

Course Descriptions

Compulsory Courses

CEE101 General Chemistry II (3 Cr. Hrs.)

Structure; Bonding and Molecular Properties of organic Compounds; Alkanes and Cycloalkanes; Stereochemistry of Alkanes and Cycloalkanes; Alkenes and alkynes; Stereochemistry; Alkyl Halides and their Reactions; Aromatic Compounds and their Reactions. Alcohols; ethers; thiols; Aldehydes and ketones; Carboxylic acids and derivatives; Amines.

CEE315 Environmental Impact Assessment (2 Cr. Hrs.)

Introduction into environmental impact assessment (EIA) involving an examination of: legislative/policy frameworks (In Jordan and elsewhere); theoretical underpinnings; the role of impact assessment in planning and decision making; methods and techniques for the assessment of impacts; implementation challenges; and the future directions for EIA. Analysis of various measures of environmental quality .Impacts on different types of resources Benefit-cost consideration in environmental impact assessment. Methodologies that identify the human and social consequences of man-made alterations pollution and resource limitation in the natural environment. Impact of engineering projects on food production lands and water.

CEE201 Statics (3 Cr. Hrs.)

Basic concepts of mechanics; vectors; Statics of particles; Rigid bodies and force systems; equilibrium of rigid bodies; Analysis of trusses and frames; Distributed forces; centroids and moments of inertia; Shear force and Bending moment diagrams for beams.

CEE311 Hydraulics (3 Cr. Hrs.)

Review of fundamentals; flow in complex pipe systems; theory and operations of centrifugal pumps; gradually-varied open channel flows; backwater computations; flow measurements; unsteady flows; hydraulic models; sediment transport theory; introduction to wave theory.

CEE312 Hydraulics lab (1 Cr. Hr.)

Center of pressure on a plane surface; stability of a floating body; Venturi and orifice meters; impact of jets; flow over a rectangular notches; flow over a weirs; head loss through pipes; critical depth and specific energy; flow under a sluice gate; roughness of open channel; hydraulic jump; performance of impulse and reaction turbines; performance characteristics of a centrifugal pump.

CEE211 Hydrology (3 Cr. Hrs.)

A holistic treatment of the field of surface hydrology with a focus on heterogeneity and variability; multiple flow pathways and residence times; water balance and scale issues. Hydrologic processes; including precipitation; evaporation; transpiration; snowmelt; infiltration; runoff; and stream flow. Rivers and lakes; springs and swamps. Surface runoff hydrology: hydrographic analysis; and its applications. Flood routing reservoirs routing and channel routing. Hydrologic forecasting. Run-off generation; flow and transport; and evapotranspiration and stream flow through exposition of fundamental theories combined with the analysis and interpretation from observed data. Risk analysis; introduction to urban drainage design. Aquatic habitats. Catchment processes and management; Functioning of water catchments from both natural science and social science perspectives; at a variety of scales. Empirical context will be drawn primarily from the Maain; Disi; Jordan Valley and Al Azraq situations.

CEE313 Water Chemistry (2 Cr. Hrs.)

Chemical species in the natural waters; Organic compounds in water; Organic pollutants and their measurement tests; toxic and hazardous compounds; Basic aqueous equilibria; the structure; behavior and fate of major classes of chemicals that dissolve in water; redox reactions and acid base reactions: carbonate systems; alkalinity; Hardness of water.

CEE314 Water Chemistry Lab (1 Cr. Hr.)

Turbidity test; TS and TDS tests; Conductivity test; Acidity; alkalinity; Hardness; chloride measurement; Dissolved oxygen; BOD and COD tests.

TME 222 Fluid Mechanics: (3 Cr. Hrs.)

Physical properties of fluids and fundamental concepts in fluid mechanics; hydrostatics; conservation laws for mass; momentum and energy; flow similarity and dimensional analysis as applied to engineering problems in fluid mechanics; laminar and turbulent flow; engineering applications such as flow measurement flow in pipes and fluid forces on moving bodies.

CEE202 Engineering geology (2 Cr. Hrs.)

Earth science as it relates to human use of the planet; global and local scales; nature of earth; types of materials of which the earth is made (minerals and rocks); the processes that effect the earth's surface (endogenic and exogenic); natural hazards; and environmental issues; the nature of earth materials and their relevance to engineering problems.

CEE203 Engineering geology lab. (1 Cr. Hr.)

the lab section will include ways of characterizing and identifying minerals and rocks; the use of maps and field excursions

TME 213: Mechanics of Materials (3 Cr. Hrs.)

Normal and shear stress and strain; deflection of axially loaded members; thermal stress; torsion of bars with circular sections; shear stress; angle of twist; power transmission; bending of beams; bending and shear stresses; combined loadings; beam deflection; column buckling.

CEE351 Building Materials (2 Cr. Hrs.)

Cement (types; manufacture; properties and hydration); aggregates; mixing water; fresh concrete properties; hardened concrete (strength; strength development; shrinkage; creep; durability); handling and placing of concrete; concrete mix design by ACI method; bricks and bricks works.

CEE352 Building Materials Lab. (1 Cr. Hr.)

Introduction to testing & specifications; concrete and mortar tests; aggregate testing; fresh and hardened concrete testing; non-destructive tests; design & testing of concrete mixes; brick testing.

CEE331 Surveying (2 Cr. Hrs.)

Introduction and basic principles of surveying; Theory of errors; Tape measurements (chain survey); Leveling and contour lines; Areas and volumes; Mass haul diagram; Angle measurement; Coordinate geometry; Traverses; Stadia and total station; Electronic distance measurement (EDM); Horizontal alignments setting out.

CEE332 Surveying Lab (1 Cr. Hr.)

Tests on distance measurements; levels and theodolites; directions and angular measurements; topographic surveys; areas and volumes; traverse surveys; Setting out horizontal curves; Training on Total Station.

CEE321 Structural Analysis (1) (3 Cr. Hrs.)

Structural forms; types of supports; stability and determinacy; reactions; determinate structures; analysis of plane trusses(method of joints and method of sections); space trusses; shear and moment diagrams for beams and frames; three hinged arches; influence lines for beams and trusses; Deflection (direct integration; moment area theorems; conjugate beams; real and virtual work); approximate analysis of statically indeterminate structures.

CEE333 Highway and traffic Engineering (3 Cr. Hrs.)

Driver and pedestrian characteristics, road and vehicle characteristics, traffic engineering studies (travel time, speed, volume, parking), highway safety, traffic flow principles, intersection design and control, highway capacity and LOS, Principles of route location, horizontal alignment (design and setting out (circular curve element, super-elevation), sight distance (stopping and passing sight distance), vertical alignment (design and setting out), highway drainage and drainage facilities.

CEE533 Highway Engineering Lab.	(1 Cr. Hr.)
Tests on asphalt binders include: penetration; softening and flash points; ductility; viscosity; and specific gravity; Tests on subgrade soils include: CBR test; Test on aggregate include: sieve analysis; specific gravity; absorption; aggregate blending; Tests on hot mix asphalts include: Marshall mix design; extraction; skid resistance.	
CEE322 Structural Analysis (2)	(3 Cr. Hrs.)
Introduction to indeterminate structures; method of virtual work (for beams; frames; and trusses); method of three-moment equation; moment distribution for beams and frames; frames subject to side-sway; structural elements and load transfer; analysis of structures by computer applications.	
CEE323 Reinforced concrete (1)	(3 Cr. Hrs.)
Properties of concrete and steel; cracked and uncracked section analysis; ultimate strength design method, analysis and design of singly RC rectangular beams; doubly RC beams; T-section RC beams; design of continuous beams; load cases and moment envelopes; design of RC beams for shear; bond requirements; development length and bar cutoffs; one-way solid and one-way ribbed slabs; design of short columns.	
CEE341 Geotechnical Engineering	(3 Cr. Hrs.)
Index and classification of soils; water flow in soils (one and two dimensional water flow); soil stresses; soil compaction; distribution of stresses in soil due to external loads; consolidation and consolidation settlement; shear strength of soils; slope stability.	
CEE342 Geotechnical Engineering Lab.	(1 Cr. Hr.)
Water content of soils; specific gravity; grain size distribution; consistency limits of soils; compaction test; field density test; coefficient of permeability of soils (constant and falling head); consolidation test; direct shear test; unconfined compression test; tri-axial test.	
CEE521 Reinforced concrete (2)	(3 Cr. Hrs.)
Analysis and design of RC columns (Braced and Unbraced; Slender and Short; under pure compression; uniaxial and biaxial moments); Serviceability requirements for beams; Analysis and design of two-way Slabs (solid and ribbed slabs); Design of RC bearing walls, Design of stairs.	
CEE515 Water and wastewater Treatment engineering	(3 Cr. Hrs.)
The needs for water quality and how to achieve it by drinking water treatment; wastewater treatment; other water-quality control strategies (principles and theory).	
CEE516 Water and wastewater Treatment engineering Lab	(1Cr. Hr.)
Water and Wastewater analysis: acidity; alkalinity; chloride; hardness; Ammonia; dissolved oxygen; biochemical oxygen demand; chemical oxygen demand; coliform bacteria; solids determination; coagulation; and softening.	

CEE511 Environmental Engineering	(3 Cr. Hrs.)
Quantities and units; environmental systems and transformation processes; material balance relationships and reactor concepts; energy fundamentals; thermodynamics and equilibrium constants; environmental chemistry: stoichiometry; chemical equilibria; and organic chemistry; transport processes; interphase mass transfer; interphase partition phenomena: fugacity and mass transfer; water pollution; air pollution; basic environmental microbiology; mathematics of growth.	
CEE522 Steel Structures	(3 Cr. Hrs.)
Properties of structural steel; load resistant factor design (LRFD); design of tension members; design of concentric compression elements; design of beams ;design beam-column elements; design of column base plates; simple welding and bolting connections.	
CEE517 Solid Waste Management	(3 Cr. Hrs.)
Introduction to the problems; regulations and techniques associated with the management of solid and hazardous waste. Composition; volume; classification and characterization of the wastes. Design of collection and disposal systems; including siting; construction and operation of sanitary landfills; composting solidification/stabilization and incineration.	
CEE512 Air Pollution Control	(2 Cr. Hrs.)
Air pollution control law and regulations. Air pollution measurement; Emission estimates. Meteorology for air pollution control engineers. Air pollution concentration models. Designing air pollution control systems and equipment. Combustion and control systems(Particulate pollutants; primary particulates; Vocs; SOx and NOx). Air pollutants and global climate.	
CEE513 Air Pollution Control Lab	(1 Cr. Hr.)
Air pollutants measurement methods and used devices: Particulate Matter, Carbon Monoxide , Sulfur Oxides and Nitrogen Oxides devices. The efficiency for an air pollutant control device (Cyclone). Design a software to estimate the emissions and predict the maximum concentration based on Gaussian Plume Model.	
CEE532 Pavement Design	(3 Cr. Hrs.)
Pavement types; Pavement materials; subgrade stabilization methods; Principles of mix design using SUPERPAVE; Analysis of stresses in flexible and rigid pavement; Design methods of highway flexible and rigid pavements; Design of airport flexible and rigid pavement; Overlay design; Computer applications.	
CEE531 Transportation Engineering	(3 Cr. Hrs.)
Urban transportation system issues and challenges; Land use; demand forecasting; Transportation modeling including; trip generation; trip distribution; modal split; and traffic assignment. Urban mass transportation systems; Computer applications.	

CEE514 Water resources engineering (3 Cr. Hrs.)

Water laws. Reservoirs; dams; and reservoir basins; Hydro- power generation; Flood estimation; routing and control; Engineering economy in water resources planning; Introduction to system engineering in water resources; Topics in arid and semi-arid region water resources; Desertification water conservation techniques; reuse of water; remote sensing and arid water resources; Linear programming and its applications in water resources.

CEE561 Contracts; Specifications and Quantity Surveying (3 Cr. Hrs.)

Contracting process; elements of contracts; tendering; bids; Types of contracts: lump sum, unit price, and cost plus contracts; Engineering service contracts; The FIDIC conditions of contracts; interim and final payments certification; testing and inspection; variation orders; termination of contracts; claims and arbitration; Specifications; prescription and performance specifications; key specifications of major civil works; Performing quantity takeoffs of major civil works: excavations, concrete, reinforced steel, lumber, masonry, tiles, plastering, sanitary, and painting. Principles of electro/mechanical works.

CEE562 Engineering Projects & Construction Management (3 Cr. Hrs.)

Examines the organization; planning; and controlling of projects and provides practical knowledge on managing project scope; schedule and resources. Topics include project life cycle; work breakdown structure and Gantt charts; network diagrams; scheduling techniques (CPM and PERT); and resource allocation decisions.

CEE591 Graduation Project 1 (1 Cr. Hr.)

Students will pick a particular problem in civil and environmental engineering; and carry out a literature survey of the problem then suggest an alternate solution to the problem. They must show a good ability in effectively applying the fundamentals of mathematics; physics; chemistry; engineering; etc...; in finding the alternate solution. This course should help the students in assessing their strengths and weaknesses in applying fundamental principles to real life environmental problems.

CEE592 Graduation Project (2) (3Cr. Hrs.)

Students will continue with the problem in civil and environmental engineering in CEE591; carry out an extensive study and suggest alternate solutions to the problem. They must show ability in effectively applying the fundamentals of mathematics; physics; chemistry; engineering; etc.; in finding the alternate solutions.

CEE541 Foundation Engineering (3 Cr. Hrs.)

Site investigation; bearing capacity of shallow foundation; distribution of stresses in soils; settlement of shallow foundation; shallow foundations design (isolated, combined, and mat); introduction to deep foundation; lateral earth pressure and retaining walls.

TME 214 Dynamics and Vibration (3 Cr. Hrs.)

Kinematics and kinematics of particles, Newton's laws, planar kinematics and kinetics of a rigid bodies, free vibration of single degree of freedom systems, harmonic excitation, general force response.

CEE390 Field training in Jordan (0 Cr. Hrs.)

Students must complete 160 hours of field training in approved industries, and agencies in Jordan by the end of their third academic year.

CEE372 International internship in Germany (12 Cr. Hrs.)

In the second semester of the fourth academic year of the program, the student is expected to find a place in German water industry in order to gain industrial experience. This can be done by preparing a good resume and by contacting and applying to as many German civil or water industrial companies as possible.

Civil Engineering Track Elective courses	
CEE422 Pre-stressed Concrete	(3 Cr. Hrs.)
Introduction to pre-stressed concrete; types and concepts of pre-stressed concrete; pre-stressing methods; types of concrete and pre-stressing steel; flexural analysis using elastic stresses; flexural strength analysis; partial pre-stressing. Flexural design of beams; beams design with load balancing. Design based on strength requirements; flexural crack control; loss of pre-stress force; composite beams.	
CEE421 Advanced reinforced concrete	(3 Cr. Hrs.)
Analysis and design of RC shear Walls; design of retaining walls; design of water tanks; estimation of wind loads and earthquake loads; corbels and brackets; deep beams;	
CEE442 Geographic Information systems	(2 Cr. Hrs.)
Fundamentals of geographic information systems (GIS). Geographic and spatial data types. Data models and structures. Projections and transformations. Attribute-based operations and spatial operations. Surfaces and near neighbors. Essential elements of GIS data structure; data acquisition; data processing; database management; and analysis and manipulation. Emphasis on product generation. Application of GIS in water and environmental engineering. Training on Arc GIS software.	
CEE443 Geographic Information systems lab	(1 Cr. Hr.)
This lab aims to develop skills necessary to interpret and utilize spatial data to generate valuable information. Lab will include hydrologic modeling within GIS, querying, map making, handling raster and vector data, proximity analysis and buffering, overlay analysis, intra-layer interpretation, placement exercises, digitizing, georeferencing, raster and vector analysis, surface analysis	
CEE479 Advanced topics in water and environmental engineering	(3 Cr. Hrs.)
A very well-structured advanced course in the area of water and environmental engineering, covering topics which are not offered in other courses.	
CEE423 Bridge engineering	(3 Cr. Hrs.)
Materials of bridge construction; bridge loads and design philosophy; design of reinforced concrete bridges; design of prestressed concrete bridges; design of steel bridges; design of plate-girder and continuous steel beam bridges; inspection, rehabilitation and maintenance of bridges; bridge-type selection criteria.	
CEE424 Earthquake Engineering	(3 Cr. Hrs.)
Introduction to Earthquake Engineering; Seismology and the causes of occurrence of earthquake and its characterization; seismic analysis of the structures under earthquake excitation; structural systems modeled as discrete and continuous system; The concept of response spectrum analysis procedure to determine structure response and design earthquake forces. The code provisions for earthquake resistant design of structures.	

CEE425 Timber structures	(3 Cr. Hrs.)
Timber as a structural material, mechanical properties (strength and stiffness), durability; unidirectional components (solid timber, glued-laminated timber, LVL). Typical structural systems for timber structures. Basic design and verification of timber structures, design rules and tools. Details and joint design. Glulam and arch structures. Stability and bracing systems. Basic ultimate and serviceability state requirements.	
CEE426 Advanced steel structures	(3 Cr. Hrs.)
Bolted and welded connections, Building Connections, Rigid Steel frames, elastic and plastic design methods, supports of rigid frames, composite design.	
CEE427 Structural systems	(3 Cr. Hrs.)
Overview of various structural systems used in the construction of buildings. Building types; from single-family houses to high-rise buildings to multi-use facilities. Load transfer for building. Case studies from a structural viewpoint, in which the rationale for the structural system is analyzed, and then a systematic construction process is followed from start to completion of the project.	
CEE429 Advanced topics in Structural engineering	(3 Cr. Hrs.)
A very well-structured advanced course in the area of structural engineering, covering topics which are not offered in other courses.	
CEE431 Traffic safety and management	(3 Cr. Hrs.)
Analysis of highway design alternatives and control strategies with respect to accident probabilities, statistical models for safety analysis, accident countermeasure selection and evaluation methodology, risk management, transportation networks, network equilibrium concepts, estimation of origin-destination matrix, traffic management measures, traffic control techniques, traffic simulation, application of Control and Optimization software (e.g. TRANSYT-7F, SIDRA, etc.)	
CEE432 Infrastructure Maintenance and Management	(3 Cr. Hrs.)
General overview of infrastructure facilities, Types of pavement distresses and survey techniques, methods of characterizing pavement conditions, Pavement maintenance techniques, management and planning of highway network maintenance, planning highway maintenance & rehabilitation processes.	
CEE433 Urban Mobility & Public Transportation	(3 Cr. Hrs.)
Introduction to urban planning, land use planning and urban transportation planning, urban mobility definitions and challenges, private car ownership models, evolution and role of urban public transportation modes, technological characteristics of different modes, urban and intercity public transportation modes (capacity, service quality, and cost), methods for data collection and analysis, performance monitoring, route and network design, frequency determination (bus, BRT, light rail, etc), impact of pricing policy and service quality on ridership, PPP in public transportation, fare policy and technology, marketing and operations management.	

CEE439 Advanced topics in Transportation engineering	(3 Cr. Hrs.)
Transportation data collection and analysis techniques, activity-based analysis modeling techniques, freight transportation, externalities and energy, future modes of transportation (passengers & freight), airport planning, seaport operations including container terminals.	
CEE441 Dam Engineering	(3 Cr. Hrs.)
Planning and design of dams in the context of hydropower development; Basics in dam engineering for civil engineers, including concrete and embankment dams, soil mechanics for dams and concrete technology for dams; Type of dams and their characteristics; how dam sites are selected and evaluated; how to investigate dam foundation; basics of soil mechanics; settlement, seepage and aspects of stress in relation to dams and dam foundation; basics of concrete property and dam concrete challenges; how to identify and quantify different loads on dams.	
CEE449 Advanced topics in geotechnical engineering	(3 Cr. Hrs.)
Permeability and seepage, consolidation theory, secondary compression, three dimensional consolidation, settlement analysis, stress-strain-strength behavior of soils: drained and undrained conditions for cohesive and cohesionless soils, anisotropy of soils, classes of stability; and any advanced topic in geotechnical engineering the instructor may choose.	
CEE451 Building Construction	(3 Cr. Hrs.)
Methods and techniques used in building construction projects; the construction process from idea conception to project closeout; including building and material codes; materials and methods; material quantity surveys; and construction procedures; Primary emphasis will be on structural steel, reinforced concrete, masonry, wood, and combined structural systems; building exterior and interior finishing systems; the use of construction drawings, scales, orthographic views, symbols, sections, and graphical interpretation, specific to the building construction industry to include structural steel detailing, reinforced concrete detailing, masonry sections, wood sections, and schedules for interior finishes and accessories.	
CEE452 Construction machines	(3 Cr. Hrs.)
Factors affecting the selection of construction equipment; Descriptions, operating methods, production rates, unit costs related to excavating equipment; Power shovels, draglines, clam shells, and trenching machines; Engineering fundamentals; Moving construction equipment, including trucks, wagons, scrapers, dozers, soil-stabilization and compaction equipment; Belt conveyors; compaction and drilling equipment; pile driving equipment, pumps and crushers.	

CEE469 Advanced topics in Project Management	(3 Cr. Hrs.)
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The course requires candidates to study in detail the way in which the principles of the whole project life cycle including design, production and operation in construction can be integrated. It embraces study of the general principles of systems integration and their application in a construction manufacture context. It also entails study of the fundamental principles of simultaneous engineering and addresses the issue of integration through a technology driven approach; and any advanced topic in project management the instructor may choose.

CEE480 Independent Studies	(3 Cr. Hrs.)
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Allows the student to explore a topic of interest under the close supervision of a faculty member. The course may include directed readings, applied work, assisting a faculty member with a research project, carrying out an independent research project, or other activities

Water and Environmental Engineering Track Elective courses

CEE410 Irrigation Engineering (3 Cr. Hrs.)

Fundamentals to the design of an irrigation system incorporating safe wastewater applications. System addressing a complex problem of water in the natural and constructed environment. Case study revolutionizes each year; generally drawn from a challenge confronting the region. Water balance concepts for tracking substances in the water systems. field project to quantify the flux of pollutants from a local watershed outlet to the ocean ; an aquifer or water body. Sociotechnical systems associated with human use of water as a resource and the hazards posed by too much or too little water. Potable and non-potable water use and conservation. Irrigation; rural and urban water supply systems; storm water management; and flood damage mitigation. Emphasis is on engineering design.

CEE412 Environmental and Water Microbiology (3 Cr. Hrs.)

The diverse roles of microorganisms in natural and artificial environments; Fundamental aspects of microbial physiology and ecology; Specific areas of focus include definition and basic notions; classifications system of microorganisms energetic and yield; enzymes; growth kinetics; pathogenicity; metabolic; microbial/environmental interactions; biogeochemical cycles and microbial count techniques; Topics on the role of microorganisms in waste treatment processes within different environmental systems; Pathways used by microbes for degradation; transformation; and synthesis of different chemicals in the environment; Theory and practice of sterilization; Action of antimicrobial agents.

CEE411 Introduction to Biotechnology (3 Cr. Hrs.)

Basic concepts of biotechnology: Biomass characterization; Biomass growth and kinetics. Bioconversion systems: types of biomass; which are currently considered for conversion into bioenergy conversion pathways available to turn biomass into bio-products. Identify energy potentials of biomass and biogas. Biofuels and Combustions Engines

CEE413 Disposal Logistics (3 Cr. Hrs.)

The process of planning; implementing and controlling the efficient; cost effective flow and storage of waste including disposal collection; transportation; handling and storage.

CEE414 Pollution Control of the Aquatic Environment (3 Cr. Hrs.)

Effects of domestic and industrial water pollution on the physical; chemical and biological characteristics of natural waters; associated environmental determinants of human disease; toxicology and epidemiology of chronic disease.

CEE415 Water Supply and Wastewater Collection	(3 Cr. Hrs.)
The design of reservoirs; conduits; water distribution systems; well fields; sewers; and drains. Included is a study of population growth and its effects on water supply requirements and sewage flows as well as techniques for analyzing rainfall; runoff; fluid flow; reservoir sitting; and groundwater flows.	
CEE416 International Environmental Law	(3 Cr. Hrs.)
An overview of the history and current application of laws and rules used to protect the environment; the general framework of legislation and includes specific discussions of regulations as they are enforced at international; national; state and local levels. The Environmental Regulations course is concerned with Industry and its relationship with the environment and community and the impact of environmental regulations on Industry decision-making. Topics include waste minimization; pollution prevention; hazardous; special; industrial and municipal solid waste control; the Clean Air Act; and Clean Water Act; and the Occupational. Safety and Health Act and how it relates to environmental regulations.	
CEE417 Process Engineering	(3 Cr. Hrs.)
The fundamental hydraulic processes, which underpin water treatment systems. Process engineering fundamentals; fluid mixing and flow; mass balance; mass transfer and elementary chemical reactor theory; flow sheeting and unit operations are discussed as key concepts. The relevant hydraulic principles and algebraic relationships governing process design and performance; and the opportunity to apply governing equations to examples provided and demonstrate their proper usage.	
CEE418 Process Operation	(3 Cr. Hrs.)
The principles of treatment plants operations. Unit operations related to production; treatment; disposal; and recycling). Principles of unit operations (mass and energy balance). Mechanical; thermal; chemical; and biological processes. Heat and mass transfer. Chemical and biological reactors. scope; limits; and methods of secondary and advanced treatment; solids handling; disinfection; reclamation of wastewater; through readings; discussions; analysis; and laboratory study. Specifically designed for individuals seeking employment or already employed in the wastewater field. Advanced wastewater treatment systems; including secondary and tertiary treatment; solids handling; disinfection; reclamation of wastewater; and laboratory study.	
CEE471 Drinking Water Abstraction and Distribution	(3 Cr. Hrs.)
Applied water hydraulics; water storage tanks; backflow and cross-connections; valves; water mains; meters; pumps and motors; and system operating equipment. Principles of electricity; OHM's Law; and the Power equation will be presented. Disinfection methods; sampling procedures; ground water wells; distribution system operations; water quality parameters; and the public health aspects of a potable water supply.	

CEE476 Environmental Unit process and operation	(3 Cr. Hrs.)
<p>Characterization of water and wastewater; Design of water distribution networks and sewerage systems; Design of water treatment systems; Wastewater Treatment design; Storm drainage design; Landfill design; Design basics of non-conventional treatment methods including: absorbers; aeration towers and membrane processes; processing of sludge; and water</p>	
CEE481 Special Topics	(1 Cr. Hr.)
<p>Students may take this course after obtaining the department's consent and only once. A topic for this course may cover any of the topics related to water and environmental engineering and its applications. The course content must be commensurate with one credit hour</p>	
.CEE482 Special Topics	(2 Cr. Hrs.)
<p>Students may take this course after obtaining the department's consent and only once. A topic for this course may cover any of the topics related to water and environmental engineering and its applications. The course content must be commensurate with two credit hours.</p>	
CEE483 Special Topics	(3 Cr. Hrs.)
<p>Students may take this course after obtaining the department's consent and only once. A topic for this course may cover any of the topics related to water and environmental engineering and its applications. The course content must be commensurate with three credit hours.</p>	
CEE472 Groundwater Modeling and dynamics	(3 Cr. Hrs.)
<p>Groundwater modeling and dynamics of flow; including groundwater recharge; saturated and unsaturated flow; the nature of aquifer materials and the various types of porosity and permeability. Equations that govern the movement of groundwater; the techniques used to evaluate aquifer properties; specifically the different types of pumping tests. Students will also be utilizing groundwater modeling software; specifically MODFLOW. Emphasis on utilizing this knowledge and skills in the sustainable management of aquifer systems.</p>	
CEE478 Water and Wastewater Reuse	(3 Cr. Hrs.)
<p>Principles for designing environmentally acceptable land application systems using municipal and industrial wastewater and sludge; land-limiting constituent analysis; soil-plant interactions; system equipment and design; system operation and management; public acceptance, social and regulatory issues. Case studies and field trip(s) are planned.</p>	

CEE477 Hydraulic structures	(3 Cr. Hrs.)
<p>The course deals with different aspects of the design of hydraulic structures. The course provides the knowledge to design various hydraulic structures, such as energy dissipaters, head and cross regulators, canal falls and structures involved in cross drainage works. The course also teaches the theory necessary to analyze and design these structures, such as the seepage and uplift theories and the hydraulic jump</p>	
CEE470 Advanced Wastewater treatment	(3 Cr. Hrs.)
<p>Characteristics of wastewater. Principles of wastewater treatment process design, operation and economics. Unit operations. Biological treatment systems and oxidation kinetics. Advanced wastewater treatment and reuse. Sludge treatment processes, including public health engineering, wastewater disposal systems, and wastewater contamination indicators. Topics include wastewater quality parameters; unit operations in treatment of wastewater. Experimental and practical projects are given to the students in the above topics. Wastewater treatment Plant design: case study. Use of renewable energy in water and waste water treatment</p>	
CEE475 Water Supply and Wastewater	(3 Cr. Hrs.)
<p>The design of reservoirs, conduits, water distribution systems, well fields, sewers, and drains. Included is a study of population growth and its effects on water supply requirements and sewage flows as well as techniques for analyzing rainfall, runoff, fluid flow, reservoir sitting, and groundwater flows.</p>	
CEE474 Heat and Mass Transfer	(3 Cr. Hrs.)
<p>A fundamental course in heat transfer processes and an introduction to mass transfer. Topics include equations of energy conservation, conduction, convection, radiation; equations for chemical species conservation, diffusion, macroscopic balances. Emphasis on problem solving, especially for purposes of design.</p>	
CEE473 Environmental and water law and policy	(3 Cr. Hrs.)
<p>An overview of the history and current application of laws and rules used to protect the environment. This course outlines the general framework of legislation and includes specific discussions of regulations as they are enforced at international, national, state and local levels. The Environmental Regulations course is concerned with Industry and its relationship with the environment and community and the impact of environmental regulations on Industry decision-making. Topics include waste minimization, pollution prevention, hazardous, special, industrial and municipal solid waste control, the Clean Air Act, and Clean Water Act, and the Occupational Safety and Health Act and how it relates to environmental regulations. Act and how it relates to environmental regulations.</p>	

Courses Taken from the Department of Service Courses

PHYS 103 Physics I (Mechanics) (3 Cr. Hrs.)

Physics and measurement. Motion in one dimension. Vectors. Motion in two dimensions. Force and motion. Kinetic energy and work. Potential energy and conservation of energy. Linear momentum and collisions. Rotation. Rolling and angular momentum.

PHYS 104 Physics II (Electricity and Magnetism) (3 Cr. Hrs.)

Electric Fields. Gauss's Law. Electric Potential. Capacitance and Dielectrics. Current and Resistance. Direct Current Circuits. Magnetic Fields. Sources of Magnetic Field. Faraday's Law.

CHEM 106 General Chemistry lab (1 Cr. Hr.)

Laboratory safety, first aid. Measurement and proper use of laboratory glassware. Density measurement. Classification of matter: Basic separation techniques. Precipitation reaction. Limiting reactant. Determination of acetic acid in vinegar. Quantitative titration of an antacid tablet. Determination of ions in hard water using EDTA. Molecular weight of a volatile liquid. Kinetic study of reaction of peroxydisulfate and iodide ions. Calorimetry

PHYS 106 General Physics Lab (1 Cr. Hr.)

Laboratory exercises that apply physical principles introduced in Physics I and Physics II courses. The lab includes the use of data logging techniques, observations, and scientific reasoning in practical situations.

MATH 101 Calculus I (3 Cr. Hrs.)

This course introduces the student to the calculus of single-valued functions. Topics include: limits; continuity; rates of change; rules for differentiating; differentials and local linear approximations; maxima and minima problems; L'Hôpital's rule; related rates; logarithmic and implicit differentiation; inverse trigonometric and hyperbolic functions; Rolle's theorem; the mean-value theorem; and applications of derivatives and integrals.

MATH 102 Calculus II (3 Cr. Hrs.)

This is a course in multivariate calculus as a continuation of Calculus I. The course focuses on power series; polar coordinates and polar functions; sequences and infinite series; vectors; functions of several variables and their limits; partial differentiation and their applications. The course views multiple integrals: double and triple; line integrals; surface integrals; Green's theorem; Gauss's divergence theorem; and Stoke's theorem.

MATH 203 Applied Mathematics for Engineers (3 Cr. Hrs.)

This course begins with an overview of vector analysis; linear algebra concentrating on using matrices to solve systems of equations; and the diagonalization of matrices; and complex numbers. It then moves into a study of differential equations; shedding light on the solutions of differential equations (first order; second and higher orders) with applications. The course will discuss Laplace transforms and Fourier Series and Fourier Transforms with applications in solving initial value problems.

IE 211 probability and Statistics for Engineers (3 Cr. Hrs.)

This course familiarizes students with descriptive statistics; probability basics; random variables; special discrete random variables; and various distributions: normal; Student's t; Chi-square; and Fisher's F. It includes a discussion of inference about one mean; one proportion; difference between two means and difference between two proportions and the ratio of two variances; large and small samples; paired and independent samples. The MINITAB statistical software package will be used; there will also be an introduction to the use of SPSS.

MATH 205 Differential equations (3 Cr. Hrs.)

This course expounds the basics of second order partial differential equations; wave equation; heat flow equation in one dimension; potential equation on rectangles and disks. Various types of special functions.

IC 101 Intercultural Communication (3 Cr. Hrs.)

This course is designed to provide prospective students (whose majors have an international flavor) with tools that offer powerful possibilities for improving the communication process. We will examine the process of sending and receiving messages between people whose cultural background could lead them to interpret verbal and nonverbal signs differently. We will learn about the diversity of these cultural differences and at the same time learn how we might overcome them. Our efforts to recognize and surmount cultural differences will hopefully open up business opportunities throughout the world and maximize the contribution of all the employees in a diverse workforce.

SFTS 101 SOFT SKILLS (3 Cr. Hrs.)

This course is designed to help develop strong oral and written communication skills. The student will be given opportunities to practice writing and editing professional correspondence and technical reports. Additionally; the student will compose and deliver oral presentations. Assignments will include the use of inductive and deductive approaches to conveying a variety of messages. The course emphasis the use of software tools to prepare presentations; stress management; confidence; and sensitivity to others. It also stresses on resume writing and conducting interviews.

SE 301 Social Entrepreneurship and Enterprises (3 Cr. Hrs.)

This course will serve as an introduction to the field of social entrepreneurship and social enterprises. Through lectures; field visits; analyses of relevant literature; case studies and exercises; this course will explore social entrepreneurship's potentials; opportunities and limitations. The topics will cover: Defining Social Entrepreneurship. Contextualizing Social Entrepreneurship (need; motives; forms; criteria). Role of Leadership; Creativity and Innovation. Locating SE on the profit/non-profit continuum. SE in the larger fields of development; social change; community activism. Social Enterprises (Missions; Markets; Finances). Ethical business and corporate social responsibility.

NE 101 National Education	(3 Cr. Hrs.)
<p>In a context of striving towards democracy like the one Jordan enjoys today; the meaning and practice of active and responsible citizenship becomes more crucial. It is often argued that democracy requires “democrats” to flourish; and become well established. Democrats are those women and men who recognize pluralism; inclusion; positive engagement; and participation as the main values that govern their interaction with the state as citizens and with each other as diverse people of different interests. In this course; you will be able to understand your rights and responsibilities as Jordanian citizen; expand your knowledge about the frameworks; and processes that regulates citizen-state relationships as well as the basic necessary skills for you to practice your citizenship rights in a civic manner.</p>	
CS 116 Computing fundamentals	(3 Cr. Hrs.)
<p>Basic computer skills, programming concepts, algorithms, variables and data types; arithmetic, logical, relational, Boolean, and assignment operators; simple input and output statements, selection structures, loop structures, single and multidimensional arrays, character strings, functions, data structures, pointers, input/output file operations.</p>	
CS 1160 Computing fundamentals lab	(1 Cr. Hr.)
<p>Lab session every week to offer hands-on experience on the topics that are covered in CS116, which are: algorithms, variables and data types; arithmetic, logical, relational, Boolean, and assignment operators; simple input and output statements, selection structures, loop structures, single and multidimensional arrays, character strings, functions, data structures, pointers, input/output file operations.</p>	
Courses Taken from other Departments at GJU	
MILS 100 Military Sciences	(3 Cr. Hrs.)
<p>History of the Jordanian Arab Army. United Nations Peace Keeping Forces. Preparation of the nation for defense and liberation. History of the Hashemite Kingdom of Jordan and its development.</p>	
PE 101 Sports and health	(3 Cr. Hrs.)
<p>The course focusing on providing students with information's related to Sport, fitness and health culture, Voluntary work Nutrition, First Aid. It covers also the Special physical preparation and general sport cultural issues.</p>	
ARB 99 Arabic	(3 Cr. Hrs.)
<p>This course aims to develop student's ability to read, comprehend, literary analyze, grammatically analyze, linguistically analyze, poetically analyze, and rhetorically analyze texts properly. The course also includes a selection of Arabic literature in poetry and prose representing different literary ages, in addition to several common forms of writing such as: scientific article, news article, and others.</p>	

ARB 100 Arabic	(3 Cr. Hrs.)
Grammar and structure. Rectifying weakness in linguistic application; training insound reading. Dictation; use of language in a manner free from grammatical and linguistic errors; accurate expression of intended meaning. Study and analysis of literary texts through the discussion of linguistic; grammatical and writing skills therein.	
ENGL098 English I (Elementary English)	(0 Cr. Hrs.)
Students will focus on English at an elementary level concentrating on the receptive skills of reading and listening; and the productive skills of writing and speaking. These will include such things as independent clauses; verb tenses; model verbs; adverbs; short dialogues; reading simple material and answering short questions; writing short meaningful sentences; listening to short conversations.	
ENGL099 English II (Pre Intermediate English)	(0 Cr. Hrs.)
Students will focus on English at a pre-intermediate level concentrating on the receptive skills of reading and listening and the productive skills of writing and speaking. These will include such things as comparatives and superlatives; quantifiers; possessive adjectives and pronouns; vocabulary building; role play activities for speaking; reading comprehension and writing short descriptive paragraphs.	
ENGL 101 English III (Intermediate English)	(1 Cr. Hr.)
Students will focus on English at an intermediate level concentrating on the receptive skills of reading and listening and the productive skills of writing and speaking. These will include collocations; tense review; affirmative; negative statements; synonyms and antonyms; time clauses; conditionals; active and passive forms; reported speech; phrasal verbs; reading comprehension with detailed questions; vocabulary and writing developed descriptive and opinion essays.	
ENGL 102 English IV (Upper Intermediate English)	(1 Cr. Hr.)
Students will focus on English at an upper-intermediate level concentrating on the receptive skills of reading and listening and the productive skills of writing and speaking. Model verb review; silent letters and proper pronunciation; jobs and careers; requests and offers; more phrasal verbs with vocabulary building; relative clauses and relative pronouns; narrative tenses for writing exercises; wishes and regrets; reading and comprehending longer passages with direct and inference questions of medium difficulty; hypothesizing; and writing fully developed descriptive; argumentative and analytical essays of 350 words.	

ENGL 201 English V (Advanced English I) (2 Cr. Hrs.)

Students will focus on English at an Advanced level. Students will analyze and produce 2 – 3 page essays with an emphasis on argumentation and persuasion working both independently and cooperatively to gather; evaluate; and synthesize necessary information. Class activities include interactive lectures; small group and class discussions; informal debates; peer feedback; individual presentations; focused listening exercises and focused viewing exercises as well as assorted reading; writing; and grammar assignments. There will be some poetry analysis together with reading and understanding a short story and a drama using basic literary terms and concepts.

ENGL 202 English VI (Advanced English II) (2 Cr. Hrs.)

Students will continue to focus on English at an Advanced level. Students will analyze and produce 4 – 5 page essays emphasizing argumentative; persuasive and discursive styles of writing; working both independently and cooperatively to gather; evaluate; and synthesize necessary information. Students will integrate the practice of critical thinking and reading into the writing process. Class activities include interactive lectures; small group and class discussions; informal debates; mini conferences; peer feedback; individual presentations; focused listening exercises and focused viewing exercises as well as assorted reading; writing; and grammar assignments. There will be some poetry analysis together with reading and understanding a short story and a drama using stronger and more intensive literary terms and concepts than in 201.

GERL101 German I (3 Cr. Hrs.)

Can understand and use familiar; everyday expressions and very simple sentences; which aim at the satisfaction of specific needs. Can introduce oneself; and others; and ask others questions to themselves - e.g. where they live; which people they know or what kind of things they have - and can give answers on questions of this kind. Can communicate on a basic level if those involved with him/ her in a conversation speak slowly and clearly and are willing to help.

GERL102 German II (3 Cr. Hrs.)

Can understand sentences and frequently used expressions if those are connected with things of immediate meaning (e.g. information to the person and to the family; buying; work; closer environment). Can communicate in simple; routine situations; with the purpose of a simple and direct exchange of information about familiar and common things. Can describe with simple means their own origin and training; direct environment and things that are in connection with direct needs.

GERL201 German III (3 Cr. Hrs.)

Can understand the main points if no dialect is used and if it concerns familiar things about work; school; spare time etc. Can master most situations that one encounters on journeys in a German speaking area. Can express oneself simply and coherently about familiar topics and areas of personal interest. Can report experiences and events; describe dreams; hopes and goals and give short reasons or explanations about plans and opinions.

GERL202 German IV (3 Cr. Hrs.)

Can understand the main contents of complex texts; as well as concrete and abstract topics; even discussions between specialists in his/ her own special field. Can communicate spontaneously and fluidly a normal discussion with native speakers; without larger effort on both sides. Can express oneself clearly; and in detail in a broad spectrum of topics; describe a point of view to a current question and indicate the pro and cons of different possibilities.

GERL301 German V (3 Cr. Hrs.)

Can understand and seize implicit meanings of a broad spectrum of demanding; longer texts. Can express oneself spontaneously and fluidly; recognizing words without having to search for words frequently. Can use the language effectively and flexibly in social and vocational life or in training and study. Can express oneself clearly; structured and detailed; to complex subjects and use appropriate different means for linkage of texts.

GERL302 German VI (3 Cr. Hrs.)

Introduction into environmental impact assessment (EIA) involving an examination of: legislative/policy frameworks (In Jordan and elsewhere); theoretical underpinnings; the role of impact assessment in planning and decision making; methods and techniques for the assessment of impacts; implementation challenges; and the future directions for EIA. Analysis of various measures of environmental quality .Impacts on different types of resources, Benefit-cost consideration in environmental impact assessment. Methodologies that identify the human and social consequences of man-made alterations, pollution, and resource limitation in the natural environment. Impact of engineering projects on food production, lands and water.

CHEM 103 General Chemistry (3 Cr. Hrs)

Stoichiometry of formulas and equations. Gases and the kinetic-molecular theory. Quantum theory and atomic structure. The components of matter. The major classes of chemical reactions (precipitation; acid-base; oxidation-reduction; and reversible reactions). Thermodynamics: energy flow and chemical change. Quantum theory and atomic structure. Electron configurations and chemical periodicity. Kinetics: rates and mechanisms of chemical reactions. Equilibrium: The extent of chemical reactions. Acid-base equilibria.

ME 111 Computer Aided Engineering Drawing (3 Cr. Hrs.)

The Use of computer aided software in drawing such as AutoCAD. Geometric constructions. Orthographic and Isometric projections; Sketching; sectioning; dimensioning and layering. Model layout (wire-frame; surface; and solid modeling); plotting to scale; blocks and attributes; Introduction to descriptive geometry; perspective drawing. Engineering applications.

IE 121 Workshop**(1 Cr. Hr.)**

General safety, materials and their classifications, measuring devices and their accuracy, basic household plumbing and electricity, fits and tolerances, theoretical background for the practical exercises including fitting, forging, carpentry, casting, welding, mechanical saws, shearers, drills, lathes, milling machines, shapers and grinders

ENE 437 Economics of natural resources engineering**(3 Cr. Hrs.)**

Time value of money, interest formula, depreciation models, tax effects, rate of return, cash flow; project evaluation methods, replacement analysis, break even analysis economic studies for decision-making under risk.