Course	Credits	Description	Prerequisite or Concurrent
1-Mathematics I	3	**(Duration: 48 hours)** Cartesian coordinates; polar coordinates; complex numbers; addition, product, root & geometrical representation of complex numbers; polar representation of complex numbers; function; functions algebra; limit and relevant theorems; infinite limit and limit in infinite; left-hand and right-hand limit; connectivity; derivative; derivation formula; inverse function and its derivative; trigonometric functions derivative and their inverse functions; Rolle's theorem; mean theorem; Taylor expansion; geometrical and physical applications of derivative; curves and acceleration in polar coordinates; application of derivative in approximation of equations roots; definition of integral of continuous functions and piecewise continuous; basic theorems of differential & integral arithmetic; primitive function; approximate methods of integral estimate; application of integral in computation of area, volume, length of curve, moment, center of gravity and labor (in Cartesian and polar coordinates); logarithm and exponential function and their derivative; hyperbolic functions; integration methods such as change of variable, component and decomposition of fractions; transform of special variables of sequence and numerical series and relevant theorems. Power series and Taylor theorem and recursive functions.	-
2-Mathematics II	3	**(Duration: 48 hours)** Analytic geometry in Euclidean plane and Euclidean space, Vector-Valued functions, elementary theory of curves and surfaces, Ferenet-Serret apparatus, multivariable functions (limit and continuity, partial derivative), polar, spherical and cylindrical coordinates, multiple integration, green and stokes theorems, elementary account of differential forms.	1

3-Differential Equations	3	**(Duration: 48 hours)** Nature of differential equations and their solution, family of graphs and vertical routes, physical patterns, separable equation, first order linear differential equation, homogeneous equation, second order linear equation, homogenous equation with fixed constants, method of indefinite constants, method of changing parameters, application of second order equations in physics and mechanics, solution of differential equation with series, Bessel and Gamma functions, Legendre polynomial, an introduction to differential equations set, Laplace transform and its application in solving differential equations.	2
4-Numerical Computations	2	**(Duration: 32 hours)** Approximations and errors, instability in numerical computations and methods of their prevention. Curve fitting and interpolation: interpolating criteria, least-squares regression, Lagrange interpolating polynomial with one and two variables. Cubic spline interpolation. Newton interpolating polynomial. Taylor approximation. Liner and polynomial regressions. Other common regression curves. Chebyshev approximation (minimax polynomial); numerical differentiation and integration: numerical integration by trapezoidal rules and Simpson rules. Gauss-Legendre, Gauss-Chebyshev and Gauss-Hermite quadratures. Romberg method and Richardson extrapolation. Numerical differentiation; roots of algebraic and transcendent equations: bisection method, substitution method, Newton methods for real and complex variables; systems of linear algebraic equations: direct methods (Gauss elimination and LU decomposition). Iterative methods (Jacobi method and Gauss-Seidel method); solving methods for nonlinear systems: Jacobi method, generalized Newton method, Newton-Rephson method; mathematical modeling of engineering problems: Physical system, classification of problems, system analysis (topological modeling, systems with concentered parameters and types of equations, systems with distributed parameters and types of equations); Integration of first-order Ordinary	3 8

		Differential Equation(ODE) with initial condition using Runge-Kutta methods of 1st to 4th order. Predictor-corrector methods. Runge-Kutta methods for first order ODE systems with initial condition. Finite difference method for ODE with boundary conditions; numerical solving of elliptic equations, and parabolic equations (explicit and implicit schemes; Thomas algorithm) Usign MATLAB for course project.	
5-Physics I	3	**(Duration: 48 hours)** Measurement, Motion in two and three dimensions, forces and Newton's laws and its application, momentum, systems of particles, rotational kinetics, rotational dynamics, angular momentum, work and kinetic energy, potential energy, conservation of energy, gravitation, temperature, molecular properties of gasses, first law of thermodynamics, entropy and second law of thermodynamics.	1
6-Basic Physics I Lab.	1	**(Duration: 32 hours)** Practical Experiments Related to "Physics I" Course	5
7- Civil Engineering statistics and Probabilities	2	**(Duration: 32 hours)** Statistical decision theory and its application in civil engineering. Identification and modeling of non-deterministic problems in civil engineering and the treatment thereof relative to engineering design and decision making. Statistical reliability concepts.	1
8-Computer Programming	3	**(Duration: 48 hours)** Introducing organization and main parts of computer, machine language and assembly, numeric and non-numeric data representation, algorithms and sub-algorithms and flowchart, basic concepts such as frequency, familiarity with C & C++ programming language: constants and variables, computational and logical phrases, different types of instructions, different types of conditional operations loops, vectors and matrices, subprograms, input and output instructions, common algorithms such as methods of search and arrangement, practical examples of programming. Using C language for course project.	Second semester
9- Engineering Drawing	2	**(Duration: 48 hours)1632**	-

		Getting familiar with general principle of technical and building drawing, typical plans and foundation and beams plan, different types of perspective, facing and sections.	
10- Surveying and Operations	2	**(Duration: 48 hours)1632** Horizontal and vertical distance measurement, angles and direction, traverses, errors, control and construction surveys, coordinate systems, land records, and coordinate geometry, office and field practice.	1
11- Construction Material and Lab.	2	**(Duration: 40 hours)2416** Introductory-level course in materials engineering to familiarize students with relationships between processing, structure and properties of materials used to manufacture devices. General treatment of physical and mechanical properties and engineering behavior of metallic and nonmetallic materials. Steel, aluminum, aggregates, portland cement concrete, bituminous materials, asphalt concrete, wood. Laboratory testing, instrumentation, and investigation into macro-behavior.	28
12- Concrete Technology	2	**(Duration: 32 hours)** Properties and types of cements and aggregates, hydration, mix design, properties of fresh and hardened concrete.	18 11
13- Concrete Technology Lab.	1	**(Duration: 32 hours)0032** Practical Experiments Related to " Concrete Technology " Course.	12
14-Statics	3	**(Duration: 48 hours)** Revision on scalar and vector quantities, Newton's laws, systems of units, force, moment of force, couple. Various force systems and their resultants, free body diagrams, equilibrium of rigid bodies and their equations of equilibrium and reactions determination, static indeterminacy and partial constraints. 1-Structures Trusses (method of joints, method of sections), frames and machines. 2-Distributed forces	1

		Centers of gravity, mass, volume of rigid bodies, composite volumes, areas and lines and their centers. 3-Beams Equations of axial and shear forces and bending moment and their diagrams for the beams under concentrated and distributed loads. 4-Cables Flexible cables under concentrated and distributed transverse loads.Parabolic cables, catenary cables. 5-Area moments of inertia Definitions of rectangular and polar moments of area, radius of gyration, product of area. Transfer of axes, rotation of axes, principal axes, Mohr's circle. 6-Friction Dry friction laws, friction angle, friction in wedges, screws, bearings, dry disk clutches and belts. Rolling resistance. 7-Virtul work Method of virtual work and its application in machines. Method of potential energy.	
15-Dynamics	3	**(Duration: 48 hours)** Fundamental course on the analysis of the equilibrium and dynamic behavior of mechanical systems. 1. Draw the appropriate free-body diagram for each problem, including linear and rotational accelerations. 2. Readily and reliably perform dot and cross products on vectors 3. Know the difference between kinematics problems and kinetics problems. 4. Identify the most direct approach to solving dynamics problems. 5. Solve both linear and rotational kinematics problems, using linear, planar and 3-D solution techniques, where appropriate.	14

		6. Solve kinetics problems by combining Newton's Law and kinematic equations, methodically accounting for all forces, and accelerations. 7. Solve kinetics problems using the principle of work & energy. 8. Solve kinetics problems using the principle of impulse & momentum. 9. Identify kinetics problems for which energy or momentum is conserved, and solve them appropriately. 10. Solve dynamics problems using both algebraic and vector techniques.	
16-Strength of Materials I	3	**(Duration: 48 hours)** 1- Concept of Stress Definition of stress, types, stress vector, stress tensor 2- Stress Analysis in Members Under Axial Loads normal stress, stress on an oblique plane, shearing stress, safety factor, ultimate and allowable stresses, an introduction to yield strength of materials, tensile test, Saint-Venant's principle, stress concentration, residual stress, stress in joints (bolt, pin and rivet) ,. 3- Strain and Deformations in Members under Axial Loadings Definition of strain, stress-strain relations, Hooke's law for axial loading, stress-strain diagrams for different materials, deformation under axial loading, thermal strain, use of deformations compatibility equation for solving different problems, lateral strain, Poisson's ratio, generalized Hooke's law for isotropic materials, volumetric strain and Bulk Modulus, shear strain, design consideration and energy relation in axially loaded members. 4- Torsion Concept and basic hypothesis, torsional stress and angle of twist in circular shafts, torsion in open and closed thin-walled members, introduction to torsion of noncircular members, stress	14

		concentration, allowable shear stress, indeterminate torsional system and compatibility equation, stress concentration, power transmission, shaft's coupling and energy relation in torsionally loaded shafts. 5- Pure Bending Concept and basic hypotheses, moment and curvature relation, bending stress, bending of members made of several materials, bending in beams under eccentric and unsymmetrical loads, general case of eccentric axial loading, kern of cross-section, design consideration, stress concentration and energy relation in beams under pure bending. 6- Shearing and Compound Stresses in Beams Concept and basic hypothesis, shear flow, shearing stress in beams and its distribution, shearing stress in circular shaft, thin-walled members such as wide flange, angle and channel shape, design consideration, stresses under combined loadings and energy relation due to shearing stress. 7- Transformations of Stress and Strain Plane stress and plane strain, stress component on oblique plane, principal stresses, maximum shearing stress, Mohr's circle for stress and its drawing method, strain components on oblique plane, principal strains, Mohr's circle for strain, measurements of strain, strain Rosette. 8- Deflection of Beams Deflection relation in beams, deflection determination with integration method, Macaulay's method, superposition method, boundary conditions. 9- Thin-Walled Vessels	
17- Architectural Design and Urban development	2	**(Duration: 32 hours)** In order to students become familiar with architecture theory and recognition of different operations in architecture. Cooperation procedure between civil engineers and architects. Description of operations in architecture.	10

18-Strenght of Materials Lab.	1	**(Duration: 32 hours)0032** 1. Hook's Law, Deflection of Cantilever and Simply Supported Beams and Betti- Maxwell's Reciprocity Theorem. 2. Bending Moment and Shearing Force in Beams 3. Hardness and Impact in different Temperature 4. Introduction to Strain Gauges 5. Uniaxial Tension 6. Column Buckling 7. Plastic Torsion in different Materials 8. Fatigue in Beams 9. Leaf and Coil Springs Behavior 10. Stress Distribution in an Angle Under Eccentric Loading	16
19- Structures Analysis I	3	**(Duration: 48 hours)** Analysis of trusses, beams and frames. Classical methods and analysis with microcomputers. Displacements, shear and bending moments, influence lines. Course Information 1-structural sys. : statistical definite and indefinite structures 2-structural displacement calculations 3-energy method and its application in structural displacement calculations 4-vertual work method 5-slope deflection method 6-momets distribution method 7-influence lines of statistical definite and indefinite structures	16
20- Structures Analysis II	3	**(Duration: 48 hours)** Approximate analysis of structures including trusses and multistory frames. Influence lines, cables and arches. Principles of limit analysis for structures and structural elements. Stiffness method, flexibility method, influence of temperature & displacement & bearing rotation , symmetry, matrix algebra.	19 4
21-Fluid Mechanics	3	**(Duration: 48 hours)**	15

		1. Fundamental Concepts of Fluids Fluid Properties 2. Fluid Statics and Pressure Measurements Manometry Hydrostatics Forces Solid-like motion 3. Fluid Kinematics and Reynolds Transport Theorem 4. Conservation of Mass, Momentum and Energy for Control Volume Integral form of Continuity Linear Momentum Angular Momentum Conservation of Energy 5. The Bernoulli Equation and Applications Flow measurements based on Bernoulli equation 6. Dimensional Analysis and Similitude 7. Viscous Flow in Pipes and Ducts, Reynolds number, Laminar flow Turbulent Flow Flow Measurements	
22- Reinforced Concrete Structures I	3	**(Duration: 48 hours)** This course discusses the fundamental principles and behavior of reinforced concrete under different types of loading. By the end of this course, students will be exposed to methods for analyzing and designing the following reinforced concrete members T shape beams, rectangular beams, reinforcement bars, Development Length – continued Shear in Beams, Serviceability, Cracks Control Development Lengths..	19 13
23- Reinforced Concrete Structures II	3	**(Duration: 48 hours)** This course discusses the fundamental principles and behavior of reinforced concrete under different types of loading. By the end of this course, students will be exposed to methods for analyzing and designing the following reinforced concrete members One-way Slabs, Short columns (using interaction diagram), Slender/long columns (in braced frames), Isolated and Continuous Footings.	22

24- Reinforced concrete project	1	**(Duration: 32 hours)0032** Application of concrete structures principles in a concrete structure. A project base on an architecture plan define for student. With usage of loading code and reinforce concrete code, different methods of 3D and 2D analysis, foundation design, floor and beams and column design. The final written report and defense is required.	23 20
25- Steel Structures I	3	**(Duration: 48 hours)** Factors influencing strength and serviceability of steel structures; LRFD limit state design procedures. Use of theories of plasticity and stability in development of design methods and specifications, bolted and welded connections, temperature effects, and affect of different fabrication methods on behavior of structure.	19
26- Steel Structures II	2	**(Duration: 32 hours)** Introduction to the design of structural elements found in steel buildings, in particular the design of steel connections. Bolted Connections, Welded Connections, rigid connections, hinge type connection, base plates design, composite floor design.	25
27- Steel Project	1	**(Duration: 32 hours)0032** Application of steel structures principles in a steel structure. Project should be done according following steps: 1- plan selection 2-vertical and lateral loads resistant system selection with economic considerations 3-dead loads and live loads calculations 4-primery analysis and design 5- analysis and design with software and comparison with manual one 6-design of structure and connections and foundation 7- creation of executive maps with suitable scale	26 20
28- Engineering Geology	2	**(Duration: 32 hours)** General overview of engineering geology and its importance to civil engineers. Topics include geologic processes, hazards, subsurface investigations, classification of geologic materials, data synthesis, and natural construction materials.	-
29- Soil Mechanics	3	**(Duration: 48 hours)**	16

		In this course, we will discuss the fundamental physical and mechanical properties of soils and use them in the design of simple foundation and earth retaining systems. We will use certain fundamental principles of solid mechanics and fluid mechanics to describe the mechanical behavior of soils.	28
30- Soil Mechanics Lab.	1	**(Duration: 32 hours)0032** Conduct and interpret soil test results. Test include water content, particle size, permeability, consolidation and shear strength.	29
31- Foundation Engineering	2	**(Duration: 48 hours)** Settlement and bearing capacity of shallow and deep foundations; beam on elastic foundation; design of footings and pile foundations; foundations on metastable soils; the use of computer codes for foundation problems.	29 22
32- Hydraulic and Lab.	3	**(Duration: 64 hours)3232** Open channel flow, natural streams and waterways, hydrologic analysis and design, pressure flow, analysis and design of pipe networks and pump systems.	21
33- Principles of Earthquake and Wind	3	**(Duration: 48 hours)** Earthquake mechanism and ground shaking, response spectra, linear elastic methods for prediction of behavior, displacement prediction methods for inelastically behaving structures, modeling and solution schemes, earthquake design philosophy, capacity design. Reinforced concrete, steel, and base-isolated structures. Response of single and multi degree-of-freedom systems due to dynamic forces. Direct integration of equations of motion. Response spectrum analysis. Application to earthquake loading. Systems with distributed mass and elasticity	20
33- Executive Building Methods	2	**(Duration: 48 hours)1632** Methods of construction, primarily buildings. Construction types: light and heavy wood; steel; plain, reinforced, and prestressed concrete; masonry. Foundations; associated details of frames, walls, roofs, floors, openings, finishes. Disasters, failures, and their causes. Industrialization of the building process.	17 23 26
34- Road construction	2	**(Duration: 32 hours)**	١٠

		To getting familiar with highway design principles and their usage in design and implementation of infrastructure of roads. Roads studies, principles of navigation on topographical maps, earthworks, road's geometry, implementation of geometry plan, horizontal path of road design, vertical path design, drainage.	٢٩
35- Road construction Project	1	**(Duration: 32 hours)0032** In this project a 1:5000 or 1:10000 scaled map with initial traffic information given to students in group and all of the required calculations and design should be done according road's national regulations and codes. On a specified date it should be submitted with a complete detail interpreted report. The project needs defense.	34
36- Road Pavement	2	**(Duration: 32 hours)** Design principles of flexible and rigid pavements; HMA mixture design, equipment and construction; and application of life cycle cost analysis (LCCA) in pavement engineering. Includes laboratory sessions for aggregate testing and Superpave mix design.	11 34
37- Measurement & Cost Estimation	1	**(Duration: 24 hours)0816** Develop an enhanced understanding of quantity take-off and cost estimating of construction resources including materials, labor, and equipment. Skills and knowledge of cost estimating will provide preparation for builders and designers to contribute to construction firms, project management consultants, and owners upon graduation. Topics include: types of cost estimates; budget estimates; preconstruction services estimates; quantity take-off; self-performed estimates; subcontractor work estimates; and bid preparation.	17
38- Environmental Engineering	2	**(Duration: 32 hours)** To getting familiar with environment Eng. and it aspects. Description of environment and its applications, getting to know: the environment's challenges in modern world, ecology foundations, water resources and relevant pollutions, physical & chemical and biologic properties and available standards, water treatment process, wastewater treatment process, solid hazardous material's	Second semester

		management, air pollution and its control methods, sound pollution and its control methods.	
39- National Building Regulations	3	**(Duration: 48 hours)** Getting to know with laws and 20's national building regulations, specially 6th code (building, forces and loading)	Seventh semester
40- Training	2	**(Duration: 16 hours)** Students have to work in a civil engineering related site in a field related to their interests or project for **300 hours**. The project should be practical and in implementation phase. Training report needed and evaluated by advising professor.	third year
41- Civil engineering specialized English	2	**(Duration: 32 hours)** English reading texts in Civil Engineering	-
42- Specialized Civil Work project	3	**(Duration: 48 hours)** In this course a research topic related to civil engineering is defined to student and the student should do his research in a specified date (maximum 12 months) under supervision of related professor. Finally a written report and oral presentation to the public should be provided with presence of at least one referee.	Seventh semester
43- Computer Application in Engineering	2	**(Duration: 32 hours)** Introduction the available software related to structure design, foundation and geotechnical studies. Modeling, analysis, linear and non-linear design. Making executive maps.	4 20
44- System Engineering	2	**(Duration: 32 hours)** It focuses on defining customer needs and required functionality early in the development cycle, documenting requirements, then proceeding with design synthesis and system validation while considering the complete problem including operations, performance, test, manufacturing, cost, and schedule. This subject emphasizes the links of systems engineering to fundamentals of decision theory, statistics, and optimization. It also introduces the most current, commercially successful techniques for systems engineering.	2 7

45- fundamentals of GIS In civil engineering	2	**(Duration: 32 hours)** GIS in civil engineering applications. Geographic and spatial data types and acquiring considerations. Data models and structures. Projections and transformations. Attribute-based operation, spatial operations. Surfaces and near neighbors. Training on Arc GIS software.	Fifth semester
46- Engineering Economics	2	**(Duration: 32 hours)** Economics applied to planning, operations, maintenance, and management problems; microeconomic and macroeconomic theories; benefit-cost analysis; and the effect of uncertainty. Presents the effect of tolls, parking pricing, transit subsides, and other pricing and incentive policies	Fourth semester
47- Welding Technology and Inspection Technology	2	**(Duration: 48 hours)1632** Safety issues and procedures of welding, different types of welding methods and instruments, and power supplies. Electric arc welding, creating electric arc, setting the correct electrode gap, and electrode angles, oxidation conditions. Basic weld joints: butt joint, lap joint, corner joint, edge joint, and T-joint. Oxyacetylene welding. An introduction to welding methods 1-Technical Safety Welding and cutting 2-Electric arc welding (SMAW) 3-SAW, 4-MAG-MIG, 5-GTAW, 6-RW	25
48- Earthquake Resistant Structures	2	**(Duration: 32 hours)** Design of unreinforced masonry elements and reinforced masonry elements, loads on break made building, masonry reinforced sections under moment, load-bearing walls, shear walls, retaining walls, frame confined walls, structural connections, seismology behavior of masonry building	20
49- Water and Wastewater Engineering and Project	3	**(Duration: 64 hours)3232** Hydrologic fundamentals of water demand and supply; water and wastewater distribution; collection systems; quality characterization; analytical methods for water quality management.	Sixth semester
50- Dam Engineering	2	**(Duration: 32 hours)** Planning and design of dams in the context of hydropower development and. The course covers the basics in dam engineering for civil engineers, including	29 32

		concrete and embankment dams, soil mechanics for dam's concrete technology for dams, stability of dams, dam maintenance and relevant problems.	
51- Transportation Engineering	2	**(Duration: 32 hours)** Studies vehicular transportation fundamentals including vehicle dynamics, geometric design, traffic flow concepts, levels of service analysis, intelligent transportation systems, travel demand prediction methods, freight logistics, and management of transportation systems. Includes a review of relevant vehicle operating characteristics.	7 34
52- Photogrammetry	2	**(Duration: 32 hours)** The course includes the development of the technologies and covers fundamental concepts of photogrammetry and remote sensing. You will learn about these technologies by exploring examples for which they can be used. The typical geometry of a photograph and the basic mathematical formulations are introduced. The accuracy and precision of measurements will be explored. You will investigate the differences between a map and a photograph and the reasons for these differences are studied in detail. A typical satellite-based passive remote sensing system will be explored in detail and several common remote sensing applications studied.	10
53- Foundation and structure performing methods	2	**(Duration: 32 hours)** After excavation near structures and building it needs to be a supporting structure or special method of excavation to prevent damages, may happen and cause damages, in adjacent structures or excavated site.	Fifth semester
54-Nailed soil and its executive methods	2	**(Duration: 32 hours)** Compaction, preloading, vertical drains, grouting, admixture stabilization, thermal stabilization, soil reinforcement, geosynthetics; construction of embankments on soft clay, embankments on mechanically stabilized earth walls, hydraulic barriers; case studies.	Third year