Engineering

Code	Name	Course Description and strengths
CHE 100	Introduction to Chemical Engineering	Orientation on chemical engineering. Overview of chemical process industries. Processes and process variables. Introduction to engineering calculation. Chemical and physical characteristics of processes. Stoichiometry and chemical compositions. Fundamentals of material and energy balances. Introduction to separation processes and equipment.
CHE 103	Material Energy and Balances	Analysis and design of chemical processes using chemical engineering principles. Fundamental of material and energy balances. Chemical and physico-chemical properties and processes such as humidity, saturation, solubility and crystallization. Thermodynamics parameters such as enthalpy, heat of reaction, heat of solution and heat of mixing. Simultaneous uses of material and energy balances. Material and energy balances on steady and unsteady state processes. Material and energy balances on multiple units, recycling, bypassing and purging. Application of computers in process analysis and simulation.
CHE 200	Computer Programming for Chemical Engineering	Computer system. Computer hardware. Interaction between hardware and software. Operating system. Programming fundamentals. Variable types including binary, integer, floating point, and arrays. Operators and flow control. File I/O. Graphical User Interface. Applications of numerical and programming for solving chemical engineering problems.
CHE 210	Industrial Organic Chemistry	Overview of organic chemistry fundamentals and different types of organic compounds. Basic products of industrial synthesis such as olefins, oxidation products of ethylene, alcohols, aromatics, and macromolecules. Organic chemistry in various industries including petrochemical industries, chemical industries, and food industries.
CHE 212	Industrial Organic Chemistry Laboratory	Laboratory test of change in physical properties of organic compounds. Determination and Synthesis of some common industrial organic compounds.
CHE 213	Analytic Chemistry and Instruments	Introduction to analytical chemistry. Errors in chemical analysis. Gravimetric methods of analysis, titrimetric methods of analysis and analysis by electrochemistry. Separation and analysis using chromatographic methods. Spectroscopic methods including AA, MS, IR, NMR, UVVIS, and ICP. Surface analysis by SEM and structural analysis using X-ray Diffraction. Analysis of particle size.
CHE 230	Introduction to Transport Phenomena	Control volume for mass balance. Newton's second law of motion. Shear stress in laminar flow. Analysis of a differential fluid element in laminar flow. Differential equations of fluid flow. Boundary layer theory. Basic mechanisms of heat transfer. Fourier's law and general heat conduction equation. One-dimension steady-state conduction through composite wall. Convective heat transfer and the correlations for internal and external flow. Radiation heat transfer. Basic mechanisms for mass transfer. Fick's law and general diffusion equation. Steady state diffusion with and without chemical reaction. Convective mass transfer Correlations for different flow geometry. Interphase mass transfer. Two resistance theory and overall mass transfer coefficients.
CHE 241	Thermodynamics 1	A general balance equation and conserved quantities. Mass balance and energy balance (the first law of thermodynamics). Thermodynamic properties of matter. Applications of the combined mass and energy balances. Entropy balance and the second law of thermodynamics. Reversibility. Helmholtz free energy. Gibbs free energy. Applications of the combined energy and entropy balances. Heat engine. Heat pump. Lost work. Power generation cycles. Refrigeration. Liquefaction processes.
CHE 301	Chemical Process Industries	Introduction to chemical process industries which include raw materials and chemical reactions leading to products. Principles of separation techniques. Process flow sheets of standard symbols. Process utilities such as water supply, energy and wastes. Illustration of process plants such as paper, cement, sugar, petrochemical and food industries. Visits to industrial plants.
CHE 333	Fluid Mechanics and Equipment Design	Fluid statics and applications. Equations of fluid flow. Flow in pipes. Flow measurement. Pump. Agitation. Particulate flow through fluid. Sedimentation. Flow in packed bed and filtration. Fluidization. Centrifuge. Particulate size distribution and size reduction. Cyclone.

Engineering

Code	Name	Course Description and strengths
CHE 334	Heat Transfer and Equipment Design	Fundamentals of heat transfer and heat exchanger, Double pipe heat exchanger . Design of shell and tube heat exchanger. Series & parallel arrangement. Boiling and condensation : theory. Condenser and reboiler. Evaporator. Plate heat exchanger. Plate fin heat exchanger. Drier and Cooling tower.
CHE 335	Mass Transfer and Equipment Design	Introduction . Mass transfer between phas . Equilibrium. Phase rule. Mass transfer equipment. Equilibrium stage operation. Distillation (binary). Multicomponent distillation. Sieve column design. Liquid-liquid extraction. Solid-liquid leaching. Absorption/Stripping. Packed column design. Adsorption. Fixed bed column design.
CHE 343	Chemical Kinetics and Reactor Design	Review of kinetic theories. Definition of the rate of reaction. Types of reactor. Rate constant. Order of reaction. Elementary and nonelementary reactions. Reversible reactions and equilibrium conversion. Stoichiometric relationships in reaction rate. Isothermal reactor design with different type of reactors: batch, plug flow reactor (PFR) and continuous stirred tank reactor (CSTR). Design equations for multiple reactions in each type of reactor. Collection and analysis of rate data with differential and integral method. Method of initial rates. Method of half-lives. Nonisothermal reactor design for continuous-flow reactors at steady state. Application to the CSTR. Adsorption and solid catalyst reaction. Effect of mass transfer in heterogeneous of gas-catalyst reaction.
CHE 391	Applied Statistics and Probability for Chemical Engineering	Fundamentals of statistics and probability as well as their application in practice. Statistical analysis for unplanned and planned data. Statistical techniques such as estimation theory, test of hypothesis and regression. Fundamental concepts of experimental design and analysis. Some practical applications including quality control and reliability.
CHE 452	Chemical Engineering Plant Design	The hierarchical approach to conceptual synthesis and design of chemical processes. Selection of batch/continuous processes. Inputoutput and recycle structure of the process flowsheet. Separation system. Heat exchanger networks. Cost diagram. Preliminary process optimization. Process retrofit. Safety and waste minimization in process design. Process design project of a chemical plant.
CHE 453	Computer- aided Process Design for Chemical Engineer	Application of process simulation software in the basic design of chemical engineering equipment and chemical process design. Process flowsheeting. Basic principle in process design. Application of process simulation software as a tool in chemical process and equipment design, Design of major unit operations in chemical engineering such as reactor, heat exchanger or distillation column. Selection of suitable physical property methods in simulation. Design vs rating of chemical engineering equipment. Equipment sizing. Analytical tools for optimum process design such as sensitivity analysis or optimization procedure.
CHE 461	Process Dynamics and Control	Modeling of processes and control systems . Applications of Laplace Transform and block diagram of the Process. Dynamics of the first and higher order processes. Feedback control. Stability analysis of the control loop. Frequency response and control system designs. Forward and multivariable process control. Introduction to control system instrumentation. Introduction to advanced control system e.g. cascade, override, etc. Introduction to automatic control.
CHE 471	Engineering Materials and Selection	Introduction to materials and selection. Mechanical and physical properties of materials. Mechanical testing. Factor affecting properties and structure-property-processing relationship. Phase diagram, grain structure and deformation of solids. Classification, structure and properties of engineering materials, i.e., metals, ceramics, polymers and composites. Processing and treatment of engineering materials. Construction materials. Fundamental of corrosion theory, types of corrosion and corrosion prevention. Materials selection and uses in engineering design.
CHE 473	Chemical Plant Safety	Principles of chemical plant safety and loss prevention. Principle of safety management. Toxicology and chemical industrial hygiene. Toxic release and dispersion models. Fires and explosions. Design for prevent fire and explosion. Introduction to reliefs and relief sizing. Hazard Identification and risk assessment. Legislation and safety laws.

Engineering

Code	Name	Course Description and strengths
CHE 481	Chemical Engineering Laboratory 1	Chemical Engineering Laboratory 1 is designed to expose the students to the mechanisms and operation of the equipment related to fluid mechanics, size reduction and separations. Students will learn how to analyze the data obtained from the experiments.
CHE 482	Chemical Engineering Laboratory 2	Chemical Engineering Laboratory 2 is designed to expose the students to the mechanisms and operation of the equipment related to heat and mass transfer, chemical kinetics and process control. Students will learn how to analyze the data obtained from the experiments.
CHE 483	Undergraduate Seminar	The undergraduate seminar requires each student to search a research paper in the areas of chemical engineering and to give a presentation in the class under supervision of an advisor. The fundamental knowledge and references are necessary for analysis and understanding of the content of that research. The students will be trained to give presentation and to participate in academic discussion. Submission of report is required after the presentation
CVE 100	Computer Programming for Civil Engineering	Computer concepts, computer components, hardware and software interaction, EDP concepts, program design and development methodology, high-level language programming
CVE 111	Engineering Drawing	Instruments and their uses, applied geometry, lettering, freehand sketches, dimensions notes and tolerance, orthographic projection of points and lines, planes, and solids, pictorial drawings; isometric and oblique drawing and sketching, perspective view, auxiliary view, section view. Practices in drawings. Detail and assembly drawings, details of civil engineering and system facilities drawings, basic computer-aided drawing
CVE 131	Engineering Mechanics 1	System of forces (in plane and 3D) on particles and rigid bodies, equilibrium of rigid bodies, distributed forces, analysis of simple trusses and frames, forces in beams and cables, friction, principle of virtual work and stability.
CVE 221	Surveying	Introduction to surveying work and leveling, error and class in surveying, principles and application of Theodolites, distance and direction measurement, error in surveying and acceptable error, data correction, triangulation; precise determination of azimuth, precise traverse plane coordinate system, precise leveling, topographic survey, map plotting; precise leveling, map projection, UTM coordinates and fundamental of GPS system.
CVE 223	Surveying Practices	Surveying practice will follow theorem in the lecture class. The practices emphasis on, how to get accuracy and precise field data in the required level of the theorem. First half of semester will start with horizontal distance measurement by tape, vertical distance measurement, vertical control traverse, profile leveling and cross-section leveling. The second half of semester starts with angle measurement and their application, vertical angle measurement, horizontal angle measurement, direction method, repetition method and repetition around a point, horizontal control traverse and producing topographic map.
CVE 224	Surveying Project	Surveying project will be the practicing for application. It will start with horizontal control traverse, circular curve, compound circular curve, reverse curve and vertical curve. Then objects along the horizontal control traverse will be collect by Total Station for doing a digital topographic map.
CVE 225	Surveying Field Camp	An eighty hours field camp. Field exercises include: alignment survey and traverse, curve ranging, volume and area of earth work by profile and cross section, route survey and construction survey, contours, triangulation, topographic map. In addition to group field reports on each exercise.
CVE 232	Engineering Mechanics 2	Kinematics and kinetics of particles: rectilinear and curvilinear motions, equation of motion, work and energy, impulse and momentum. Plane motion of rigid body : equation of motion, work and energy, impulse and momentum, introduction to vibration.

Engineering

Code	Name	Course Description and strengths
CVE 233	Mechanics of Materials	Force and stress, stress-strain relationships, ductile and brittle failure, stress in beams, shear force and bending moment diagrams, deflection of beam, torsion, buckling of column. Mohr's circle and combined stress.
CVE 236	Civil Engineering Materials	The fundamental engineering behaviors, properties, and introduction to material testing of various civil engineering materials, behaviors of steel and rebar, properties and characteristic of wood, classification and properties of cement, aggregates and concrete, properties and characteristic of asphalt, the fundamental behavior and properties of additional civil engineering materials
CVE 237	Structural Analysis 1	Introduction to structural analysis: equilibrium of shear forces and moments in beam and frame, analysis of trusses. Deflections of beams and frames by methods of virtual work and strain energy, structures subjected to moving loads, influence lines, analysis of statically indeterminate structures by method of consistent deformation, concept of long span structures
CVE 240	Applied Mathematics for Civil Engineers	Introduction to probability and statistics, matrix, solution of linear and nonlinear equations by numerical methods, solution of partial differential equations by separation of variables and numerical methods.
CVE 281	Fluid Mechanics	Properties of fluid, fluid statics, macroscopic balance of mass, energy and momentum in steady incompressible flow, flow of inviscid fluid, similitude and dimensional analysis, phenomena of real fluid flow, steady incompressible flow in closed conduits, open channel flow, flow measurements.
CVE 311	Engineering Management	Principle of management, productivity improvement, human relation, safety, engineering and sustainable, commercial laws, principles of engineering economics and finance; marketing; project management
CVE 335	Cement and Concrete Materials	History of cement, classification and properties of cements, aggregates, additives and admixtures, concrete mix design and quality control, testing of fresh and harden concrete and ingredients, properties of concrete, creep and shrinkage, guide to durable concrete, pozzolanic materials, introduction to high strength concrete.
CVE 338	Structural Analysis 2	General principles for statically indeterminate structures; degree of statically and kinematically indeterminacy, concepts of force and displacement methods, analysis of indeterminate structure by method of consistent deformation, theorem of Castigliano, three-moment equation, slope-deflection method, moment distribution, column analogy. Influence lines, introduction to matrix analysis of structure, Introduction to plastic analysis, approximate analysis.
CVE 341	Steel and Timber Designs	Study on structural properties of steel and timber, behavior and design of steel and timber structures subjected to axial loads, bending moments, shear forces, and combined actions, design of joint connections of steel and timber structures, design of composite structures, design of built up members, design of plate girder, introduction to Load and Resistance Factor Design (LRFD), design practices, construction technique
CVE 342	Reinforced Concrete Designs	Design concepts of strength design, in comparison with working stress design, properties of concrete and reinforcing steel bars, building codes requirements. Fundamental behavior in thrust, flexure, torsion, shear, bond and interaction among these forces. Design of reinforced concrete structural members by strength and working stress design concepts, design practice and detailing construction technique.
CVE 361	Engineering Geology	Introduction to geology, mineral, rock and engineering rock classification, weathering, mass movement, ground water, structural geology, application of engineering geology in civil engineering works
CVE 362	Soil Mechanics	Soil formation, index properties and classification of soils, compaction, permeability of soils, principle of effective stresses within a soil mass, stress distribution, compressibility of soils, shear strength of soil, earth pressure theory, slope stability bearing capacity.

Engineering

Code	Name	Course Description and strengths
CVE 363	Soil Mechanics Laboratory	Soil boring, soil classification, Atterberg limits, grain size analysis, specific gravity, soil permeability test, compaction, field density, California bearing ratio, shear strength, unconfined compression test, direct shear test, unconsolidated undrained triaxial test, consolidation test.
CVE 364	Foundation Engineering	Subsurface investigation, bearing capacity of foundation, spread and mat foundation design, pile and caisson foundation design, settlement analysis, earth pressure problems and retaining structures. Elementary of soil improvement construction technique.
CVE 371	Highway Engineering	Historical development of highways, department of highway administration. Principles of highway planning, traffic study. Geometric design and operations. Highway finance and economic, subgrade soils, flexible and rigid pavement design, highway materials, construction and maintenance of highways.
CVE 382	Hydraulic Engineering	Application of fluid mechanic principles to study and practice of hydraulic engineering. design and analysis of piping systems, water hammer, turbines and pumps, open channel flow and design, sediment transport in stream, reservoirs, dams, spillways, hydraulic models, drainage.
CVE 385	Hydrology	Hydrologic cycle, watershed and measurements from topographic map, precipitation, streamflow, evaporation transpiration and evapotranspiration, infiltration, groundwater, hydrograph analysis and unit hydrograph theory, synthetic unit hydrograph, flood routing, probability concepts of hydrology, flood frequency analysis
CVE 394	Hydraulic Laboratory	Experimental works including presentation and analysis of results on fluid properties, fluid statics, principle of energy and momentum equation, energy loss in pipe, flow measurement in pipe, flow measurements in open channel, hydraulic jump, hydraulic machines.
CVE 401	Civil Engineering Project Proposal	Preparation of a proposal report showing objectives, concepts, methodology, work schedule and budgetary for a selected project in the field of civil engineering
CVE 402	Civil Engineering Project	Conduct the study of the approved project and present major findings in form of project report.
CVE 414	Construction Estimating and Specifications	Contract (FIDIC), specifications, bidding documents, principle of estimating, construction equipment and materials, profit, Budding and tendering, case study of cost estimating.
CVE 415	Construction Management	Project delivery system, organization and structure of construction industry, site layout, construction progress, scheduling tools: CPM, PERT, line of balance, network compression. project control: construction regulation, safety in construction . Human resource management, quality assurance system.
EEE 100	Electrotechnology (Power)	Magnetic aspects of electrical machines: magnetism, magnetic circuits, magnetic core losses. Voltage induced in a conductor as sinusoidal wave, phasor representation. Active, reactive and apparent power in single and three- phase circuits. Single and three- phase transformers. Direct current and alternating generators: construction, induced voltage, efficiency. Direct current and alternating motors: construction, efficiency, speed control, forward and reverse control, selection, application, maintenance. Electrical measurements. Introduction of semiconductor devices for power electronics.
EEE 102	Electrotechnology 1: (Power)	Basic dc and ac circuit analysis; voltage, current and power; transformers; Introduction to electrical machinery; generators, motors and their uses; concepts of three-phase system; method of power transmission; introduction to some basic electrical instruments

Engineering

Code	Name	Course Description and strengths
EEE 118	Electromechanical Energy Conversion	Review of electromagnetic concepts, Faraday's law, flux cutting rule, force law, Ampere's law and magnetic circuital law, magnetic materials and permanent magnets, flux density, field intensity, permeability, magnetic saturation hysteresis and eddy current loss. Transformer: voltage induces in a coil, polarity of a transformer, equivalent circuit of a practical transformer, measuring transformer impedances, autotransformer, voltage regulation. Direct current generators: construction; field, armature, commutator and brushes, induced voltage separately excited generator, sheet, compound, differential compound generator, load characteristics. Direct current motors: construction; field armature, commutator and brushes, induced voltage separately excited generator, sheet, compound, differential compound generator, load characteristics. Direct current motors: counter emf, mechanical power and torque, armature speed control, field speed control, shunt, series and compound motor, reversing the direction of rotation, three phase Induction motors: construction, rotating field, direction of rotation, starting characteristics of a squirrel – cage motor, wound rotor motor. Three- phase Alternators : construction, stator, rotor. Equivalent circuit of an alternator, alternator under load, synchronization and alternator synchronous motors: starting a synchronous motor, motor under load, mechanical and electrical angles, v-curve. Single-Phase Motor: construction, torque-speed characteristic, principle of operation, capacitor – start motor, capacitor-run motor, shade-pole motor, series motor, hysteresis motor.
EIE 104	Electric Circuit Theory	Circuit elements. Electric circuit theory and analysis methods: Kirchhoff's laws, Node and Mesh Analysis, Thevenin and Norton equivalent circuit, superposition theorem. Analysis of circuits with DC and sinusoidal signals. Phasors, phasor diagram and complex frequency. Power and energy. Three phase circuit analysis. Two port network theory.
EIE 201	Electrical Systems and Safety	Generation, transmission and distribution of electrical energy systems. Selection of wire and cable conductor according to permissible against physical damage temperature rise and voltage drop. Wiring regulations for electrical installation. Electrical installation in industrial and building relate to safety; panel board, metering equipment fuses and circuit balances protection of conductor against overloads, motors and electric shock, grounding systems calculation and design considerations for office building and industrial lighting.
EIE 205	Electronic Engineering Practice	A course of electrical practice designed on basic measurement using multimeter and oscilloscope, Printed Circuit Board (PCB) design, soldering and electronic circuit assembly.
EIE 206	Computer Languages and Applications for Electrical Communication and Electronic Engineering	This course introduces some computer languages and applications that are necessary for studying and working in the field of Electrical Communication and Electronic Engineering, programming languages include C, JAVA, etc., applications that help calculating and analyzing data, simulation, and applications for circuit design and drawing, the use of the internet for data acquisition, etc.
EIE 207	Basic Electrical and Electronic Laboratory	Experiments on fundamental laws and concepts of electrical and electronic engineering, electrical and electronic measurements.
ENE 208	Electrical Engineering Mathematics	Complex numbersystems and complex functions. Matrices: basic matrix operations, eigenvectors and similarity, characteristic equations, diagonalization, canonical forms. Introduction to fields and vector space. Signals and Fourier Transform (FT): continuous and discrete signals, trigonometric Fourier series, complex Fourier series, Fourier integral, signal analysis with FT. Systems and Laplace Transform (LT): Linear system characteristics and representations, initial-state response, zero-state response, zero-input response, transient and steadystate response, impulse response, and system analysis with LTand FT.

Engineering

Code	Name	Course Description and strengths
EIE 210	Electronic Devices and Circuit Design 1	Principle of electron tube operation, basic semiconductor physics and P-N junction theory. Diode and zener diode characteristics and applications; wave shaping circuits, simple DC power supplies and DC voltage multiplier circuit design. Bipolar junction transistor (BJT) and field effect transistor (FET); Operations, characteristics, specifications, and DC biasing techniques. Analysis and design of BJT and FET amplifiers. Operational amplifier (op-amp): characteristics, specifications, and applications
EIE 211	Electronic Devices and Circuit Design 2	Analysis and design of selected electronic circuits for communications and instrumentation by using discrete and IC devices; theory of operations, characteristics and specifications of the devices, frequency response, feedback, oscillator, noise reduction in electronic circuits and printed circuit design techniques.
EIE 221	Principles of Communication Systems	Signal classification (random, periodic and nonperiodic) and transformation: Fourier series and Fourier transform. Analog signal transmission and reception: AM, FM and PM. Analog to digital conversion: pulse code modulation (PCM) including sampling theory and quantization, delta modulation. Baseband digital transmission (binary and multidimensional). Digital transmission via carrier modulation and demodulation: ASK, FSK, PSK. Multiplexing techniques: time division multiplexing (TDM) and frequency division multiplexing (FDM).Source and channel encoding.
EIE 231	Digital Circuits and Logic Design	Number systems and computer arithmetic. Computer codes; Binary code, BCD code, Gray code ASCII code, etc. Boolean algebra and truth table. Analysis and synthesis of combination logic: switching functions, canonical forms, Karnough's map, Quine-McCluskey's method, hazards, multi-level NAND-NOR Circuits. Typical combination logic functions using logic gates. Analysis and synthesis of sequential logic: asynchronous and synchronous sequential circuits. State transition diagrams, state tables, state assignments, minimization of states, flipflop implementations. Typical sequential of logic functions using flip-flops: latch, registers, shift registers counters. Logic design for sequence control applications, typical programmable logic controller functions and programming.
EIE 240	Electrical and Electronic Measurement	Basic concepts of experimental methods regards as measurement: accuracy, precision. Calibrations, standard and treatment of data, principles of operation, characteristics, as well as appropriate range extension for electrostatic, permanent magnet moving-coil, moving iron, electrodynamics, induction etc. AC/DC bridges and potentiometer. Operation principles and characteristics of instruments for power measurement: phase – sequence indicator, power-factor meter, single and poly-phase wattmeter, var meter and watt-hour meter. Basic principle of oscilloscope, introduction to digital instrument: digital voltmeter, digital multimeter and counter.
EIE 301	Probability and Statistics for Engineers	Definition, scope and history of probability, limitation of classical and relative frequency-based definitions, set, field, sample space and events, axiomatic definition of probability, combinatorics, joint and conditional probabilities, independence, total probability, Bayes' rule and applications, definition of random variables, continuous and discrete random variables, cumulative distribution function (cdf), probability mass function, moment, expectation, some special distributions for engineer.
EIE 312	Electronic Engineering Laboratory	Experiments on operations, characteristics and some applications of discrete electronic devices, operational amplifier and
EIE 314	Advanced Electronics Laboratory	A laboratory course to accompany the topic, covered in EIE 211 and EIE 231.
EIE 324	Communication and Telecommunication Laboratory	Experiments on basic communications and telecommunications both systems and circuits: AM and FM modulation/ demodulation, pulse modulation, digital communication, optical communication and microwave communication experiments.

Engineering

Code	Name	Course Description and strengths
EIE 325	Electromagnetic Field and Waves	Three-dimensional vector analysis for engineers. Electrostatic fields: Coulomb's law and electric field intensity, electric flux density, Gauss's law and divergence, energy and potential, conductors, dielectrics and capacitance, Poisson and Laplace equations. Steady magnetic fields: Magnetostatic fields: Biot-Savart's laws, Ampere's circuitry law, curl and Stoke's theorem, magnetic flux density, magnetic forces, materials and inductance. Time-varying fields and Maxwell's equations: Faraday's law, Maxwell's equation, retarded potentials. Uniform plane wave, motion of wave in dielectrics and conductors, skin depth, pointing vector and power of wave, incident and reflection of uniform plane waves, standing wave ratio, transmission line equation and parameters, Smith's chart, waveguide.
EIE 326	Electronic Communication	Element of radio systems. Modulation and demodulation: AM, FM, PM. Noises and their influences in the radio systems.
EIE 334	Microprocessors	Introduction to digital computer system, microprocessor system and general structure, machine and instruction cycle, general bus structure, instruction flow in CPU, data flow in microprocessor, registers and counters used in microprocessor. Selected popular microprocessor architecture and instruction set, addressing mode in microprocessor. Examples of useful subroutines such as binary addition and subtraction, binary multiplication and division, BCD to binary and binary to BCD conversions, microprocessor memory, I/O instruction, I/O interrupt, parallel and serial I/O transfer method, programmable I/O interface.
EIE 335	Digital Circuit and Microprocessor Laboratory	Experiments on digital circuit design, microprocessor programming, microprocessor interfacing, and microprocessorbased systems.
EIE 341	Linear Control Systems	Systems stability. Routh's stability criterion. Dynamic analysis: characteristics function, Root-locus method, frequency response method, Bode plots, Polar plots, Nyquist stability criteria, M-circles, N-circles and Nichols chart. Control system design: lead, lag and lead-lag compensation PID controllers.
ENV 211	Environmental Chemistry	Fundamental principles of environmental, atomic theory, chemical bonding and structure, reactions, thermochemistry, chemical equilibrium, acid-base equilibrium, chemical kinetics, electrochemistry, metals and solid state materials. Chemical and physical characteristics of water and wastewater. Applications of basic principles for water chemistry, atmospheric chemistry, geochemistry, organic chemistry and nuclear
ENV 212	Environmental Chemistry and Microbiology Laboratory	Introduction to methods for determination of water and wastewater characteristics, sample collection and preservation. Skill practices for reliable analysis of water quality and wastewater characteristics. Basic instrumentation applications. Laboratory analysis of water and wastewater characteristics e.g. solids, DO, BOD, COD, nitrogen, phosphorus, etc. Technic for general microbiological analysis, e.g. sterile techniques, microscopic observation, dye staining, measure of cell growth, determination of coliform bacteria, etc. Data interpretation and application of data to environmental engineering practice e.g. water treatment system, neutralisation, chemical coagulation, water softening and activated carbon adsorption.
ENV 213	Surveying for Environmental Engineering	Fundamentals and concepts of engineering survey. Distance and direction measurements, leveling, contour. Error in surveying, acceptable error and data collection. Introduction to the capabilities and techniques of usage of theodolites and develop the basic usage skills, horizontal and vertical angles, triangulation, precise determination of azimuth, precise transverse plane coordinate system, precise leveling, area and volume determinations. Fundamentals and practical skills of positioning, global position systems, computer aided drafting-topographic and pollution map.

Engineering

Code	Name	Course Description and strengths
ENV 214	Environmental Engineering Statistics	Role of statistics in environmental engineering. Environmental sampling, sampling and non-sampling errors, systematic sampling, ratio estimation, choosing sample sizes, data quality objective process. Models for data, statistical, linear regression and generalised linear models, discrete and continuous statistical distribution. Drawing conclusion from data, observational and experimental studies, true and quasiexperiments, design-based and model-based inference, test of significance and confidence interval. Environmental monitoring, purposely chosen monitoring site, designed based on optimisation, detection of changes by analysis of variance and Chi-squared test
ENV 215	Environmental Biology	Basic concepts of cell and its structure. Principles of bacteriology, growth, control and metabolism. Biodegradation of organic compounds and actions of enzymes as related to stabilisation of organic matter. Fundamental concepts related to energy, food chain, productivity and limiting factors. Basic concepts of ecology, stream ecology, biota dymanics in wastewater treatment environment. Roles of microorganisms in biological wastewater treatment systems, aerobic and anaerobic processes, nutrient removal. Biodegradation of xenobiotics in biological treatment systems.
ENV 437	Industrial Safety Management	Occupational health and safety regulation and standards. Nature of accident in industry and need of accident prevention. Risk perception, assessment and management. Prevention and control of occupational accidents. Planning for safety such as plant layout, machine guarding, maintenance and etc. Prevention and control of workplace hazards. Personal protective equipment. Audits and emergency planning. Safety in industry, typically specific hazards. Management of safety programme. Safety training. Case studies in accident analysis
ENV 438	Environmental Law	Background of environmental law. Law and standards; Factory Acts; Hazardous Substance Acts; Environmental Regulation and Decrees; Public Health Acts; Implementation and Enforcement; Related International laws and regulations.
ENV 341	Unit Operation in Environmental Engineering	Principles, designs and applications of physical and chemical unit operations in water and wastewater treatment, mixing, sedimentation, floatation, filtration, equalisation, coagulation and flocculation, chemical precipitation, ion-exchange, absorption and adsorption, aeration and mass transfer opertations.
ENV 442	Water Supply Engineering	Importance of water, nature and sources of water. Water crisis related to environment. Estimating of water demand, requirement and consumption in household, industrial, and public units. Estimating the quantities of natural raw water resources, river, lake and groundwater. Evaluation of surface and groundwater quality and standards. Criteria for selecting water sources for water supply system and standards for water supply. Introduction to water reuse and household water saving equipments. Water treatment processes, aeration, pH adjustment and softening, coagulation and flocculation, sedimentation, filtration and disinfection. Design of distribution system.
ENV 343	Building Sanitation	Fundamentals of building sanitation, laws and regulations. Design of cold water supply system, hot water supply system, waste and vent pipe system, fire protection system, site drainage, wastewater treatment and solid waste management for individual building. Design concepts and options for increased sustainability. Integrated concepts of environmental friendly and energy saving materials.
ENV 381	Air Pollution and Control Engineering	Types and sources of air pollutant. Effects of air pollution on health and environment. Regulations and standards for ambient air quality. Applications of meteorological data for predicting fate and transport of air pollutants in the atmosphere. Global circulation of air pollutants. The use of dispersion models to predict pollutant concentrations in the atmosphere, photochemical reactions of stratospheric ozone, global impacts of acid rain. Emission of pollutants from stationary and mobile sources. Principles of particulate and gaseous pollutant control. Measurements for air pollutants, sampling and analysis method. Laws and regulations.

Engineering

Code	Name	Course Description and strengths
ENV 401	Environmental Engineering Project Proposal	Proposal preparation that clearly states the objectives, idea, methodology, working plan, and budgetary of a selected project in the field of environmental engineering.
ENV 402	Environmental Engineering Project	Conducting of a study of the approved project proposal. Presenting major finding results in form of an oral presentation and submitting a project report to a project committee appointed by department.
ENV 434	Environmental Impact Assessment and Management	Concepts of environmental impact assessment and methodology. Assessments of physical resources; air, water, noise. Assessments of ecological and biological resources. Human use values and quality of life values, culture, socioeconomic. Interrelationship of engineering aspects and environmental parameters. Planning of environmental quality evaluation, monitoring, prevention and mitigation measures. Establishment and organisation of environmental agencies. Industrialisation and Urbanisation management, resource conservation. Management approaches and program implementation. ISO 14000 series, Cleaner Technology.
ENV 345	Environmental Engineering Laboratory	The study of environmental unit operation and process through laboratory experiments including, physical unit operation; sedimentation ,filtration, etc. physico-chemical unit operation; coagulation, adsorption, etc. Biological unit process; activated sludge rotating biological contactor etc.
ENV 344	Biological Unit Processes in Environmental Engineering	Fundamentals of biological unit processes in wastewater treatment. Fundamental of reactor engineering. Kinetics of biochemical systems. Mathematical model of ideal biochemical reactors. Applications of the biological operations including attached and suspended growthsystems e.g. F/M ratio, SRT, SVI etc. Aerobic and anaerobic processes in combined and separated operations.
ENV 445	Wastewater Engineering and Design	Wastewater characteristics. Wastewater flow rates. Design of wastewater collection systems, combined and separated sewers, pump and pumping stations. Wastewater treatment and effluent standards. Design of facilities for wastewater treatment, disinfection, sludge treatment and disposal.
ENV 446	Industrial Water Pollution Control	Production processes and characteristics of wastewater generated by major industries. Concepts and practical guidelines for wastewater minimization and clean technology in production processes. Technologies for industrial wastewater treatment. Control and monitoring of wastewater treatment plant and facilities. Modification and performance improvement of existing wastewater treatment. Laws and regulations with regard to industrial wastewater management and control.
ENV 371	Solid Waste Management	Development of municipal solid waste management system, generation source, composition, quantities and characteristics of municipal solid waste. Handling at source and collection, transfer and transport. Processing and transformation technologies. Source reduction and recycling. Disposal of solid waste and residual matter, incineration, composting and sanitary landfill.
ENV 372	Hazardous Waste Management	Definition, laws and environmental legislations, classification of hazardous wastes, physico-chemical properties, toxicology. Types and characteristics of hazardous waste. Risk assessment and management. Handling and transportation. Fundamentals of treatment and disposal processes, stabilisation, solidification, land disposal, site remediation.
INC 111	Electric Circuit Analysis	Units and scales, charge, current, voltage, power, electrical sources, Ohm's law, Kirchhoff's law, resistors in series and parallel, voltage and current division, nodal analysis, mesh analysis, superposition, Thevenin and Norton equivalent circuits, maximum power transfer, delta-wye conversion, capacitance and inductance combinations, basic RL and RC circuits, RLC circuits, natural and force response from RL,

Engineering

Code	Name	Course Description and strengths
INC 211	Mathematics for Signals and Systems	Introduction to differential and difference equations. Linear constant-coefficient differential and difference equations. Homogeneous and particular solution of linear differential and difference equations with constant coefficients. The Laplace and z-transforms and their applications to solution of systems governed by differential and difference equations. Numerical methods to solve differential equations. Introduction to partial differential equations. Elementary of continuous-time (CT) and discrete-time (DT) signals and systems: classification of signals and system properties. Representation of discrete and continuous linear time invariant (LTI) systems in the time domain with response developed via the convolution sum and the convolution integral.
INC 212	Signals and Systems	Continuous-time Fourier series and Fourier transform. Frequency-domain analysis of signals. The Laplace transform and the transfer function representation. Time-domain and frequency-domain analysis of LTI systems using the transfer function representation. Sampling theorem. Discrete-time signals in the frequency domain: the discrete time Fourier transform (DTFT), the discrete Fourier transform (DFT), and the Fast Fourier Transform (FFT) algorithm. The z-transform and z-transfer function representations. Time-domain and frequency-domain analysis of discrete-time. Elementary design of digital filters. Application examples from communications, control, and signal processing. Computer and demonstrations for signal and system analysis using MATLAB.
INC 221	Basic Electronic for Sensors and Actuators	Basic semiconductor physics and p-n junction theory. Diodes and zener Diodes characteristics and specifications. Wave shaping circuits, simple DC power supply and DC voltage multiplier circuit design. Bipolar Junction Transistor (BJT) and Field Effect Transistor (FET) : operations, characteristics and specifications. DC biasing technique. Analysis and design of BJT and FET amplifiers. Operational amplifiers (opamp) : theory of operation, characteristic and specifications of devices, linear and non-linear applications. Analysis and design of selected electronic circuits such as power supply, filter circuit, and amplifiers. Experiments and application of electronic devices.
INC 241	Programmable Language Control	Introduction to automation, Sensors and actuators, Hardwire control, Structure of PLC: modules and their functionalities: input-output, and power supply. Guidelines for wiring related to PLC, sequence control, programming languages and instruction sets. Laboratories: programming for controlling simulation models: lifts, motor controls, and conveyors. Man-machine Interface.
INC 331	Industrial Process Measurement	Introduction to metrology engineering. Basic concepts of measurement methods. Process instrumentation symbology and diagram static and dynamic characteristics of signals. Probability and statistics, uncertainty analysis. Motion and dimensional measurement. Force, torque and shaft power measurement. Pressure, flow and level measurement. Temperature and heat – flux measurement. Miscellaneous measurements. Reliability, choice and economic of process control system.
INC 341	Embedded Systems and Applications I)	Open-loop and Closed-loop control. Mathematical models. Analysis of transfer functions and state equations. Block diagrams. Signal-flow graph. Linearization. Analysis of steady-state response. Routh-Hurwitz criterion. Frequency-domain analysis: Nyquist's stability, Polar plot, Bode plot, Nichol's chart. Root locus. Compensator design in time and frequency domain. Design with MATLAB.
INC 342	Embedded Systems and Applications II	Process Control terminology and definition referring to ISA standard. Principles of continuous process. Review of control system foundation. Mathematical modeling of process. Theoretical and experimental process characteristics. Process instrumentation symbology and diagram referring to ISA standard. Final control elements. Controller. Converter. Regulator. Theoretical and experimental controller tuning. Control structures: single loop, cascade, feedforward, ratio, selective, override, and multivariable control. Self – tuning controller. Computer simulation of process control systems. Examples of industrial process control such as boiler control, distillation control, steam turbine controls, and water treatment control.

Engineering

Code	Name	Course Description and strengths
INC 352	Industrial Process Measurement	Introduction to process control and instrumentation drawing. Process control and instrumentation equipment. Symbols and abbreviations. P&ID diagram. SAMA diagram. Protection code. Hazardous Code. Color code. Piping specifications and related standard.
INC 354	Factory Automation Design	Experiments on measurement of various process variables, such as temperature, pressure, flow, and level. Instrument calibration. Process control. Digital filters.
INC 361	Digital Factory Technologies	Microprocessor system architecture. Address space for programming. Data and I/O. Data organization. Addressing mode. Assembly language instruction set. Assembly and other high level language programming. Software development tools: editor, assembler, compiler, simulator, and debugger. Microprocessor boards. Input/output devices of microprocessor systems and input/output programming. Principles of interrupt and interrupt programming. Background/foreground programming.
INC 441	Manufacturing Automation Systems	Automation network technology. Distributed control systems. Batch control systems. Supervisory control systems and data acquisition. Automation software. Automation network security. Safety for automation systems. Principals of quality control. Statistic methods in quality control. Control chart. Sampling Principles.
INC 451 Course 2553	Process Control Laboratory	The aim of the course is to provide a hands-on laboratory course and computer-based laboratory experiences to solve industrial-based problems which integrate the system aspects of industrial control systems, including plant modeling, real-time programming, plant-computer interface and control algorithm design. Students will work as part of terms. Oral group presentation, written group report and demonstration are required as part of the project.
INC 457 Course 2553	Control and Instrumentation Engineering ProjectStudy	An individual or a group of students propose a topic related to control and instrumentation engineering, study the topic's feasibility, and design the overall system under the department's supervision.
MEE 224	Thermal Engineering	Definitions and basic concepts. Properties of a pure substance. Heat and work. The first and the second laws of thermodynamics. Entropy. Power and refrigeration cycles. Pump and compressor. Internal combustion engine. Air-conditioning unit.
PRE 290	Industrial Organization and Management	The nature of management. The structure of organization and the industrial system. Quality Control concept. Facilities Planning. Product development and demand forecasting. Material control. Financial Management. Marketing Management
PRE 380	Engineering Economics	Basic concepts in economic analysis. Cost concepts. Time value of money. Measuring the worth of investment comparison of alternatives. Depreciation and income tax consideration. Replacement analysis. Decision making under risk and uncertainly. Break-even analysis.
Pre 394	Industrial Safety	Nature of accident in industrial and need of accident prevention. Planning for safety such as plant layout, machine guarding, maintenance, etc. Safety in specific hazard such as handling of materials, welding, boiler operation, silo, electricity, toxic materials, flammable and explosive materials. Organization and administration of safety program. Safety training and cost study in accidental.
PRE 372	Probability and Statistics for Engineers	Probability Theory; axioms for probability in discrete sample space, counting sample point, independent and dependent event. Bayes' Theorem, Binomial, Poisson, Normal distribution, Joint distribution. Distribution of Sums and Averages, Central Limit Theorem, Covariance and Correlation, Sampling Distribution : F-distribution, estimate and test of hypothesis. Least squares methods.