, status of surface water hydrology, hydrological variables), watershed (flow continuity equation and estimating water balance), a review of weather and climatology, precipitation (rainfall characteristics, spatial and temporal variations, IDF and DAD curves), water-leaf, evapotranspiration, permeability, physical characteristics of the basin, hydrometry, surface runoff (SCS) equation, linear equation of rainfall, flood hydrograph, natural and synthetic unit hydrograph, separating the base flow from the river hydrograph.

Prerequisite(s): Meteorology and Climatology, Statistics and Probability

The original version of the syllabus in Farsi can be seen on the website of the Iranian Ministry of Science, Research and Technology.

Course Title: Open Channel Hydraulics

Class Hours: 32

Course Credits: 2

Course Description:

An introduction to the differences between pressurized flow and flow in open channels, types of flows, flow regimes (critical, sub-critical and super critical), the velocity of surface wave, velocity and pressure distribution in open channels, continuity equation and it application in open channels, flow through gates and transitions, the concept of specific energy and alternative depths, the characteristics and equations of critical flow, control sections, upstream and downstream control, the application of energy principle in short surface waves, the principle of momentum and it application in open channels, the concept of specific force and alternative depths, hydraulic jumps, evaluation the force of flow over hydraulic structures (weir, gates, transitions,…), flow resistance in open channels, shear stress equation, Darcy Weisbach, Chezy and Manning equations; open channel design, covered channels, the best hydraulic section for covered channels, gradually varied flow, non-uniform flow equation, water surface profiles, water surface profiles in prismatic canals.

Prerequisite(s): Fluid Mechanics

Course Title: Principles of Drainage

Class Hours: 32

Course Credits: 2 theory

Course Description:

General concepts (definition and importance of drainage systems, irrigation and drainage relations, drainage coefficient), physics of water and soil (soil classification, soil water potential, water table, water movement in soils, Darcy's law, drainage porosity, the volume of water extracted from the soil), drainage studies (studies of topography, hydrology, pedology, geology, hydraulic conductivity and its measurement, hydraulic conductivity of non-homogeneous soil, hydraulic conductivity of non-uniform soil, the potential curves), surface drainage systems, underground drainage systems (networks, zigzag, parallel, single, compound, drainage pipes, loss coefficient, filters, piping slope, installation of drainage pipes), introduction to the theory of steady and non-steady drainage, drainage system management.

Prerequisite(s): General Irrigation, Surveying I

Course Title: Ground Water Resources (Underground Water)

Class Hours: 64

Course Credits: 3 (2 theory + 1 practical)

Course Description:

Theoretical:

Groundwater contribution in water balance, aquifers and their classification, formation properties, springs, aqueducts, hydrodynamic coefficients, hydraulic conductivity, transfer coefficient, special storage, groundwater flow, Darcy's equation, continuity equation in steady and unsteady flow, flow net, one, two and three dimension flow, uniformity and consistency of formations, flow lines, potential lines, the network, well hydraulics, steady and unsteady flow equations, testing the well pumping, hydraulic loss of well, well close to river and foothill, well efficiency, drilling method, well completion, groundwater quality, groundwater pollution, artificial recharge of aquifers, seawater intrusion, rise of saltwater due to pumping.

Practical:

Visit dredging operations of aqueduct, visit the drilling of deep wells, pumping tests, determine the hydrodynamic coefficients, ISO potential groundwater contour map, well hydrograph.

Prerequisite(s): Geology, Fluid Mechanics

Course Title: Hydraulics

Class Hours: 64

Course Credits: 3 (2 theory + 1 practical)

Course Description:

Theoretical:

Rules and general equations of fluid flow and their applications (calculations of siphons, flow measurement, hydraulic machines, power of pumps and turbines, cavitation, network flow, boundary layer), fluid flow in pipes (laminar flow, turbulent flow, velocity distribution, energy loss in pipes, local losses), network of pipes (pipes in series, parallel and cyclic networks, branched pipes, connecting pipe to the tanks).

Practical:

Measurement of fluid properties, pressure measurements, measurements of forces due to pressure on surfaces, balance and floating objects, observation of fluid motion, linear flow and pipe flow, measuring devices such as venturi meter, orifice, weir, measurement of the losses.

Prerequisite(s): Statics, Fluid Mechanics

Course Title: Surface Irrigation Systems Design

Class Hours: 64

Course Credits: 3 (2 theory +1 practical)

Course Description:

Theoretical:

Irrigation purposes, role of surface irrigation in increasing crop, principles of economic analysis in the selection of irrigation systems, chemical and physical principles of soil and water, management of water, saline soils and water quality; general design of surface irrigation systems, the pattern of water motion over the ground, surface irrigation systems, furrow irrigation systems, the physical relationship between water motion and water penetration, experimental and hydraulic equations, methods of cut-back, surface irrigation methods on a flat plot, border irrigation system design, border irrigation restrictions, prevent water losses and increase efficiency, spate irrigation, the use of mathematical models in surface irrigation.

Practical:

Visit the farm fields, evaluation of surface irrigation systems, field experiments and surface irrigation projects.

Prerequisite(s): General Irrigation, Open Channel Hydraulics

Course Title: Drainage System Design

Class Hours: 64

Course Credits: 3 (2 theory +1 practical)

Course Description:

Theoretical:

A review of drainage principals, studies required for designing drainage systems (soil studies, hydrological studies), mathematical models of drainage, the design of drainage networks (surface, underground and vertical drainage, drain buffer, implementation of drainage network, machinery, operational problems of drainage, operation and maintenance of drainage networks), drainage materials (pipes, filter materials, select the appropriate filter), issues related to drainage (environmental considerations, costs and revenues of drainage).

Practical:

Introduction to drainage software, drainage projects, visit a drainage network.

Prerequisite(s): Drainage Principals, Advance Surveying, Surface Water Hydrology

Course Title: Water Structures Design I

Class Hours: 64

Course Credits: 3 (2 theory +1 practical)

Course Description:

Designing principals of channels (capacity, path, geotechnical and soil mechanic studies, selecting the sections based on hydraulic, operational and economical criteria), design of structures (transitions, junctions, road crossings, siphons, air flume, drop structures, gates and turnouts).

Prerequisite(s): Open Channel Hydraulics, Soil Mechanics

The original version of the syllabus in Farsi can be seen on the website of the Iranian Ministry of Science, Research and Technology.

Course Title: Design of Pressurized Irrigation Systems

Class Hours: 32

Course Credits: 2 theory

Course Description:

Theoretical:

Application of pressurized irrigation systems, sprinkler irrigation systems (types, goals of design, uniformity of water distribution, effects of wind and pressure on uniformity, water distribution, coefficient of uniformity, adequacy of irrigation and irrigation efficiency, components, the amount of water distribution, distance of sprinklers, criteria of selecting sprinklers, determine the capacity, the design and arrangement of the water distribution system, lateral design, main and sub-main pipes), pump specification, center pivot irrigation systems and their types, wheel-move irrigation systems, gun irrigation system, drip irrigation (concepts and principles, benefits, disadvantages, components, emitters and their variations, uniformity of emitters, hydraulics of emitters, effects of temperature on droppers, water quality in drip irrigation, filters, water treatment, types of filters, bacterial filtration, chemical treatment, injecting manure, instructions).

Practical:

Emitters' evaluation, determining the coefficients of emitters' discharge equation, evaluation of sprinkler irrigation systems, pressurized irrigation project.

Prerequisite(s): General Irrigation, Hydraulics

Note: This course is translated to High-Pressure Irrigation System Design in the transcript.

Course Title: Engineering Economics

Class Hours: 32

Course Credits: 2 (theory)

Course Description:

Introduction and definition (application of engineering economy to invest in development projects, time value of money, diagram, cash flow, financial mathematics, benefit formulas), economic analysis and comparison of variants: (definition and resolution of variations, costs estimating, the annual equivalent method, amount to the cost method, rate of return method, graphical methods, depreciation, dynamic analysis of the project, risk, economic study of the project, computational and graphical methods.

Prerequisite(s): None

The original version of the syllabus in Farsi can be seen on the website of the Iranian Ministry of Science, Research and Technology.

Course Title: Agricultural Experiments Design I (Design of Agricultural Experiments)

Class Hours: 64

Course Credits: 3 (2 theory +1 practical)

Course Description:

Theoretical:

Definitions, science, experiments, repeat, treatment, experimental units, experimental errors, systematic and random designs, Latin squares, comparison of means using LSD, TUKEY and DUNGAN, calculation of missing plot, the relative utility, nested plans, factorial experiment, additional analysis of SS, SS separation, the split plots.

Practical:

Problem solving, implementing some practical plans in the field, calculation and observation the results.

Prerequisite(s): Statistics and Probability

Course Title: Water and Soil Conservation

Class Hours: 48

Course Credits: 2

Course Description:

Theoretical:

water erosion (sheet erosion, furrow erosion, ditch erosion, calculating the erosion in watersheds, common equations of soil erosion, models of soil erosion, detriments due to soil erosion), wind erosion (principles, cause of erosion, results of erosion, preventative methods, wind breakers, the use of mulch, dune stabilization), soil conservation (terracing, vegetation protection), water conservation (dikes, reduce the permeability and evapotranspiration in water ways, increased water storage in soil, artificial injection, create small reservoirs).

Practical:

Visit a completed project, present a soil and water conservation project.

Prerequisite(s): Advance Surveying

Course Title: Water Soil and Plant Relationship

Class Hours: 64

Course Credits: 3 (2 theory + 1 practical)

Course Description:

In this course, the relationship between water, soil, plant, and atmosphere are discussed. Therefore, students get familiar with drought and salinity and their effects on the crop yield.

Theoretical:

Water's importance to plants, chemical and physical properties of water, liquid properties (vapor pressure and osmotic pressure), chemical potential and water potential (osmotic, pressure, gravity, and matric potential), water in plant cells, water movement in plant cells, water movement in saturated and unsaturated soils, soil hydraulic conductivity especially in unsaturated soils, movement of water vapor in soils, soil water distribution, roots growing in soil, the environmental effect on plant growth, floating plants, water absorption by roots and other organs of plants, water movement in plants, energy required for plant Transpiration, plant cell structure and function, water deficits and plant growth, plant dry strength, water use efficiency of plants, effects of water temperature on plant growth, frost & freeze protection with irrigation.

Practical:

Effect of water potential on germination, soil-water characteristic curve, soil water content measurement using TDR, leaf area index measurement, measurement of water potential in plant, leaf diffusion porometer.

Prerequisite(s): General Irrigation, General Pedology

Course Title: General Horticulture

Class Hours: 48

Course Credits: 3

Course Description:

Theoretical:

History of garden products, garden plant classification, plant proliferation, plant hormones, principles of pruning, proliferation methods of cultivation, planting and harvesting of vegetables, glandular plants, fruit, seed and ornamental plants.

Practical:

Identify fruit trees, vegetables and ornamental plants in Iran, proliferation cultivation, planting and harvesting fruits, vegetables and flowers, visit horticultural production centers.

Prerequisite(s): Botany I, General Agronomy

Course Title: Geology

Class Hours: 48

Course Credits: 3

Course Description:

Geological processes, geological materials, geological structures, earthquakes, rock weathering and soil formation, the role of coping with destructive winds and wind deposits, streams, groundwater, unstable slopes.

Prerequisite(s): None

The original version of the syllabus in Farsi can be seen on the website of the Iranian Ministry of Science, Research and Technology.

Course Title: Pumps and Pumping Stations

Class Hours: 64

Course Credits: 3 (2 theory + 1 practical)

Course Description:

Theoretical:

Introduction, positive displacement pumps and rotodynamic pumps, centrifugal pumps and fluid mechanics calculations, pump curves, types of pumps, calculate TDH or total dynamic head, net positive suction head (NPSH), pump affinity laws, pump specific speed, pumps and pump stations damages (cavitation and water hammer) and their mitigations, pump series, design and operation of pumping stations on rivers and canals, energy consumption in pumps and how to reduce it, dry pumping stations, floating pumping stations.

Practical:

Introducing different types of pumps, plotting a pump curve, designing a pumping station for a water distribution network as a project, field trip to dry pumping stations and floating pumping stations.

Prerequisite(s): Hydraulics

Course Title: Principles of Remote Sensing and GIS

Class Hours: 32

Course Credits: 2 theory

Course Description:

Theoretical:

GIS definition and its history, basic definitions, GIS data structures, topology basics, the relation between descriptive data and spatial data, basics of preparation, saving and processing of spatial data (digitizing data, conversion format, and data structures), the introduction of some applicable GIS software, and concepts of remote sensing including, Electromagnetic Radiation (EMR) and its application in remote sensing, earth-based satellites and their application in remote sensing, satellite image processing, a technical trip to an organization related to GIS.

Prerequisite(s): Advanced (Supplementary) Surveying

Course Title: Water Resources Management

Class Hours: 48

Course Credits: 2 (1 theory + 1 practical)

Course Description:

Theoretical:

Introduction to water resources and cycle, water resources and usage in Iran and the world, hydraulic structures (reservoirs, pumping stations, distribution lines, irrigation network, urban water distribution, drainage systems, surface water collection, …), project management and control, engineering economics in water resources, objectives in water resources, water resources system analysis (simulation and optimization), modeling.

Practical:

Application of WEAP for watershed simulation, conducting a water resources management project using a simulation.

Prerequisite(s): Surface Water Hydrology, Groundwater