



Curriculum of Bachelor Degree in Civil Engineering

Courses Description

CIE0221	Statics	3(3-0)
Statics of particles; rigid bodies; equivalent systems of forces; centroids and centers of gravity; analysis of structures: frames, machines, and trusses; friction; moments of inertia; principle of virtual work;		
Prerequisite: (30202102 ,30201101)		
BSE0102	Engineering Workshop	1(0-3)
Occupational safety and health in engineering workshops, mechanical forming of metals, machining operations, welding processes, carpentry works, electrical installation		
Prerequisite: -		
BSE0202	Probability and Statistics for Engineering	3(3-0)
Randomness; introduction to probability theory and probability distributions; discrete and continuous probability distributions; univariate analysis; decision theory (Bays' theorem); hypothesis testing; confidence intervals and tolerance limits; correlation; regression analysis; analysis of variance; time series; nonparametric methods.		
Prerequisite: 30202101		
BSE 0203	Technical Writing and Professional Ethics	3(3-0)
This course deals with the definition of technical writing, its standards and how they differ from other types of writing. The basics of writing official reports, laboratory reports, projects and scientific papers. The common mistakes in writing and the process of writing citations and references. The concept of professional work and the definition of professional ethics and the acceptable and unacceptable professional practices. The sources of professional ethics and reasons for non-compliance with professional ethics. Identifying different forms of professions and explaining the importance of their relationship to ethics, standards of ethical behavior in science. Professional ethics in Jordanian laws and regulations.		
Prerequisite: AEL102		
BSE0201	Programming for Engineers	3(3-0)
This is a fast-paced introductory course to the C++ programming language. It is customized for the engineers with a little programming background. It covers C++ programming concepts, variables and basic data types, control structures and loops, functions; call by value and reference, arrays, structures, classes and objects, pointers and references to objects, files and streams. Weekly laboratory experiments will provide hands-on experience in topics covered in this course		
Prerequisite: 30202102		
BSE0401	Engineering Economy	3(3-0)
Engineering Economy: engineering economic concepts; interest formulas; decision making using present worth, future worth, annual worth, internal rate of return and benefit- cost ratio methods; payback analysis; depreciation.		
Prerequisite: Completing 80CH		
BSE0205	Engineering drawing	2(0-6)
Drawing instruments and their use, lettering, geometric construction, dimensioning, free-hand sketching, Orthographies, isometric projections, sketching and sectioning. Computer drawing using autocad (AutoCAD), engineering applications		
Prerequisite: CS101		
CIE0367	Geotechnical Engineering	3(3-0)
Introduction to soil mechanics; formation and structure of soil; physical properties; determination of index properties, identification and classification of soil; permeability; seepage flow; stress distribution; consolidation; shear strength; compaction; CBR, earth pressure; stability of slopes.		
Prerequisite: MEE0214		
CIE0369	Geotechnical Engineering-Lab	1(0-3)
Specific gravity; moisture content; liquid, plastic, and shrinkage limits; consolidation test; sieve analysis; site density; compaction test; California Bearing Ratio (CBR); permeability; Shear strength of soil (direct shear, unconfined and triaxial tests).		



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Prerequisite: CIE0367*		
CIE0214	Engineering Geology	2(2-0)
Introduction to Geology and its importance in Civil Engineering. Basic concepts of Engineering Geology. Physical properties of minerals. Classification and physical properties of rocks. Structural Geology and crustal deformation. Basics of Geological Mapping. Rocks as construction materials, Introduction to soils, Surface and groundwater. Mass movements. Earthquakes and seismology related to civil structures, Subsoil investigation. Site investigation.		
Prerequisite: -		
CIE0216	Engineering Geology Lab	1(0-3)
Study of crystal systems. Physical properties and identification of Minerals. Classification and physical properties of rocks. Geological maps and geological cross sections. Three points problems.		
Prerequisite: CIE0214*		
CIE0213	Surveying	3(3-0)
Theory of errors and their analysis; Distance measurements: tape and electronic distance measurements (EDM), tape surveying and lay-out techniques; Leveling and elevation determination, datum for elevations, types of leveling, profile and cross-section leveling and computations; Horizontal and vertical angles and directions, instruments, measurement and computations; Trigonometric leveling; Coordinate systems and coordinate geometry, direct and inverse surveying problems.		
Prerequisite: 30202101		
CIE0215	Surveying Lab	1(0-3)
Tape measurements and tape surveying; Differential leveling: closed and connecting leveling loops, 3-wires method, profile and cross-section leveling; Horizontal and vertical angle measurements; Electronic distance measurements and trigonometric leveling.		
Prerequisite: CIE0213*		
BSE0306	Numerical Methods	3(3-0)
Error analysis, roots of equations by open methods and parentheses, solutions of the system of linear equations: deletion by Gaussian method, LU analysis method, inverse of matrix, Gauss - Seidel method, representation and fit of curves, derivation and numerical integration, solutions of differential equations: Runge-Kutta method, terms with Value and eigenvalue issues.		
Prerequisite: 30202102		
MEE1361	Applied Mathematics for Engineers	3(3-0)
Linear algebra Applications of solutions to ordinary differential equations. Fourier series. Solutions of partial differential equations using separate variables and Laplace transform techniques.		
Prerequisite: 30202203		
CIE0563	Foundation Engineering	3(3-0)
Site investigation; foundation classifications; bearing capacity; foundation settlement; factors affecting foundation design; spread footing; special footing; beams on elastic foundations; mat foundations; lateral earth pressure and retaining walls; pile foundations.		
Prerequisite: CIE0369		
CIE0331	Structural Analysis I	3(3-0)
Introduction to structural analysis; loads: static, environmental and dynamic loading; classification of structural elements and structural systems; stability and determinacy of structures: determinate trusses, cables, beams and frames; influence lines of beams, frames and trusses; deflections in elementary structures; introduction to virtual work.		
Prerequisite: MEE0214		
CIE1332	Structural Analysis II	3(3-0)
Statically indeterminate structures; method of consistent deformations; slope-deflection method; three moment equation; moment distribution method; introduction to matrix structural analysis, computer applications.		
Prerequisite: CIE0331		
CIE0333	Properties of Concrete	3(3-0)
Introduction; Concrete advantages and disadvantages, aggregates of concrete; cements; mixing water; additives;		



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concrete industry; properties of wet and hardened concrete; testing of concrete; mix design; hot and cold weather concreting; quality control of concrete; special concrete.		
Prerequisite: MEE0214		
CIE0335	Properties of Concrete Lab	1(0-3)
Cement and mortar tests; aggregate testing; testing of fresh and hardened concrete (Workability, Compressive strength, tensile strength, Slump test).		
Prerequisite: CIE0333*		
MEE0327	Fluid Mechanics	3(3-0)
Fundamentals of fluid mechanics; hydrostatic and continuity principles; energy and momentum principles; forces on emerged bodies; laminar and turbulent flows in closed conduits; friction and pressure drop in pipes, flow in open channels, Dimensional Analysis, applications of fluid mechanics.		
Prerequisite: CIE0221, 30202203		
CIE0342	Hydraulics	3(3-0)
Types of flow; Types of channels, orifices, weirs, siphons, pressurized and non-pressurized flow, head losses, hydraulic applications: water distribution systems, Design of water supply networks, Pumps, Design of storm water networks: (Street Inlets, Storm sewers, culverts, and manholes).		
Prerequisite: MEE0327		
CIE0344	Hydraulics Lab	1(0-3)
Rectangular and triangular Weirs, Venturi meter, Impact Jet, Pipe head loss, critical depth, Pipe Turbulent Flow, Pumps (of different types), Hydraulic Jump, and Belton Turbine.		
Prerequisite: CIE0342*		
CIE0346	Water Treatment	3(3-0)
Basic water Chemistry; Basic Principles of inorganic chemistry; Drinking water engineering; Water consumption; Population Predictions; Water resources; Physical , chemical and biological properties of water; Drinking water treatment; Total dissolved solids; Suspended particles; Precipitation, filtration, removal of hardness of water, Removal of taste and odor, Water distribution networks and design principles.		
Prerequisite: CIE0342*		
CIE2381	Route and Construction Surveying	2(1-3)
Elements, design and setting out of horizontal circular curves and transition or Spiral curves; Problems in curve location; Location studies; Super-elevation and properties of vertical curves; design and setting out; Sight distance on horizontal and vertical curves; Special setting out surveys such as: sewers, canals, bridges, pipelines, dams, etc; Setting out using laser instruments; Optical tooling alignment and industrial surveying. Introduction of GPS, using of GPS in Highway and construction surveying.		
Prerequisite: CIE0215		
CIE1435	Computer applications in Civil Engineering	3(3-0)
Excel spread sheets, using computer programs and modeling software packages in solving structural problems, project management, transportation and traffic engineering, term project.		
Prerequisite: CIE1332		

CIE4448	Computer Applications in Water and Environmental Engineering	3(3-0)
Computer applications and various software uses in water and environmental engineering. Use of Matlab, Mathematica, Windows, spreadsheets (Excel), Statistical software, design and analysis software in civil engineering, and the use of engineering packages for water and structures.		
Prerequisite: CIE455		
CIE0433	Reinforced Concrete Design I	3(3-0)
Materials properties; Flexural behavior of reinforced concrete members in the different stages (before cracking, after cracking, and ultimate stage); flexural analysis and design of beams (singly, doubly reinforced section), design of nonrectangular sections; design for shear and diagonal tension; bond, anchorage and development length; Design of short columns under axial loads (compression combined with moment, interaction diagrams); design of one way solid and ribbed slabs.		



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Prerequisite: CIE0331, CIE0335		
CIE0537	Reinforced Concrete Design II	3(3-0)
Serviceability of beams and one-way slabs; loading patterns; moment and shear envelopes; moment redistribution; design for torsion, torsion plus shear; design of two way slabs (direct design method, equivalent frame method), design of braced and unbraced columns and columns under biaxial bending, introduction to prestressed concrete, Foundation design.		
Prerequisite: CIE0433		
CIE0438	Steel Structures	3(3-0)
The course covers the structural design of steel members and connections. Topics include material properties of steel, steel sections, load and resistance factor design (LRFD) method. Design of tension members, compression members, beams and beam-columns, Design of column base plates. Design of bolted and welded concentric and eccentric connection.		
Prerequisite: CIE0335		
CIE2382	Aerial Photogrammetry and Remote Sensing	3(3-0)
Theory of photography; Aerial photographic characteristics, Photographic materials and their physical and sensitometric properties; Photogrammetric optics; Imaging systems; passive and active; Camera calibration; Geometry of aerial photographs, planning, stereoscopy, parallax, simple instruments and planimetric mapping; Theory of orientation; Plotting instruments with optical, optical-mechanical, mechanical, and analytical projection; Radial line triangulation and ground control points; Principles of mosaicing. Fundamental theory and application of remotely sensed imagery, including aerial photography, and data processing using remote sensing software's.		
Prerequisite: CIE0215		
BSE 0203	Engineering Hydrology	3(3-0)
Meteorological data; Water cycle: precipitation; evaporation, transpiration; infiltration and percolation; ground water; surface runoff; recurrence periods, hydrographic analysis; flood routing; hydrological Hydraulics of artesian wells.		
Prerequisite: CIE0344		
CIE2384	Geographical Information Systems (GIS)	2(2-0)
Design and operation of Geospatial Information Systems (GISs) and their role in digital mapping and spatial data management; Characteristics of GIS: Concepts of information and GIS, the multipurpose cadastre, spatial data management system, georeferencing, land information modeling, spatial representation (vector and raster format), geoprocessing, input/output operations, file storage, data base management systems, and distribution; The selection process of computer hardware/software for GIS, e.g. ArcGIS, Geographics, Geomedia etc.		
Prerequisite: CIE0215		
CIE2386	Geographical Information Systems (Practical)	1(0-3)
Exercises and projects covering all topics discussed related to Geographic Information System using a selected Software such as: ArcGIS, Geomedia or Microstation/Geographics; the topics include: Project and Geoworkspaces creation; Coordinate Systems; GIS files such as: shape-files, warehouse files and/or geodatabase files; Working with GIS map windows; data tables; Working with features (point, line, and polygon); Working with tables (join, relate); Working with queries (attributes and spatial); Buffering and overlay; Printing and layouts.		
Prerequisite: CIE2384*		
CIE1546	Wastewater Treatment	3(3-0)
Sources of wastewater and quantities. Physical, chemical, and biological characteristics of wastewater, Primary treatment of wastewater. Biological treatment methods, advanced treatment methods. Management of treatment residuals. Design of wastewater treatment plant.		
Prerequisite: CIE0346		
CIE0455	Highway Engineering	3(3-0)
Characteristics of the Driver, the Pedestrian, the Vehicle, and the Road; Principles of Highway Location, Highway Survey Methods, Highway Earthwork and Final Plans; Factors Influencing the Design of Highway Facilities, Highway Functional Classification, Basic aspects of the Geometric Design of Highway Alignment, Design of the Horizontal Curves and Super-elevation, Vertical Curves Design; Design of the Special Facilities for Heavy Vehicles on Steep Grades, Design of the bicycle Facilities, Design of the Parking Facilities; Intersection Design, Types of At-Grade Intersections, Design Principles for At-Grade Intersections, Design of Highway Drainage, Hydrologic Considerations, Surface Drainage, Highway Drainage Structures, Hydraulic Design of Highway Drainage Structures,		



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Subsurface Drainage, Computer Use in Highway Engineering Design.		
Prerequisite: CIE0215		
CIE3552	Traffic Engineering	2(2-0)
Introduction, Traffic Engineering Studies, Spot Speed Studies, Volume Studies, Travel Time and Delay Studies, Parking Studies and Highway Safety ; Fundamental Principles of Traffic Flow, Traffic Flow Elements, Flow-Density Relationships, Shock Waves in Traffic Streams, Gap and Gap Acceptance, Introduction to Queuing Theory ; Intersection Control, General Concepts of Traffic Control, Conflict Points at Intersections, Types of Intersection Control, Signal Timing for Different Color Indications, ; Capacity and Level of Service at Signalized Intersections; Capacity and Level of Service for Highway Segments, Freeways, Multilane Highways, and Two-Lane Highways; Computer Use in Traffic Operations Design.		
Prerequisite: CIE0455		
CIE0452	Pavement Design	3(3-0)
Soil Characteristics and pavement design Basic Engineering Properties, Classification of Soils for Highway Use, Soil Compaction, Special Soil Tests for Pavement Design and Frost Action in Soils, Asphalt and Uses of Bituminous Binders, Properties of Asphalt Materials, Tests for Asphalt Materials, Asphalt Mixtures, Recycling, additives, Distress and Construction Methods, SUPERPAVE Systems, Flexible Pavement, Structural Components of Flexible Pavement, Soil Stabilization, General Principles of Flexible Pavement Design; Rigid Pavement, Joints in Concrete Pavements, Types of Rigid Highway Pavements, Stresses in Rigid Pavements and Thickness Design of Rigid Pavements.		
Prerequisite: CIE0452*		
CIE0454	Pavement Design Lab	1(0-3)
Physical and mechanical properties of bituminous materials: Consistency Tests, Penetration Test, Viscosity Test, Softening and Float Test, Durability Tests, Thin Film Oven, Safety Test, Flash, and Fire Points Test, Specific Gravity and, Ductility of Bituminous Materials, Marshall Mix Design procedure, Aggregate Blending, Bulk Specific Gravity, and Theoretical Maximum Specific Gravity of Bituminous Paving Mixtures, Asphalt Extraction, Skid Resistance.		
Prerequisite: 30202101		
CIE0575	Project Management	3(3-0)
Project management concepts, Project strategic planning, Legal aspects of construction process, Organizational management structures, Project financing and budgeting, Construction material management, Human resources management, manpower planning, and Quality management.		
Prerequisite: CIE0438, CIE0476		
CIE1571	Construction Management	3(3-0)
Construction management concepts; planning; arrow network analysis CPM, PERT; precedence network analysis; time- cost trade-off; resource allocation; project controlling		
Prerequisite: CIE0476		
CIE0490	Engineering Field Training	3CH
Training for 8 weeks in the field of Civil Engineering in an approved public or private sector.		
Prerequisite: passing 115 Cr. Hr.		

CIE0591	Project 1 for Civil Engineering	1 CH
Project under the supervision of a faculty member, on Civil Engineering, or related engineering topic, this is the first part of the project; it will normally involve literature review, theoretical work and laboratory or fieldwork.		
Prerequisite: (Completing 120 CH)		
CIE0592	Project 2 for Civil Engineering	3 CH
Completion of Graduation Project 1 by preparing all necessary drawings, calculations, designs, models, and the report documentation.		
Prerequisite: CIE0591		
CIE1532	Earth Retaining Structure	3(3-0)
Soil review, Lateral Earth Pressure, Retaining Walls. Cantilever retaining walls. The different Types of Sheet Piles. Design the Cantilever sheet piles. Design the Anchored sheet piles: soil reinforcement, mechanical stabilized earth		



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wall with steel and geosynthetics reinforcement. Gabion design.		
Prerequisite: CIE0563		
CIE1533	Construction Methods	3(3-0)
Understanding and selection of heavy construction equipment, earthmoving, tunneling, compaction, construction equipment productivity, factors affecting equipment productivity, economic analysis of plant ownership.		
Prerequisite: CIE3431		
CIE1534	Advanced Structural Analysis	3(3-0)
The course covers structural analysis by matrices for beams, trusses, frames, using excel sheets & computer programs in structural analysis.		
Prerequisite: CIE1332		
CIE1535	Reinforced Concrete Design III	3(3-0)
Control of cracks, Design of slabs using the ACI building code, Direct Design Method, Equivalent Frame Method, Deep beams, biaxial bending of columns, torsion in beams, design of staircases and water tanks, estimation of wind loads and earthquake loads, Introduction to prestressed concrete.		
Prerequisite: CIE0537		
CIE1537	Introduction to Earthquake Engineering	3(3-0)
Concept of seismic design; analysis of earthquake effects; choice and design of earthquake resistance systems; the behavior of reinforced concrete under cyclic loading; design of shear walls; codes of practice, Design of bridges against earthquakes, Using Computer programs in earthquake design.		
Prerequisite: CIE3452, CIE0537		
CIE3533	Bridge Engineering	3(3-0)
Types of bridges; material properties; loads on bridges; design of bridge slabs; design of reinforced and prestressed concrete bridges; T-beams; box girder bridges; design of steel bridges; substructure design (piers, abutments, foundations, bearings and joints).		
Prerequisite: CIE3431, CIE0537		
CIE1441	Environmental Engineering	3(3-0)
Water pollution; Water pollutants including pathogens, oxygen-demanding Wastes, nutrients, salts, thermal pollution, heavy metals, pesticides, volatile organic chemicals, and emerging contaminants. Biochemical oxygen demand, water quality in rivers, lakes and reservoirs. Air pollution; Criteria pollutants including carbon monoxide, oxides of nitrogen, volatile organic compounds, photochemical smog and ozone, and oxides of sulfur. Solid waste management; municipal solid waste, source reduction, greenhouse gases, and lifecycle Assessment.		
Prerequisite: CIE0346*		
CIE1537	Environmental Engineering Lab	1(0-3)
Water and Wastewater analysis: acidity, alkalinity, chloride, hardness, Ammonia. Dissolved oxygen; biochemical oxygen demand, chemical oxygen demand, coliform bacteria, solids determination, coagulation, and softening.		
Prerequisite: CIE1441*		
CIE1548	Water Engineering Lab	1(0-3)
Tests and equipment used for water testing, pH testing, turbidity, solid and dissolved suspensions, bio-oxygen consumption, chemical oxygen consumption, electrical conductivity, Bernoulli base and energy losses in tubes and connections, determining the operational properties of centrifugal pumps.		
Prerequisite: CIE1546*		
CIE3554	Transportation Engineering	3(3-0)
Air transportation: estimate the number of passengers, choose the location of the airport, determine the direction of the runway, imaginary surfaces, the runway capacity, the planning and design of the terminal, the design and the length of the runway, rainfall drainage. Rail transport: the design of horizontal, vertical and cross-sections of the railway, the speed of the trains. Transport Planning: Strategic Planning, Transport Management, Flight Estimation, Distribution of Trips by Means of Transport, Distribution of Traffic Size on Roads.		
Prerequisite: CIE0455		
CIE2585	Advance Remote Sensing	3(3-0)



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Methods of classifications, land cover and land use applications; Modeling using remote sensing software; Advanced classification techniques: neural classification and per-object classification, hyper-spectral sensors, analysis of hyper spectral data, advantages and disadvantages of hyper-spectral analysis; radar imagery; advanced data fusion techniques. Characteristics of remote sensing satellites orbits, atmospheric effect, Earth curvature effect.		
Prerequisite: CIE2382		
CIE3431	Building Construction	2(2-0)
Systems of structures, Stages of construction of buildings and other types of structures, Design of formworks, Excavations and bracing, construction of skeleton, Finishing works, Methods of construction, Specifications of materials and methods of construction.		
Prerequisite: CIE1332		
MEE0212	Dynamics	3(3-0)
Kinematics and kinetics of particles and systems of particles with applications to force motion, impact and relative motion, single-degree of freedom, free and forced vibration, dynamics of rigid bodies, relative motion, and gyroscopic motion		
Prerequisite: CIE0221		
CIE2481	Mathematical Geodesy and Adjustment	3(2-3)
Mathematical Models in Geodesy and Geomatics measurements, linearization of mathematical functions, application of statistical theory to the adjustment of redundant data using the method of least squares; Errors in engineering measurements; Use of probability distributions; Use of statistical tests; Law of propagation of errors; Mathematical models and formulation of observation and condition equations; Weight matrix; Some techniques of adjustment; Solution of normal equations; Precision of unknowns and functions of unknowns; Variance and covariance matrix; Error ellipses and confidence regions; Statistical testing, accuracy and reliability; Exercises covering the least squares adjustment of leveling, triangulation, trilateration and combined networks, traverses and coordinate transformations using programming and software, such as "Adjust" and MathCAD.		
Prerequisite: CIE0221, CIE2382		
CIE2482	Geodetic Positioning and Global Navigation Satellite System	2(2-0)
Geodetic earth model: Introduction to gravity field and vertical datum; Horizontal positioning, Ellipsoidal trigonometry, reductions of measurements, Geodesic on the rotational ellipsoid; Astronomic positioning; instruments, observations and mathematical models for astronomical azimuths, latitudes, and longitudes; Direct and inverse geodetic problem; Topographic and geodetic field in operative geodesy; Geodetic Networks: triangulation and trilateration; Jordanian geodetic network; Datum transformation: Helmert transformation, Molodensky transformation, the multiple regression transformation; Introduction to GNSS: basic concept, segments of GPS, mathematical models for positioning and adjustment of mathematical GNSS models, Surveying with GNSS, Observation techniques, planning a GNSS survey; Surveying procedures, Data processing, Survey report.		
Prerequisite: CIE2481		
CIE2484	Geodetic Positioning and Global Navigation Satellite System (Practical)	1(0-3)
Computer programming and problem solutions related to reductions of physical geodetic measurement to the ellipsoid; Planning and surveying of classical network using terrestrial positioning systems; computer applications for adjustment of the conventional survey; Introduction to GPS instruments (such as Leica GPS500 systems); Planning and surveying a small GPS network using GPS instruments; GPS data processing software such as SKI-Pro or Trimble Geomatics Office; Static, rapid-static and kinematic GPS field survey; Integration between classical and GPS measurements.		
Prerequisite: CIE2482*		
CIE2581	Analytical and Digital Photogrammetry	3(2-3)
Measurements and reduction of image coordinates; Film corrections, affine and conformal transformation, and lens distortions; Emphasis on interior and exterior orientation of the camera (camera calibration methods); Relative and absolute orientation; Intersection algorithm; Resection algorithm; Rectification methods; Formation of spatial models; Spatial transformation; Model connection; Orthophoto; Digital images; Computer solutions for the previous algorithms; Mathematical modeling of photogrammetry orientations; Block adjustments, aero-triangulation and bundle adjustment; Orthophoto production and Digital Terrain Modeling (DTM).		



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Prerequisite: CIE2382		
CIE2584	Design and Implementation of GIS	3(2-3)
Overview of geospatial information systems; General GIS design and implementation approaches in Geomatics engineering; Line oriented, patch oriented and object oriented GIS design strategies; Relational algebras and normalizations for geospatial data coding, retrieval and analysis; Geospatial browsing and querying in GIS; Access, quality and integrity control in GIS; Overview of map projections with an emphasis on conformal mapping of a biaxial ellipsoid, such as: Transverse Mercator, and Stereographic; Overview capability and comparison of the available software such as: ArcGIS, Geomedia, Microstation/Geographics; Software customization; Student projects related to various types of GIS data-models; Exercises covering all topics discussed related to Design and Implementation of GIS using a selected software; the topics include: design configuration and procedure using domain subtypes, and relational classes, network design and models, transportation modeling, 3D modeling, spatial analysis, advance spatial editing applications; Web-mapping and GIS customization example. The student should conduct a comprehensive project covering one topic of the above using modern GIS software.		
Prerequisite: CIE2386		
CIE2483	Programming for Geomatics Applications	2(2-0)
Introduction to the essential skills necessary for developing object-oriented programs on the Microsoft .NET platform. Understanding object-oriented programming (OOP) as essential for working with Microsoft .NET for GIS customization applications. Study of GIS objects to develop software for GIS application using off-the-shelf software such as ArcGIS and/or Geomedia; etc. Also, introduction of the open source GIS object will be covered. The student should be able to build simple applications and script file to add more functionality for the above mentioned software. Furthermore, customization aspect for Photogrammetry and remote sensing software such as SOCET SET, Z/I, PCI and ENVI will be briefed. Students should be able to add new customized models that add specific functionality to any one of the above mentioned software.		
Prerequisite: CIE2386, 30801101		
CIE2583	Digital Image Processing	3(3-0)
Introduction to the major categories of digital image processing, Digital image fundamentals, perception, discrimination, and sampling; Image transforms using FFT Fourier Algorithm, Image rectification and restoration, image enhancement, filtering and multi-image manipulation, image encoding, image segmentation and description, Image matching and data merging.		
Prerequisite: CIE2382		
CIE2588	Satellite Positioning and Applications	2(2-0)
Reference systems: WGS84, ITRF, ETRF; Introduction to GNSS; Satellite orbits: orbit description, orbit determination, broadcast orbits, and precise orbits; Satellite signal: signal structure, signal processing; Receiver design; Linear phase combination; Atmospheric effects: ionospheric refraction, tropospheric refraction; Data processing: data handling, ambiguity resolution; Software modules; Introduction to GPS quality control; Static and kinematic survey procedures and operational aspects and data processing; Introduction to integrated GPS-INS systems; Satellite Geodesy: GPS, GLONASS, Galileo, Doris, Laser Ranging, Very Long Baseline Interferometry. Application and exercises using the GPS and GNSS receivers for Real-Time-Kinematic measurements, geodetic and non-geodetic applications such as Automatic Vehicle Location. Using modern software for data processing and data analysis. Using IGS stations for precise geodetic computations.		
Prerequisite: CIE2482		
CIE2383	Photo Interpretation	2(2-0)
Manual visual procedures of photo-interpretation: highlights of analysis procedures, techniques, aids and elements. Briefing of aerial photograph types, film technology, optical filters and image characteristics. The applications of photo-interpretation in different aspects such as: engineering surveys for city planning, dam site selection, highways, land-use and land-cover, and aerogeology, and also, engineering geomorphology with emphasis on interpretation of morphogenesis and morphodynamics of the landforms and their potential role in engineering site selection.		
Prerequisite: CIE0214		
CIE2587	Gravity Field	3(3-0)
Fundamentals of potential theory; Laplace and Poisson differential equations; Spherical harmonics and boundary value problems solution; Modeling the Earth's gravity field; Normal and disturbing potential; The normal gravity formula, geoid undulations and deflections of the vertical; Effect of gravity field on surveying measurements; Observational procedures and computations; Gravity measurements and reductions; Least-squares collocation.		
Prerequisite: CIE2482		



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CIE2586	Special Topics in Geomatics Engineering	3(3-0)
A special topic in surveying and geomatics engineering; Applications and exercises covering the main topics.		
Prerequisite: CIE2386, CIE2382		
CIE2582	Cadastral Surveys and Land Administration	1(1-0)
Introduction and history; Definitions, benefits and impediments; Legal status of land and real property, land policy, land management, land tenure; Land registration and cadastre: principles, registration systems, cadastral maps; Boundaries: concepts, types, legal force, establishment and maintenance of a cadastre; Transactions, boundary reestablishment, correction orders, cadastral surveys, land information systems; Land valuation; Multipurpose cadastre; Data protection, accuracy, criteria for success; future vision.		
Prerequisite: CIE2482		
MEE0214	Strength of Materials	3(3-0)
introduction to mechanics of deformable bodies, concept of stress and strain, classification of material behavior, stress-strain relations, application to engineering problems involving members under axial load, torsion of circular rods and tubes, bending and shear stress in beams ,combined stresses , deflection of beams, buckling of columns.		
Prerequisite: CIE0221		
CIE0476	Specifications, Contracts, and Quantity Surveying	3(3-0)
Bidding and contracting; specifications of concrete works finishing; highways; quantities surveying of Earth works, buildings, highways, concrete, and steel bridges.		
Prerequisite: CIE0433, CIE0455		
CIE3534	Prestressed Concrete	2(2-0)
Introduction; prestressed concrete concepts and materials; detailed estimation of losses, design for flexure; design for shear and torsion; slab design.		
Prerequisite: CIE0537		
CIE0410	Civil Engineering Drawing	1(0-3)
Introduction; primary structural plans: topographic and site plans; reinforced concrete buildings plans; bridge plans; detailing of footings, columns, slabs, beams sections and stairs; mechanical and electrical plans; detailing of steel structures; computer aided drawing.		
Prerequisite: CIE0433		
CIE1538	Occupational Safety	2(2-0)
Principles of public safety in engineering projects and preserving the environment and taking the necessary precautions to avoid risks affecting the safety of workers, citizens and the environment (Health, Safety and Environment HSE)		
Prerequisite: CIE0575		