

**ASPETE
DEPARTMENT OF CIVIL & CONSTRUCTION ENGINEERING
EDUCATORS**

4-Year Degree Programme

**Duration of Studies: 8 Academic Semesters
ECTS: 240**

Course Content

Μετάφραση από την Ελληνική:

Μαρία Μ. Καντωνίδου, Επικ. Καθηγήτρια, Υπεύθυνη Γραφείου Δημοσίων & Διεθνών Σχέσεων ΑΣΠΑΙΤΕ, σε συνεργασία με τους Καθηγητές Ειδικότητας.

Επιμέλεια Μετάφρασης:

Γεώργιος Γεωργούσης, Καθηγητής, Τμήμα Εκπ/κών Πολ. Έργων Υποδομής

Απόφαση Συμβουλίου Τμήματος: 11/25.05.2009

1st SEMESTER

Y101 – Mathematics I (ECTS 6.0)

Linear algebra: matrices, determinants, linear systems, eigenvalues and eigenvectors. Vector calculus and analytic geometry. Differential and integral calculus of one variable. Ordinary differential equations. Sequences-Series: basic concepts, numerical series, function series, power series (Taylor and Maclaurin series). Applications in the field.

Y102 – Physics I (ECTS 5.0)

Motion: Newton's laws of motion, force and conservation of momentum, force and conservation of energy. Rotational force: description of rotational force, rotational kinetic energy, inertia torque, parallel and perpendicular axis theorems, torque and Newton's second law, torque and conservation of energy, torque and conservation of angular momentum.

Fluid mechanics: basic concepts (pressure, buoyancy, Pascal's principle), laws of continuity, Bernoulli's law, viscosity, Stokes's and Poiseuille's laws. Heat: temperature scales, thermal expansion, calorimetry, phase changes, heat transfer.

Lab assignments: Theory of errors and error diagrams. Measuring angles and lengths. Young's modulus of elasticity. Measuring the moment of inertia and angular acceleration. Conservation of energy tests. The Maxwell wheel. Fluid density. Measuring the viscosity coefficient. Determining surface tension using the ring method. Determining the performance coefficient of a heater. Black body radiation. The C_p/C_v ratio.

Y103 – Technical & Construction Drawing (ECTS 4.0)

Line drawing. Decorative drawing – straight and curved lines. Straight and curved line joints, geometric constructions. Drawing scales. Plans, views, and cross-sections of solid objects. Axonometric drawings of solid objects. Structural works design: building plans, views and cross-sections, staircases, inclined planes, dimensioning, material symbols. Detail drawings. Transportation works design: longitudinal road sections and cross-sections, traffic intersections and interchanges. Road construction design: gutters and retaining walls. Hydraulic works drawings: monitoring wells, rain gutters, dam plans, lined irrigation canals. Port works design: quays, piers.

Lab assignments.

Y104 – Introduction to Informatics and Computer Programming (ECTS 5.0)

Number systems: binary, octal, hexadecimal. Hardware: input– output units, memory, cards. Software: system software, applications software. Networks–communications: computer communications, network architecture, internet (TCP/IP protocol, domain addresses, internet services).

Introduction to QBASIC programming language: input-output commands, program flow control, do loops, matrices.

Lab assignments: Introduction to Windows, Microsoft Word, Microsoft Excel. Internet, spreadsheets, email. Simple select commands and do loops. One- and two- dimensional matrices.

Y105 – Introduction to Educational Sciences (ECTS 4.0)

Theoretical background. Interdisciplinary aspects and approaches. Sources of pedagogical knowledge: educational practice, philosophical thinking, bibliographic support, scientific research. Determining factors in educational processes. General aspects of education: goals and objectives, school space and time, relations of school, family and society, etc.

Educational practice: fundamental principles, educational relations, school textbooks, educational material. New trends and forms of education: education for persons with special needs, environmental education, cross-cultural/intercultural education, health education – consumer education, art education, etc. Current pedagogical trends and applications: Children's rights, voluntary work and social problematics, linking education and work, technological literacy, "flexible zone" in education, etc.

Y106 – General and Developmental Psychology (ECTS 6.0)

Psychology as science. Methods of psychological research. Main theoretical streams. Personality – The role of heredity and environment. Adjustment (problems, disorders, defense mechanisms, etc). Intelligence, emotional intelligence, creativity.

Personal growth and development. Theories of human development (psychodynamics, sociological, and developmental approaches). Lifespan development. Special attributes at different stages. Focus on the

emotional problems of adolescents (emotional disorders, depression and suicide, etc). Individual differences.

2nd SEMESTER

Y201 – Mathematics II (ECTS 5.0)

Functions of multiple variables. Differential equations, the Laplace transform. Probability and statistics. Probability theory. Presentation of numerical data. Basics of distribution theory. Probability distributions: binomial, normal, student. Vector analysis. Applications in the field.

Lab assignments: Numerical calculations, mathematical expressions. Functions of one variable: limits, derivatives, integrals, graphs. Taylor series. Graph display of implicit, parameter, and reverse function. Solutions of equations, inequalities, and systems of equations and inequalities. Functions of multiple variables: limits, partial derivatives, differential, composite functions, graphs. Local maxima and minima, line integral, graphs. Solutions of differential equations and systems. Direction fields and graphs. Matrices and systems, eigenvalues-eigenvectors. Point lists, regression, graphs. Statistical analysis of data.

Y202 – Physics II (ECTS 5.0)

Oscillations: linear harmonic oscillation, angular, damped, forced, resonance, composition. Waves: harmonic wave equation, wave intensity, superposition of waves, standing waves. Acoustics: subjective and objective characteristics of sound, noise measurement (decibel scale) – the Doppler phenomenon, ultrasounds. Electromagnetism: electrostatic field (Gauss law), magnetic field (Biot Savart's law, Ampere's law), electromagnetic induction (Faraday's law), Maxwell's equations.

Lab assignments: Light wavelength. Spectroscopy grading. Laser wavelength. Resistance and capacitance measurement with a Wheatstone bridge. Capacitance measurement. Thermal dependence of resistance. Voltage divider. Cathode-ray oscilloscope. Characteristic curve of PN junction diode. Special charge measurement. Hysteresis loop. X-ray attenuation coefficient.

Y203 – Applied Mechanics (ECTS 5.0)

Types of loads: concentrated and distributed forces, moments. Forces in plane and in space structures. Equilibrium of a body. Force resultants. Types of support restraints and static determinacy. Reactions in simple statically determinate structures. Internal forces in plane structures: axial force, shear force and bending moment diagrams. Applications on common statically determinate structures: Gerber beams, frames, simple trusses.

Y204 – Engineering Geology (ECTS 5.0)

Basics of Engineering Geology. Geological formations (creation, structure, texture, classification, properties). Identification and classification of rocks and minerals. The structure of the Earth. Crust, mantle and core. Basics of rocks. Igneous, sedimentary and metamorphic rocks. Stratigraphy. Use of geological compass. Use of measurement data. Network representations. Endogenous and exogenous geological processes. Erosion – surface erosion. Geomorphology. Slopes. Hydrographic network. Water divides. Catchment basins. Rivers. Geomorphology parameters. Geoforms and masonry. Representations of geological formations with traditional and modern methods. Physical properties of rocks. Fine scale and large scale rock properties. Description and measurements of discontinuities. Orientation of discontinuities (use of compass). The Schmidt stereographic representation. Earthquakes, types of earthquakes, seismic waves. P and S waves. Underground waters. Permeability. The Dupuit assumption. Permeability (K), conductivity, and storativity tests. Geotechnical research projects. Research drilling, types of drilling, sampling.

Lab assignments: Minerals (simple methods of mineral identification, the Mohs scale of hardness). Identification of rocks. Topographic and geological maps. Geological compass. Statistical analysis of geological data. Soil relief, hydrological basins, rock permeability, seismology.

Y205 – Philosophy – Sociology of Education (ECTS 5.0)

Philosophy of education: Fundamental concepts. Relationship of philosophy of education and education. Basic methods of philosophical analysis, philosophy of education and teacher education, the philosophical underpinnings of teaching and learning. Problems and antinomies in education, language and philosophical thought, critical thought and philosophy. Major figures in the philosophy of education. Analysis of classical texts. Main philosophical streams. Trends and contemporary issues.

Introduction to Sociology. Leading figures in sociology. Sociology of Education, overview of theoretical streams. Social functions of education, education and economic development, equal opportunities in education, school and social environment, school performance, school failure. The school as a social organization. Ideological-political functions of education. Sociological analysis of Greek educational system.

Sociology of Technical & Vocational Education. Main theoretical streams. Science and technical studies in recent years and in postindustrial society, “technoscience”. Technical & Vocational Education and new technologies.

Y206 – Educational Psychology (ECTS 5.0)

Introduction to educational psychology.

Learning: Concept, object and problems. Learning theories. Overview of main theories. Factors influencing learning outcomes (motivation, maturity, teaching styles, etc). Individual differences and learning. Learning styles and study habits. Perception, learning and memory.

Learning difficulties. Interpersonal relationships and mental health. Social skills. Enhancement of interpersonal relationships. Gender relations. Special student groups (intelligent students, mentally retarded, non-privileged students, foreign students, etc). The classroom as group. Peer groups in the classroom. Group types, group function and group dynamics. Drug, alcohol, AIDS and other support services for students and school. The teacher as counsellor.

3rd SEMESTER

Y301 – Structural Materials (ECTS 7.0)

Types of structural materials. Structural materials chemistry. Properties of structural materials: Porosity, moisture content, water absorption, water permeability. Laboratory test procedures. Aggregates and sieve analysis: grain-size analysis. Cement: properties and production technologies. Mortars and concretes: production, properties, and testing. Concrete carbonization. Ceramics: production and properties. Timber structures: structural properties of wood, glue laminated members, plywood. Structural steel: types, shapes, protection against corrosion. Polymeric structural materials. Structural glass and applications.

Lab assignments: Aggregate sampling and grading. Properties of aggregates: particle shape and texture, strength, apparent weight, specific gravity, porosity, moisture content and water absorption. Sand purity. Sand equivalent test. Cements: fineness and, volume stability of cement paste. Mortars: slump and flow tests, mortar cohesion. Concretes: mix design, compressive and tensile strength of concrete – the split-cylinder test.

Y302 – Strength of Materials (ECTS 7.0)

Basic concepts. Normal stresses (tension, compression). Shear stresses. Plane structures, principal stresses, Mohr’s cycle. Deformations. Centers of gravity. Moments of inertia. Moment-area. Elastic behaviour of materials: Bending, shear, torsion. Eccentric loading – shear core. Members with flexure and axial load. Buckling. Brittle and ductile materials. Elastoplastic behaviour of ductile materials. Failure criteria.

Lab assignments: Steel tension: stress-strain diagrams. Tests of prismatic specimens: under compression, bending, and torsion. Torsional moment, rotation diagram. Photoelasticity. Folding tests. Brinell & Rockwell hardness tests. Impact and fatigue tests.

Y302 – Strength of Materials (ECTS 7.0)

Basic concepts. Normal stresses (tension, compression). Shear stresses. Plane structures, principal stresses, Mohr’s cycle. Deformations. Centers of gravity. Moments of inertia. Moment-area. Elastic behaviour of materials: Bending, shear, torsion. Eccentric loading – Section kern limits. Members with flexure and axial load. Buckling. Brittle and ductile materials. Elastoplastic behaviour of ductile materials. Failure criteria.

Lab assignments: Steel tension: stress-strain diagrams. Tests of prismatic specimens: under compression, bending, and torsion. Torsional moment- rotation diagram. Photoelasticity. Folding tests. Brinell & Rockwell hardness tests. Impact and fatigue tests.

Y303 – Building Constructions and Structural Elements (ECTS 5.0)

Structural materials. Construction of load-bearing structure. Scaffolding. Indoor and outdoor walls.

Floors and ceilings. Insulation (humidity, thermal, and sound insulation). Water proofing of slab roofs and basements. Roof trusses. Door and window panels. Staircases. Coatings. Paints and paintings.

Lab assignments: Thermal insulation design. Insulation techniques. Noise measurements and sound absorption coefficient. Sound insulation techniques. Wall construction preparation (marking and marking devices). Brick interlocking in intersecting walls. Estimate and measuring of structural elements (walls, coating areas, concrete elements). Scaffolding manufacture.

Y304 – Computer-Aided Design (ECTS 1.0)

Creating, saving, and transferring design files. Draw commands (Line, Pline, Circle, Arc, Ellipse, etc). Edit commands (Erase, Copy, Move, Trim, Offset, etc). Drawing aids (Grid, Snap, Ortho, Drafting Setting, Osnap, etc). Text processing and editing (Text, Mtext). Automatic dimensioning. Editing of complex designs (Layer, Block, Xref). Scale printing. Applications.

Y305 – Educational Management and Policy (ECTS 5.0)

Basic concepts and principles of educational management and policy. Statutes and Constitution. The issue of pedagogical freedom. Authority and pressure groups and their impact on educational policy. Organizational and management theories and their impact on educational management.

Structure and organization of the educational system: Overview of educational reforms and changes, levels of education, school types, institutions, etc). Central and regional educational management. School environment and school climate.

Human resource management. Staff categories. Staff management (placement, promotion and professional development policies). Human resource management in education. Gender and educational management. School quality and health and safety policy. The teacher as educator; the teacher as public servant or private employee. Performance assessment. Internal evaluation of school unit.

Comparative educational management and policy: European and international educational policy. CEDEFOP's role in Vocational Education and Training.

Y306 – Counselling Psychology and Guidance (ECTS 5.0)

Counselling: Concept, aim, content, and relation with counselling psychology. Theoretical background, methodology and applications. Counselling intervention. Professional ethics and principles of counselling and guidance. Assessment in counselling. School case studies requiring counselling intervention and support.

Career counselling: School, educational and occupational guidance. Career development and personal growth. Career education in the context of career counselling. Career counselling methodology and organization of overall counselling/guidance services and interventions. Assessment in career counselling and guidance. Overall evaluation of career counselling and guidance.

4th SEMESTER

Y401 – Structural Analysis I (ECTS 5.0)

Introduction to structural analysis. Types of loads. Equilibrium equations. Statically determinate and indeterminate structures. Structural models. Internal redundancy. Internal forces in determinate structures. Axial force, shear force and bending moment diagrams. Trusses and methods for determining internal axial forces. Arch structures. Influence lines of simply supported beams, Gerber beams and three-hinged arches. Peak internal forces due to live loads. The principle of virtual work. Betti-Maxwell theorem. Deformations of statically determinate structures. Unit load method. Mohr's theorems. Elastic curve.

Y402 – Transportation Works and Traffic Engineering (ECTS 5.0)

Introduction to traffic engineering. Traffic volume. Variations of traffic volume (annual, monthly, daily, hourly, peak hour factor). Design volumes (average daily traffic). Traffic composition. Distribution of traffic volume. Speed and speed variation patterns. Volume-speed, volume-density and density-speed relationships. Characteristics of drivers, pedestrians and vehicles. Road capacity and service level of a road (traffic capacity, service volume, ideal conditions, levels of service, operating conditions). Factors affecting traffic capacity and service volumes.

Lab assignments: Collection and processing of traffic flow data. Traffic flow case study of a road and a simple intersection.

Y403 – Foreign Language- ESP (ECTS 4.0)

A learner-centered approach to English for Specific Purposes (ESP) in the context of civil & construction engineering curriculum. Task-based activities promoting the acquisition of receptive competence and communicative skills in the field (contextualized treatment of specific notions, functions, discourse skills and rhetorical components; specialized/authentic reference materials).

Y404 – Surveying (ECTS 8.0)

Basic concepts. Units of measurements. Reference surfaces. Two- and three- dimensional coordinate systems. The Greek Geodetic Reference System. Error theory. Error propagation law. Length measurements and instruments used. Setting perpendicular lines, instruments and methods. Measurement of horizontal and vertical angles. Area measurements. Total geodetic system. Tacheometry. Traverse alignments and types. Three fundamental problems. Calculations. Triangulation. Altimetry. Level instruments. Methods of measurements. Area mapping. Topographic plans.

Lab assignments: Area measurements; mapping and area calculation of a plot using both the geometric method and the method of coordinates. Use of transit instrument for measurement of horizontal and vertical angles. Level instrument. Measurements of elevation differences. Planimeter, electronic planimeter, applications. Total station– measurement of distances, angles, and elevations. Topographic mapping of a wider area: polygonometry, tacheometry, and altimetry measurements. Production of an integrated topo plan.

Y405– Teaching Methodology (ECTS 7.0)

Introduction to the field. Teaching models. Forms and principles of teaching. New ways of teaching, teaching style(s), dilemmas in teaching, curriculum and hidden curriculum. Lesson planning, goals, content, and implementation. Teaching methods: Lecture, guided discussion, Socratic questioning, demonstration, discovery learning, cooperative learning, team teaching, individualized teaching, project-based, problem-based, skill-based, interdisciplinary instruction, developing teaching portfolio, programmed teaching, tele-teaching, etc.

In-class practice: Lesson plans and analysis of teaching.

Y406 – Computer Applications in Education (ECTS 1.0)

Computer Basics: Operating systems basics, office applications software, educational software.

Computer applications in education: Integrating technologies & educational software in course design and teaching. Development of multimedia presentations.

Networks – Internet: The educational potential of internet, internet as an educational tool, internet technologies and services and learning theories. Internet as an information resource (web browsing, searching for information, retrieval of information, information management and evaluation). Internet as communication and distance learning tool. Development of web-based educational material. Web page concept and design. Introduction to web-base teaching and learning activities.

Multimedia: Designing multimedia applications. Authoring tools.

Lab assignments.

5th SEMESTER

Y501 – Structural Analysis II (ECTS 5.0)

Statically indeterminate structures. Force equilibrium and compatibility of deformations. Force method. Flexibility coefficients. Temperature effects. Support displacements. Elastic supports. Applications. Deformations of statically indeterminate structures. Symmetric structures: symmetric and anti-symmetric loading. The displacement method. Encastre beams and propped cantilevers. Free body diagram. Stiffness coefficients. The Cross method. Applications. Influence lines of indeterminate structures. The Muller-Breslau principle. Applications to continuous beams. Geometric instability: braced and unbraced frames

Y502 – Land Transportation Works (ECTS 7.0)

Introduction to highway engineering. Road components. Design stages of a road. Design speed. Definition, speed types, design speed V_e , change of curvature rate, operational speed V_{85} . Consistency of road alignment, roadway improvements. Road classification. Geometric design elements. Road design elements: tangent-circular curve. The spiral as a transition curve in roadway design. Horizontal road alignment - use of tables and computer software. Vertical alignment - definition, determination of vertical curves and finished grade elevations. Curvature diagrams. Cross section elements - Greek and German roads. Typical cross-sections - embankment development. Super elevations: tangent – curves – transition spirals. Visibility: definition – stopping and passing sight distance. Earth works and mass diagrams. Cuts, fills, method of measurement, Bruckner diagram, determination of the ultimate split line and the average hauling distance. Earth moving and hauling cost tables. Earth work optimization. Quantity take-off and cost of highway projects.

Lab assignments: Road design. Speed determination, set up of uni-slope line and traverse line, calculation of road center line data using tables or computer software. Cross sections. Super elevations. Earthworks (area and volume measurements, mass diagrams). Quantity take-off and cost estimate: earthworks, base and sub base material, asphalt layers based on Greek standards, curbs, concrete islands, traffic control devices, pavements, roadway illumination, planting, etc. Cost analysis. Highway design using computer software.

Y503 – Technical Legislation (ECTS 3.0)

Principles of town planning and the General Building Code. Town planning legislations – definitions and concepts. Public works specifications and provisions. Basic concepts: cost analysis and invoicing of construction works, contractual obligations and liabilities, public works auction and tenders, contracts. Public work legislation (Law 1418/84, Presidential Decree 609/85, Presidential Decree 472/85 – Contracting Companies’ Register, Law 2576/98). Penalties and civil liability. The impact of legislation on the practice of technical profession and the construction of technical works. Professional ethics. Legislation on workers’ safety and hygiene: safety measurements and prevention of accidents.

Y504 – Hydraulics (ECTS 7.0)

Properties of fluids, surface tension, capillary phenomena. Principles of hydrostatics, center of pressure, buoyancy, equilibrium of floating bodies, dam calculation practice. Principles of hydrodynamics, rotational and irrotational flow, flow functions, permanent and non-permanent flows. Laminar and turbulent flow. Continuity, momentum, and energy equations. The Bernoulli equation for ideal and real fluids, Euler and Navier–Stokes equations. Hydraulic losses, Moody diagram, piezometric line and energy line. Hydraulic machines (pumps and water turbines). Open channels, free-surface flows, special energy, critical flow, hydraulic jump. Flows over weirs, tank and orifice flow. Hydraulic works – open and closed channels.

Lab assignments: Properties of fluids – test methods for density and specific gravity (hydrosopes). Measurement of viscosity using falling ball viscometers. Surface tension, cohesion and adhesion capillary forces, capillary rise and fall. Hydrostatic pressure, demonstration of hydrostatic paradox. Buoyancy, the Archimedes’ principle. Hydrostatic forces on σ το μέτωπο σωληνοειδούς. Venturi flow meter. Application of the Bernoulli equation in horizontal and non-horizontal circular pipes, piezometric line and energy line. Linear and local losses. Hydraulic machines (Pelton turbine and centrifugal pump), performance curves. Open-channel flows. Flow rate measurements through gates and over rectangular and triangular weirs, determination of flow discharge coefficients. Determination of hydraulic jump elements.

Y505 – Educational Evaluation (ECTS 4.0)

Introduction to the field. Theoretical background, contemporary evaluation theory, models, methods, techniques, context and application problems. Purpose and standards. Staff evaluation, school-based evaluation. Organization and presentation of data. Evaluation programmes and evaluation processes. Institutional framework. The role of evaluation in the curriculum.

Student evaluation. Theoretical background, goals and objectives. Methods and assessment techniques. Student performance assessment – test construction and validation. Key elements involved in testing and grading, test anxiety. Higher education entrance exams. Marking and grading of papers and projects. Statistical analysis of test results; score interpretation. Presentation of data; different types of scales.

Y506 – Educational Research Methodology (ECTS 4.0)

Philosophical background of scientific research (positivism, anti-positivism, phenomenology, etc). Fundamentals of empirical research. Empirical research methodology. Empirical research design and methods (formulation of research questions, goals and objectives, variables, hypotheses, funding, etc). Statistical criteria and techniques. Computer data processing. Writing a research paper – steps and instructions. National and European research institutes and programmes. Educational research institutes at national and European level.

6th SEMESTER

Y601 – General Technology (ECTS 5.0)

The concept of technology. Technology and society. Linking technology with production. Primary, secondary, and tertiary production. Technological development and professions. The economy. Production organization and management. Study of technology (individual work). Study of production (collective work). The production line method in industry: method, research and experimentation. General Technology didactics in secondary education. Educational processes (seminars and lectures, presentations of projects, manufactures).

Lab assignments: Applications in the field (tools, instruments, apparatuses, machinery, materials, technical drawing, production line methods, scientific research). Individual research and team work.

Y602 – Urban Hydraulics (ECTS 7.0)

Fundamentals of urban hydraulics and the design of urban hydraulics networks. Urban water demand, surface flow hydraulics, springs, water abstraction techniques, water intake. Water transport, open and closed channels, aqueducts, pressure pipes, pumping stations. Water demand-supply balance. Water tower and reservoir dimensions. Hydraulic studies specifications, water supply planning. Drinking water treatment plants. Water quality specifications. Planning and operation of separate and non-separate wastewater networks. Ancillary works for sewerage. Typical sewage systems: nominal water flow discharge, hydraulic calculations, water pipe technologies.

Lab assignments: Water tower dimensioning for residential water supply. Dimensioning of aqueducts. Performance of water supply pumping systems. Experimental sampling – water contaminants. Educational visits.

Y603 – Reinforced Concrete (ECTS 7.0)

Reinforced concrete as structural material. Design limit states: ultimate and serviceability limit states. Mechanical properties of steel and concrete. Strength of members with flexure. CEB diagrams and tables. Applications on beams and slabs. Reinforced concrete slabs: one-way slabs, two-way slabs, cantilevers. Modeling of reinforced concrete structures. The axial force effect: predominant bending, predominant compression. Bond and anchorages: the nature of bond resistance, anchorage types and development lengths. Strength of members with shear and torsion. Service load behavior: control of deflections and cracking. Code provisions: longitudinal and lateral shear reinforcement ratios, steel bar spacing, types of stirrups, concrete cover.

Lab assignments: Under- and over-reinforced beams. Experimental load-deflection and moment-curvature curves. A design example: dimensioning calculations and cost estimate of a simple floor construction made of slabs and beams.

Y604 – Subject Didactics (ECTS 6.0)

Introduction to the field. The concept of job analysis; job analysis in vocational education and training. Professional knowledge and skills. Linking production with vocational education and training. Sample teaching analysis. Curriculum design principles and programmes of subject didactics – current trends. Comparison of vocational education and vocational training programmes.

Skill-based teaching. Demonstration and experiment. Individualized practice. Procedural knowledge and the strategy of effective teaching in subject didactics.

Declarative knowledge and teaching practices in vocational courses didactics; alternative applications. Development of learning enhancement strategies during teaching.

Lab assignments.

Y605 – Educational Technology-Multimedia (ECTS 5.0)

Nature of technology and emergence of educational technology as a discipline. Learning theories as bases for technology integration models. Technology integration planning. Current educational technology systems and emerging trends. Integrating software tutors and tools into teaching and learning: educational software, basic software tools (word processing, spreadsheet and database programs), multimedia and hypermedia tools.

The internet as an educational tool: integrating the internet into teaching and learning. Research findings on the use of new technologies in different teaching and learning environments.

Lab assignments: Production, presentation and integration of educational material. Current and emerging information and communication technologies. Web-based teaching and learning activities. Teleconference, tele-education, distance learning.

7th SEMESTER

Y701 – Soil Mechanics (ECTS 7.0)

Introduction to soil mechanics. Physical properties of soils: structure, nature, porosity, porosity index, apparent and specific gravity, soil moisture content, the moisture-density relationship. Soil classification (grain-size analysis, Atterberg limits). Cohesive and non-cohesive soils. Mechanical properties of soils. Permeability, capillary elevation, groundwater flow. Active and neutral stress, compressibility of clay soils, shear strength, cohesion, friction angle, natural slope angle. Mohr cycles. Soil compaction. Relationships between stresses. Uniaxial and triaxial compression. Plastic equilibrium, earth pressure. Stresses and deformations, elastic modulus.

Lab assignments: Soil moisture content (successive weighting and calcium carbonate methods). Apparent and specific gravity of cohesive soils, void index, porosity index. Grain-size analysis. Atterberg limits. Soil classification. Density of sand (sand-cone method). The moisture-density relationship of soils (Proctor and modified Proctor method). Soil water permeability test. Shear strength test. Unconfined compression test.

Y702 – Seismology and Earthquake Resistant Constructions (ECTS 5.0)

Introduction to seismology. Seismicity in Greece. Strong motion data. Seismic behaviour of a single-degree-of-freedom elastic system. Response spectrum. Inelastic response of a single-degree-of-freedom system. Inelastic spectrum. Elastic response of multi-degree-of-freedom systems. Mode shapes and vibration periods. Design spectrum, the behaviour factor concept. Greek code provisions. Simulation of masses and structural idealizations. Design eccentricity. Methods of analysis. Lateral load resisting bents: shear systems (frames), bending systems (walls), mixed type structures. Capacity design principles. Plasticity of structures and construction details. Prevention of collapse.

Lab assignments: Application of the pseudo-static method on a simple building structure (via computer software). Bending moment distribution in simple frames due to gravity and horizontal loading. Critical sections in building structures. Dimensioning of beams and columns. Modal analysis of tall buildings. (computer demonstration).

Y703 – Construction Management and Machinery (ECTS 7.0)

Technical works: procedures and legislation. Construction site planning and operation. Construction site works. Preliminary works: excavations, embankments, scaffolding, demolitions, soil conditions and structural requirements, piles, tunneling, underwater works. Construction management and organization, site decisions, material quantities (estimates, measurements, budget, invoicing). Safety, and hygiene precautions: required facilities and equipment, legislation, common accidents. Scheduling of construction activities: plan layout and work flow. Construction progress diagram. Construction cost. Time-cost curves. Mechanization of technical works: mechanical equipment, machinery types and appropriate selection.

Lab assignments: Video demonstration of construction machinery operation: aggregate production process, cement production machinery, material handling equipment (vehicles and conveyors), crane types and capacity. Basic mechanical equipment: operation and maintenance costs. Visit to large construction sites.

Y704 – Land Reclamation Works (ECTS 7.0)

Natural streams. Introduction to sedimentation processes and suspended sediment transport. Meanders mechanisms. Riverbed protection hydraulic works. Basics of agricultural hydraulics and irrigations.

Basics of soil science, the structure of soil. Hydraulic properties of soils, irrigation infrastructure demands in Greece. Irrigation methods, irrigation networks. Water balance, irrigation water demand. Planning of sprinkler irrigation and drip irrigation networks. Hydraulic calculations. Network optimization techniques. Large-scale irrigation works. Drip irrigation pumping systems. Land reclamation studies – principles and specifications. Introduction to drainage systems, ground water level. Planning of drainage networks. Hydraulic calculations. Construction elements. Drainage system installation. Standardization of drainage symbols. Large-scale drainage works in Greece and environmental effects.

Lab assignments: Simulation of sprinkler irrigation. Determination of the Manning-Strickland open channel factor. Seepage forces in open channels. Simulation of drip irrigation installation. Irrigation systems employing parallel flowpaths. Irrigation case studies.

Y715 – Techno-Economic Analysis (ECTS 4.0)

Cost estimation of technical works. Cost categories: direct, indirect, additional cost items (general expenditure, construction/development profit, etc). Cost calculation: staff costs, procurement of equipment and materials, capital use. Measuring of works done, certifications, payments. Actual cost. Project analysis, expenditure budget, expected profit, cost-effectiveness of technical equipment, options of technical solutions and cost compatibility, cost optimization. Expenditure curve, funding curve. Invoicing. Typical construction budget examples.

Y716 – Operational Research (ECTS 4.0)

Linear programming (Simplex method, transfer binaries). Non-linear programming, basics of quality control. Dynamic programming. Project management techniques (PERT-CPM). Investment models. Decision analysis, decision trees. Problem solutions by means of computer packages. Applications in the field.

8th SEMESTER

Y801 – Teaching Practice (ECTS 6)

Y802 – Practical Work Experience (ECTS ---)

Y803 – Graduation Thesis (ECTS 24)