

Summary of Course Contents For the Faculty of Engineering

1001 General Physics 1

This course introduces the students to the field of gravitational force, fluid statics and dynamics, viscosity, elasticity, heat and temperature, first law of thermodynamics, heat engines, entropy, second law of thermodynamics, gas theory, sound waves, waves in elastic media, experiments: simple pendulum, complex pendulum, liquid viscosity, liquid surface tension, coefficient of heat conduction and specific heat.

1002 Engineering Mathematics 1

This course involves functions, elementary functions, inverse function, polar and parametric coordinates, limits, Newton's method, derivatives (chain rule, derivation of implicit and inverse functions), Maclaurin's and Taylor's expansions, theory of equations, matrices, Gauss elimination method and matrix eigen value problem.

1003 Mechanics 1

The course introduces the vector applications, resultant and moments of a group of forces, equivalent forces, equilibrium, reaction, friction, vector calculus, equilibrium of trusses, frames, and simple machines, experiments: equivalent forces and friction.

1004 Engineering Chemistry

This course is an introduction to the atomic structure and its bearing on chemical and nuclear changes, chemical formulae, percent composition, thermochemistry, chemical equilibrium, the gaseous state, solutes, electrolytic dissociation and ionic equilibrium, chemical kinetics & rate of reactions, sources of elements, chemical industries, building materials and ceramics industries, corrosion, fuels, combustion, experiments: identification of simple salts and identifications of acids.

1011 General Physics 2

This course presents: charge and matter, electric field, Gauss law, electric potential, capacitors and dielectrics, current, resistance and electromotive force, magnetic field, Ampere's law, (Biot-Savart) law, Faraday's law of induction, inductance magnetic properties of matter, physical optics, interference and diffraction, laser physics, electromagnetic induction, properties of magnetic materials, A/C current, electromagnetic waves, experiments: capacitor capacity, magnetic field, Ohm's law, sonic speed.

1012 Engineering Mathematics 2

The course specifies Indefinite integration, Methods of integration, Definite integrals, Applications (arc length, areas, volumes, center of gravity, first order differential equation), Numerical methods of integration, Transformations in plane, partial differentiation, Conic sections, Frames of work and different kinds of systems of coordinates, Straight line in space, Plane in space, Surfaces of the second degree and The general equation of the surfaces of the second degree.

1013 Mechanics 2

This course is the second part in the Mechanics series including: Displacement, velocity and acceleration in Cartesian, curvilinear, tangential, polar and cylindrical coordinates, Relative motion, Projectiles, Motion under centrifugal forces, Work, Energy, Momentum, Impulse and collision, Experiments: Momentum conservation, Projectiles and Free falling,

1022 Engineering Mathematics 3

This course is the third part of the Mathematics series involving: Vectors, matrix, differential equations, Eigen,value problems, linear systems of equations, complex calculus, Fourier ranks, Fourier transformation, Fourier analysis, Laplace transformation and z,transformation.

1027 Social Research and Networking

This course presents the following topics: Social competence in the interaction with students and colleagues, Good realization as well as further development of the existing concepts, Tolerance and openness for various styles, Process oriented and open for change and development, High technical skills and Practical experience in the specific scope.

1028 Engineering Art

This course explains in depth the: Basic definitions of: art, science, technology, and engineering, Impact of historical inventions on civilization, Historical great art works nationally and internationally, Art in human development, Innovative art works in history, History between technology engineering, technology, and art, History between technology and science, The impact of engineering, technology, and art development on environment, society, and economy, Examples of some typical art and engineering activities.

1065 Operational Statistics

This course is an Introduction to statistics in engineering, Descriptive statistics sampling distribution, estimation and sampling intervals, hypothesis testing, Introduction to models and methods of operations research in solving engineering and management problems. Simplex methods, duality, sensitivity analysis, transportation, assignment and transshipment methods, network flow methods, network flow models and integer programming.

1066 **Community Service Training**

Though technically not a requirement, the community service a Faculty requirement training with specific credit hours requisite for graduation. Community service allows students to reflect on the difference they are making in society. They gain a greater understanding of their roles in the community, as well as the impact of their contributions towards those in need of service. As community service outlets vary, engaged students are exposed to many different kinds of people, environments, and situations.

1101 **Communications and IT**

The course introduces the vector applications, resultant and moments of a group of forces, equivalent forces, equilibrium, reaction, friction, vector calculus, equilibrium of trusses, frames, and simple machines, experiments: equivalent forces and friction.

1121 **Computer Programing**

This course prepares students to the: Basic concepts of programming: problem analysis, developing the program flow charts, structured programming based on common programming languages, forming the program, repetition, branching, matrix, processes and function, registers, pointers, pointers, connected lists, self repletion, the return. Concept of object-oriented programming. User graphic interface and Practicing on some programming

1122 **Electrical Engineering**

This course is an Introduction to the electrical engineering concept. Principles of Electric Circuits: electrical quantities and Kirchhoff's law. Introduction to DC Circuit Analysis: Ohm's Law, series/parallel connections, node analysis, loop analysis, voltage and current dividers. Techniques of DC analysis: Thevenin/Norton equivalent circuits, power calculations. Inductance and Capacitance circuits. Sinusoidal signals properties. Phasor Analysis of RLC Circuits. Introduction to digital signals: logic gates, Flip-Flops, Boolean algebra.

1133 **Thermodaynamics**

This course introduce the students to A scope of thermodynamics, Definitions and concepts, Energy (sources and forms), Properties of pure substances, Ideal gases , The first law of thermodynamics, Reversible and irreversible processes, The second law of thermodynamics, Entropy, Air standard cycles and vapor power cycles.

1134 **Modelling and Simulation**

This course is an Introduction to the simulations concept, Review of numerical methods: numerical differentiation and integration, numerical block diagrams, System identification, display of mechanical and electrical components, modeling of subsystems, Introduction to simulate boundary and Eigen, value problems.

1142 Electronic Circuits

This course involves: Controlled sources, graphical network analysis, semiconductor circuits and operation points, low level signal descriptions and equivalent circuits, basic circuits with FETs and bipolar transistors, logic components, frequency attenuation circuits and Bode diagram, operation amplifier circuits, AD and DA converters, power amplifier and heat sinks.

1143 Sensors and Measurements

This course is an Introduction to international system of units. Sensors and transducers definitions. Classification of sensors and transducers: sensor characteristics, analog and digital sensors, inductive transducers, Piezo electric transducers, optical sensors, pressure sensors, chemical and biochemical sensors, micro mechanical sensors. Strain gauges. Introduction to measurements: analog and digital measurements, instrument classification, characteristics of measuring instruments. Accuracy and errors of measuring instruments. Electrical measurements and Mechanical measurements

1148 Training in Industry 1

This training is an introduction for the industry needs and fields. Present the main component of the product and production process. Know the production line and the basics of the quality control.

1152 Microprocessor systems

This course is an Introduction to the theory and design of microprocessors and microcontrollers microprocessors architectures: memory types and memory organization, basic memory interfacing signals, microprocessors families. Microprocessors programming and program interfacing. The assembly language and software development of microprocessors. Microprocessor buses. Designing memory subsystems. Basic I/O and interfacing signals. Designing interface to basic I/O devices. Cases of analog interfacing

1153 Heat and Mass transfer

This course is designed to introduce the students to Introduces the fundamentals of heat and mass transfer, Free and forced heat convection, Conduction heat transfer: steady state and transient conduction analysis, Convection heat transfer: internal flow, external flow, Radiation heat transfer: Introduction to heat exchangers, Introduction to mass transfer.

1155 Renewable Energy Applications

This course is designed with Surveying of energy resources, Collecting typical data of any site, analyze, charting, and presents a report, Typical economical study of replacing traditional energy resources by renewable energy system (such as solar water heater to replace electrical water heater, PV for lighting, „etc.), prepare a presentation for discussion to explain the issues of replacement, Writing a full report with conclusions.

1163 Solar Thermal Energy Systems

This course is an introduction to Basics of thermal solar conversion systems: solar thermal conversion coating, coating technology, Solar thermal collectors: flat plate collectors, concentrating collectors, evacuated collector, Analytical design of various types of solar collectors: performance of solar collectors, Solar active and passive heating: solar cooling, solar desalination, solar drying, Industrial Application, Solar thermal power plant, economics of solar processes, Modeling of solar thermal systems, components and simulation, Design and sizing of solar heating systems.

1168 Training in Industry 2

This training advanced level of industry marketing analysis which enable the student to build his own ideas and create its feasibility studies.

1171 Aerodynamics

This course gives an introduction to: aero-dynamical forces and moments. Dimensional analysis: Buckingham theorem. Dynamic similarity. Types of flow. Aero dynamical coefficients. Continuity and momentum integral equations. Applications to air force drag calculation. Energy equation. Path lines and streamlines. Angular velocity and vorticity. Stream function and velocity potential. Relation between stream function and potential. Incompressible motions of an ideal fluid. Euler equation and Bernoulli theorem. Wind tunnel for low velocity, Velocity conditions for motions of an ideal fluid, Equation for velocity potential and Laplace equation.

1172 Power Electronics

This course includes Energy used and thermal energy balance of different types of buildings, The potential for energy savings, Passive solar techniques for heating the buildings, Solar cooling: the roll of building design and orientation, Natural solar adopted in buildings: day lighting, natural ventilation, Application of solar energy in buildings: active elements, integration of active elements with solar thermal and PV system applications.

1175 Energy Auditing and Efficiency

This course gives the general philosophy and need of energy audit and management: definition, general principles and types of energy audit, energy management approach understanding, energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel and energy substitution as well as energy audit instruments.

1182 Electromechanical Energy

This course involves: Introduction to the electromechanical energy conversion. A.C induction machines: induction motors, induction generators. A.C synchronous machines: synchronous generators(alternators), synchronous motors, synchronous condensers. D.C machines: d.c motors, d.c servo motors. Stepper motors: types of stepper motors, control of the stepper motors and Introduction to electrical machines control.

1183 **Solar Energy in Buildings**

Energy used and thermal energy balance of different types of buildings, The potential for energy savings, Passive solar techniques for heating the buildings, Solar cooling: the roll of building design and orientation, Natural solar adopted in buildings: day lighting, natural ventilation, Application of solar energy in buildings: active elements, integration of active elements with solar thermal and PV system applications.

1187 **Energy B Sc Project 1**

The aim is to prepare the target of the project. Literature review for the previous work and the project idea, plan and methodology to be presented.

1188 **Training in Industry 3**

This training enables student to participate in the control room and involve them in the errors or problems may happen and how to overcome it.

1192 **Electrical Power Systems**

This course is an Introduction to power system elements, Types of power plants: steam power plants, gas turbines, combined gas turbine/steam turbine, internal combustion engine, Introduction to nuclear power plants, Economic of power plants, Environmental effects of power stations, Introduction to high and low voltage distribution systems, The 4, terminal network, Underground cables: construction and performance

1193 **PV Technology**

This course is offered as part of Solar Photovoltaic conversion: basic principle of solar PV conversion, types of solar cells, fabrication of solar PV cells, modules and panels, Solar PV systems: systems configurations, integrated solar PV system components, characteristics, applications, hybrid SPV system, Solar PV system designing: block diagram of general PV system, load estimation, selection of inverter, battery sizing, array sizing, wiring for solar PV system, Case studies.

1194 **Bioenergy Conversion**

This course is an introduction to Concept of Bio-energy: photosynthesis process, biofuels, biomass resources bio-based chemicals and materials, Thermo-chemical Conversion: pyrolysis, combustion, gasification, liquefaction, Biochemical Conversion: aerobic and anaerobic conversion, fermentation etc., Biofuels: importance, production and applications.

1197 **Energy B Sc Project 2**

This project is a description for the work analysis, software used and the conclusion for the implementation of the project and its enviromental benefits.

1198 **Electric Engineering**

Basic laws of electric circuits, Methods of solution of DC circuits, Network theorems, Harmonic excitations, Complex algebra in AC circuits, Methods of solutions and theorems for circuits with sinusoidal excitations, Coupled circuits, Resonance, Four terminal networks, Poly phase circuits, Circuits with periodic non-sinusoidal excitations.

1211 **Production Engineering**

This course is an Introduction to industrial safety, Engineering materials (types and properties), Metallic alloys, Casting processes, Forming processes (forging, rolling, drawing, extrusion and spinning), Joining processes (riveting, welding and adhesive bonding), Cutting processes, Machining processes (turning, shaping, drilling, milling and grinding), Measuring tools (vernier calipers and micrometers), Introduction to production costs and management systems and Practical practicing.

1242 **Basics of Mechatronics**

This course is an Introduction to the definition of Mechatronics typical examples of mechatronic systems. Introduction to actuators and sensors: electromechanical actuators, electromagnetic actuators, piezoelectric actuators, pneumatic actuators, analysis of actuator dynamics using field, circuit methods, sensors used in mechatronics applications. Introduction to data transfer in mechatronic systems: analogue, digital, and D/A conversion. Introduction to the design of mechatronics systems.

1243 **Fluid mechanics**

This course is an introduction to Basic principles of fluid engineering: definition, dimensions and units, Main properties of the fluid. Fundamentals of fluid Statics, Formulation of fluid engineering mechanics: kinematics of flow, control volume approach, continuity, momentum, energy and Bernoulli's equations. Introduction to dimensional flow analysis. Introduction to compressible flow. Analysis of immersed bodies in different fluids. Applications.

1244 **Control Systems 1**

The course introduces the basic terms of control theory, system properties, modeling, specification methods for the time and frequency domain, transfer functions, frequency response, Nyquist-criteria, stability, leadership and disturbance behaviour, control circuit design, design of standard controllers, Ziegler-Nichols adjustment procedures, computer aided design of control circuits, basics of rapid control prototyping

1248 **Training in Industry 1**

This training develops ability the system problem and interfere to solve. Basic understanding of software and simulation program.

1252 Applied Mechatronics

This course is designed to, Mechatronic systems exemplar: elements and applications, Design aspects of mechatronic systems, Economical aspects of product design and Renewable energy systems.

1254 Applied Control Technology

This course includes: Means of representing motion sequence and switching conditions in pneumatic sequence control systems. Basic control circuits: motion control of single and double acting cylinders, direct and indirect, operational Amplifiers (Op Amps) and their basic circuits control, impulse and holding control circuits, automatic return circuits. Analog and digital signals in control systems. Digital to Analog and Analog to Digital Converters, DAC and ADC. Data Acquisition Systems. Introduction to relay and digital control systems: logical sensors and logical actuators.

1262 Logic Design

This course is an introduction to: Basic logic circuits, combinational circuits, sequential circuits, Basic hardware components: flip, flops, logic gates, Classical design methods for digital logic, Digital hardware: Complex Programmable Logic Devices (CPLD), Application Specific Integrated Circuits (ASIC), Field Programmable Gate Arrays (FPGA), Basics of structured hardware design, Introduction in hardware description languages (HDL), synthesis and simulation and Realisation and test, HDL examples (VHDL, Verilog).

1263 Microcontrollers and PLC

This course includes Review of the electrical circuits and semiconductors devices, Digital logic and arithmetic, Basic architecture of microcontrollers and PLC, Programming languages of microcontrollers and PLC, Digital signals and control through the input/output communications, Interrupt programming and services, Digital/analog actuation control, Applications.

1264 Mechatronics System design

This course is an Introduction to the definition of Mechatronics typical examples of mechatronic systems. Introduction to actuators and sensors: electromechanical actuators, electromagnetic actuators, piezoelectric actuators, pneumatic actuators, analysis of actuator dynamics using field, circuit methods, sensors used in mechatronics applications. Introduction to data transfer in mechatronic systems: analogue, digital, and D/A conversion. Introduction to the design of mechatronics systems.

1268 Training in Industry 2

This training is to upgrade the production design, solve the problem and be able to control for the production line and reprogrammed it.

1271 Computer Aided Design/ CAM

This course is an Introduction to CAD/ CAM and the industrial application, Techniques in developing a concept from inception to final product, Approaches to develop 3D models (Curves, Surfaces, Solids, Feature and Parametric, Assembly), Cutting process and its variables Part programming for CNC Machines: Manufacturing Surface Contouring, turning, Tool path generation for roughing, finishing and drilling cycles, Machine tool simulation & NC programming, Case studies and applications

1274 Control Systems 2

This course deals with Review classical control: Characteristics of closed, loop systems, PID control and system stability, Frequency response methods for control system analysis, Compensators, lead, lag and lead, lag compensators, State Variables and the State Space Description of Dynamic systems: Eigenvalues and Eigenvectors, Controllability and observability for Linear Systems, State feedback: Pole placement, Introduction to digital control, Case study and applications

1284 Robotics

This course includes Industrial robots, robot systems, kinematics of robots, control of robots, robot programming languages, applications of robots in the manufacturing operation and material handling.

1285 Digital Control

This course deals with Review of continuous control. Introduction to digital control theories and systems. The approach of discrete systems analysis: linear difference equations models, the discrete transfer function, discrete models of sampling-based data, signal analysis and dynamic response, frequency response, the approach of the z, transform.

Transform techniques and state, space methods used in design control systems. Sample rate selection: the sampling theorem's limit, time response and smoothness, errors analysis.

1287 Mechatronics B SC Project 1

In this course the student selects one of the initiated projects with the academic support of the academic staff. By the end of the proposed project, the student has to fulfill satisfactory the following: Understanding of both theoretical and practical aspects of the problem in his project, Ability to search for references and to survey modern technology, Ability to suggest solution for the problem and apply it on the project and Ability to illustrate the main work of the project in an acceptable form.

1288 Training in Industry of mechatronics 3

This training enhances ability to understand the fundamental of the machines and motions. Understand the mish between mechanical system and electrical system. Know the concept of each system

1291 **Machines and Vibrations**

This course presents Fundamental of machine kinematics. Principals of motions, Motion and inertia, Mechanisms, Velocity and acceleration in machines, Cams, Gears relations, Analog computing mechanisms, Machine dynamics: Inertia forces, Flywheel, Gyroscopic effects, Speed systems (governors). Introduction to mechanical vibration: single and multiple degrees of freedom systems, free and forced vibrations, vibration measurements

1292 **Automation Technology**

This course presents, Architecture of Industrial Automation Systems levels of automation, Review of programmable logic controllers PLC Architecture, PLC Programming, Selection of PLC, Installation and Operations, Industrial applications of PLCs, Hierarchical Control System, Concept of Computer aided process control system: Direct digital control, Distributed control systems DCS, Distributed Control System: Overview and Architecture, Operation of Workstations, Subsystems (Data collection subsystem, Process computing subsystem), Telemetry System, Methods of Telemetry, Fiber optic Transmission & Pneumatic transmission, Supervisory Control and data Acquisition SCADA: Basic Components of SCADA, Functions of Components, Types Communications (IEEE standards and protocols), Industrial Computers, Comparison between DCS and SCADA, Applications of SCADA

12940 **Actuators and Drives**

This course is offered as part of reviewing power electronics usage, electric drives, electrical models, dimensioning, pneumatic and hydraulic actors, sensors and circuits, control design, circuit diagram design, thermal initiated actors, piezo actors, micro actors

1294 **Robotics Control Systems**

The course gives a review of Kinematics: velocity and acceleration of rigid bodies ,Dynamics, Euler Lagrange Equations of Motion ,Properties of Robot Dynamics ,Independent Joint Control ,Actuator Dynamics ,Classical approaches for robot control, feedback loops ,PI/PID Control - Drive-Train Dynamics, Feed-forward Control ,Position and force control ,Introduction to virtual reality methods, action planning, multi-robot coordination

1297 **Mechatronics B Sc Project 2**

The project is to communicate and work effectively in the multidisciplinary environment. Successfully identifying the problems, designing integrating and optimizing solution with central to modern mechatronics practice will be the target.

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1299 Wind Energy Technology

This course includes Wind resources: physics and estimation, Wind turbine technology and grid integration, Wind turbine testing, Standards and Certification, Wind diesel hybrid systems, Implementation of wind power projects: planning including design of wind farms, installation and commissioning, post installation activities including operation and maintenance, Financing opportunities, Wind turbine technology, Cost benefit analysis of wind energy projects, Field visits to: some wind turbine manufacturing plants.

1331 Structure Analysis

This course is an introduction to different types of structures: definition of structures stability, Computational analysis of internal forces: in beams, in frames, in planes, Introduction to stress and strain analysis in different bodies and beams, Bending moments and shear diagrams.

1332 Engineering Systems

This course introduce the students to: Origin and evolution of systems engineering, Standards in systems engineering, Mapping the systems engineering process onto system life cycles, Systems engineering process, Systems engineering technical management, Risk management, Organizational practices, Functional analysis/allocation, Systems engineering analyses, Integration, verification, and validation, Human systems engineering and Methods for functional analysis and allocation with key supporting methodologies,

1333 Hydrology 1

This course is offered as part of the Hydrology series: Applied Hydrogeology, Soil Moisture and Groundwater: Porosity of Earth Materials, Specific Yield, Forces Acting on Groundwater, Aquifer Characteristics, Homogeneity and Isotropy,, Principles of Groundwater Flow: Mechanical Energy, Hydraulic Head, Force Potential and Hydraulic Head, Equations of Groundwater Steady Flow in a Confined Aquifer, Steady Flow in an Unconfined Aquifer, Effect of Hydro-geologic Boundaries, Pumping-Test Design, Hydrologic cycle, Evaluation of available water resources, Water quality and Rate of different water uses.

1344 Basics of Water Engineering

This course prepares the students for Water Engineering with: Introduction to building materials, Soil mechanics, Engineering of water supply and sanitation, Water management and quality, Introduction to reinforced concrete structures, Water for Energy production, Groundwater engineering, Transport planning and transport engineering, Processes of water/waste water treatment and Introduction to hydraulic engineering.

1345 **Water Resources Engineering**

This course aims to enhance understanding of the multiple, multi-scale interconnections of water management. It considers multidisciplinary approaches to water management problems where examples and case studies will be used to illustrate the issues surrounding water management, drawing on perspectives from both the natural and social sciences as well as policy considerations. Topics covered will include: various uses of water; water supply issues; and water demand issues, water quality monitoring and management, integrated water resources management, flood risk management, dams and water regulation, climate changes and exposure to, and use of computer-based tools in solving water resources management problems.

1348 **Training in Field 1**

This training is constructed application for structure and infra structure work. Diagnose the consequences of bad contraction and its affects.

1351 **Reinforced Concrete 1**

This construction course includes: Principles of reinforced concrete and the material used, Mechanical properties of the hardened concrete and the reinforcing steel, Design methods: Load factor and material factor, Characteristics of the reinforced concrete sections under different states and conditions and Typical design applications.

1353 **Hydrology 2**

This course is a part of the Hydrology curricula involving: The hydrologic processes and analysis related to water quantity, statistical hydrology which includes the theory of extreme value and frequency analysis, Hydraulic Jump, Weirs, Discharge measurements, Steady gradually varied flow, Water surface profiles, Computation of water surface profiles length, Flow control, Laboratory experiments, Hydrologic design, flood routing, hydrologic models, basic probability and statistics, frequency analysis, hydrologic statistics, simple linear regression and ground water hydrology.

1354 **Water Engineering Project**

This course is designed to involve students in: Population studies, Surveying of water recourses, Collecting typical data of any site, analyse, charting, and presents a report, Typical economical study of water resource problems including natural, underground, waste, etc, Surveying the technology used in water engineering industry, Preparing a full report regularly, and presentation for discussion to explain the issues of the subject.

1355 Hydraulics

This course includes: Continuity equation, momentum equation, energy equation, momentum function, critical condition, uniform condition, gradually varied flow, water surface profile, discharge problem, direct integration method, graphical method, rapidly varied flow, flow measurements, Fluid Properties: Units, Dimensions, The Continuum, Viscosity, Specific: Volume, Weight, Gravity, Heat, Pressure, Compressibility, Vapor pressure, Surface tension, Fluid Statistics, Pressure at a Point, Pressure Measuring Devices, Forces on Plane and curved Surfaces, Ideal-Fluid Flow, Flow classification, The Continuity, and Requirements for Ideal Flow, Buoyant Force, Stability of floating and submerged bodies, Horizontal, vertical and radial acceleration, and Forced vortex, Pipe analysis, Design and Optimal design, Water hammer in pipes: Hydraulic machines: Types of turbines, Types of pumps, Pump characteristics and performance and Operation of pumps.

1361 Material Science

This course includes: Bonding in materials: the crystal structure of metals and ceramics, mechanical properties of metals and alloys, introduction to defects in materials. Introduction to microstructural evolution: basic principles of phase diagrams and phase transformations, the effect of microstructure on the mechanical properties of metals and alloys. Mechanical properties: testing methods, strengthening mechanisms, and fracture mechanics.

1362 Reinforced Concrete & Steel Structure

This course is presents the principles of reinforced concrete and the material used and the basics of steel structures including the following: mechanical properties of the hardened concrete and the reinforcing steel, design methods: load factor and material factor with typical design applications. It also introduces application of ultimate and elastic design procedures to continuous beams and frames, composite members, statically indeterminate trusses and arches.

1364 Plant Water Relationship in Soil

This course introduces the Soil-Plant-Water relationships, Irrigation water requirements, Irrigation efficiency and calculating periods between irrigation, Low rates and irrigation time, Different types of field water application : Surface irrigation methods, Sprinkler and drip irrigation, Subsurface irrigation, Planning Design, Management, Operation and maintenance for different methods and Canal lining.

1368 Training in Field 2

This training is for a complete understating of the construction procedures, problems and solution. Understating of the water plants requirements . Complete the irrigation design system. Simulate the modern methods of building.

1374 Sanitary Engineering

This course is the Introductory level of the analysis of pollution transport, treatment, containment, remediation, Process engineering approach to contaminant removal methods, including use of appropriate computer software, Sources and characteristics of water and wastewater, water quality criteria and monitoring, principles and application of physical, chemical, and biological processes for water purification and wastewater treatment, Design and operation of treatment systems to meet water quality and effluent standards, Water pollution; Water supply engineering; Water purification works; Water distribution system and storage tanks; Sanitary drainage; Sewerage system; Wastewater treatment Works.

1375 Irrigation and Drainage Systems

This course is an overview for the irrigation structures for control and distribution of water on the canals and field levels, Crossing works, Navigation works and water lifting devices, Planning and design of fish ponds, Introduction to the drainage, Types, Factors influencing selection and design, Design of open, Subsurface and vertical drains, Disposal of drainage water and drainage water reuse and precautions, Seepage under structures, Scour downstream of structures, Weirs: types and functions, stepped and flow measuring weirs, accuracy and submergence ratios, Structural design, Barrages: structural design, design and operation of gates, Development of the irrigation system in Egypt, the environmental impacts of irrigation and drainage projects in general, Basis and procedures for designing control structures.

1376 Soil Mechanics

This course deals with studying the mechanical behaviour of engineering soils and basic properties when they are sheared or compressed or when water flows through them, Topics include the nature of soil, states of stress and strain in soil, Tunnelling for piping system.

1381 Reinforced Concrete 2

This course is an advanced approach on the design methods of reinforced concrete associated with design applications. It covers: development of reinforcement; continuity in building frames, design of one-way slabs and two-way slabs considering flexure, shear, anchorage, curtailment and serviceability requirements, behavior and design of short and slender columns under combined bending and axial loads, design of t-beams, deflection calculations, design of footings, design of cantilevered retaining walls. Analysis of frames and shear wall structures; analysis of sections in bending and/or axial loads; yield line and strip methods for slabs; behavior and design of reinforced concrete beams.

1384 Waste Water Treatment

This course familiarizes students with appropriate design criteria and the design process for water and wastewater treatment in industry, This includes Introduction to wastewater treatment plant design, operation of waste water treatment in industry, design flow rates, design mass loadings, process selection, and elements of conceptual process design, Physical unit operations - flow measurement, flow equalization and mixing.

1385 Irrigation Management

This course provides the appropriate science and technology background required managing water effectively and efficiently, the common themes are the scientific assessment of plant water requirements and water resources, and the design and management of efficient irrigation systems, water management; water source engineering; group projects: irrigation design; irrigation management and evaluation.

1387 Water B Sc Project 1

This project is the basic study and preparation for a water graduation project. Literature review , work place and methodolgy are to be presented.

1388 Training in Field 3

This training could be multi disciplinary. Each sector has own problem and practical field. Soil, construction , water treatment or other could give the student introduction of the civil work. He could diagnose and find out benefits of each system.

1391 Steel Design

This course is a construction application of ultimate and elastic design procedures to continuous beams and frames, composite members, statically indeterminate trusses and arches, Projects and special topics focus attention to the basis and limitations of codes and specifications for steel structures.

1394 Desalination

This innovative course deals with: Global and local water resources, water quality and analysis, technical and economic analysis of major desalination processes such as multi-stage flash, reverse osmosis, multiple-effect distillation and electro dialysis.

1395 Hydroinformatics

This course is designed to enhance students capabilities in: Technology of construction of hydro informatics systems, Use of a series of hydro informatics tools, including Graphical User Interface builders, Geographic Information Systems, Code Builders, Databases, Data Analysis and Data Modeling Packages and Communication Tools.

1397 Water B Sc Project-2

Managing a project with all its intergrated approach . Ability to understand the nature of the project condition and adapt his design and construction work accordingly.

1398 Groundwater Flow

This course is will look at the advances in: Development and application of models for fluid flow and contaminant transport in porous media, Derivation of governing equations, analytical and numerical solutions, and application to the movement of groundwater and transport of contaminants at an actual field site.

1411 Engineering Drawing

This course introduces the students to: Engineering graphics, techniques and skills, Geometric constructions and tangency, Rules and conventions of lines, lettering and dimensioning, Orthographic projection of engineering bodies, Frames of reference, Orthogonal projection, Representation of a straight lines, Representation of a plan, Position problems. Derivation of views of a given body, Derivation of a missing view from two given views, Drawing of steel sections, Auxiliary projection, Circle, Helix, Helical surfaces, Polyhedra, Sphere, Cone, Cylinder, Plane section of surfaces and, Intersection of two surfaces of revolution.

1420 Green Design Studio 1

The main theme of this studio is "Passive Design & Green Architecture". It explores the green design as a thinking process through the medium of small scale projects. The development and analysis architectural propositions concerning personal space within the context of large community, dealing with the issues of public and private spaces which taking into consideration the climatic conditions.

1421 Theories of Architecture

This course provides an outline of the history and theories of architecture from the prehistoric to the 19th century: Ancient Egyptian, Mesopotamian, Classic Architecture (Greek, Roman), Early Christian, Byzantine, Gothic and Islamic architecture. It analyzes buildings as the products of culture and in relation to the special aspects of architectural design and the basic philosophy of design as a vehicle to transmit the values and attainments of cultures through the ages. The philosophical and conceptual framework of Ancient Egyptian and Islamic Architecture will be emphasized through analysis of different case studies.

The course offers as well an introduction to design principles, quality, comfort and safety, living and sleeping zones, private and public spaces, services and utilities, horizontal and vertical circulation.

1422 Green Building Construction 1

This course is considered the basic for architectural students, to recognize and understand building systems and techniques, materials and components. The course explains building construction components such as floors, roofs, walls, doors, windows, stairs, and pre-fabricated building with their method of construction and finishing. This course offers an introduction to the analysis and design of structural systems for load distribution & design methods; slabs, columns, beams, arches, vaults, domes and others structural elements. The structural behaviour of individual elements and simple structural systems is studied and analyzed. Moreover, the course introduces soil properties; soil classification, field compaction, compressibility, bearing capacity & footings. The student should understand the design of structural elements and systems of masonry, reinforced concrete, steel construction of low rise buildings. The course includes theoretical lessons, drawing lessons and site visits.

1423 Computer Aided Design

The course introduces the use of digital tools in architectural design and visual communication in the area of 2D drawings, 3 DD modelling, image editing and page layout.

This course aims mainly to provide the students with understanding of the features, limitations and considerations associated with the operation of a computer-aided design/drafting (CAD) system. CAD course work gives each student the opportunity to develop an aspect of a current studio project. In addition to the assistance available through the workshops, students are supervised on a one – to – one basis for CAD course work.

1430 Green Design Studio 2

This green design studio continues the previous theme of "Passive Design & Green Architecture". It expands the scope of green architectural issues, programmatic complexity and physical context introduced in the previous semester. This studio will emphasise on the building envelope and its relation to the comfort inside architectural spaces in the different climatic zones of Egypt. It focuses on functional relations, circulation patterns, quantitative and qualitative study of architectural spaces.

1431 Architecture and Cities in History

This course is a global-oriented survey of the history and theories of urbanism and cities, from the prehistoric to the 19th century. It treats buildings and environment, including cities, in the context of the cultural and civilizational history. Being global, it aims to give the student perspective on the larger pushes and pulls that influence architecture, cities and its meanings, whether these are economic, political, religious or climatic. This course provides an outline of the history and theory of modern architecture: Pre-international school, art nouveau, organic architecture, international architecture in Germany, France, and Holland, technological progress of post and world war, post modernism, deconstruction, green and environmental architecture movements and schools, cosmic architecture and future trends. It introduces the traditional and contemporary design methods, definition of designing and the role of design in the changing perspective of the society. It also proposes a particular perspective of the city, combining the strength of architectural history and theory with the study of the city, to provide an understanding of the relation between architecture and urban design and its dynamic conditions.

1432 Green Building Construction 2

Continuation of Green Building Construction (1) with emphasis on the Green construction systems and techniques such as stabilized earth block, rammed earth, sand bags, and green prefab composite sandwich panels. The lecture course is supplemented by small-scale design and builds projects involving the design of simple structure using prescribed materials to carry certain given loads with a prescribed configuration. The structure are designed by groups, built and then subjected to load test. The course includes theoretical lessons, drawing lessons and site visits.

1433

3D Modeling

The course offers students with the skills to use Photoshop create eye catching designs, experience in 3D modelling techniques. The students gain skills in 3D form-making. This course work gives each student the opportunity to develop an aspect of a current studio project. In addition to the assistance available through the workshops, students are supervised on a one – to – one basis for Photoshop and 3D modelling course work.

1440

Green Design Studio 3

The main theme of this studio is "Passive Design & Green Technology in Architecture". It introduces various sustainable design technologies and explores main principles of energy efficient, passive, zero and plus energy designs; distribution, and utilization of energy in passive strategies; implementations of day lighting, natural ventilation, heating and cooling strategies in specific contexts. It emphasise the importance of the setting, environmental and socio-cultural factors in the design process.

1441

Theories of Green Architecture

The course introduce the green design principles and analysis of different public and community facilities and building types such as educational, cultural, health, recreational, commercial, administrative and touristic buildings. It offers as well an introduction to the life style issues in contemporary architecture in terms of specific building types. Topics include building evacuation, compartmentalization, fire fighting and suppression, evaluation and testing of new building materials and systems, systems control and managements. Special emphasis is on such building types as multi-use, high density, schools, hospitals, and other institutional categories.

In addition, the course will introduce the various green building rating systems, indexes and different categories with main focus on the well known rating systems such as LEED, BREAM and Estidama and its comparison with the Egyptian Green Pyramid Rating System.

1442

Green Building Construction 3

This course addresses advanced structures, exterior envelopes, and contemporary production technologies. It continues the exploration of structural elements and systems, expanding to include more complex determinate, indeterminate, long-span, and high-rise systems.

The course offers an introduction to: 1) exterior and interior finishing materials and specifications, 2) common exterior and interior finishing materials and specifications, 3) basic carpentry mathematics related to exterior and interior finishing, 4) insulation installation and specifications, 5) drywall installation and finishing, 6) interior doors and running trim installation.

Moreover, the course offers an introduction to the construction process, construction contract types, modifications and substitution procedures, contractual relationships rights, duties, and responsibilities, contract provisions, relationship and organization of construction documents, use of construction documents, organizational formats, and Interpreting construction documents.

The lecture course is supplemented by medium-scale design and builds projects involving the design of green construction basis on special problems in building construction and the building life cycle. The projects are designed by groups, built and then subjected to tests. The course includes theoretical lessons, drawing lessons and site visits.

1443

Green Design Software

The course offers students with the skills to use Green design software on both two levels building and urban such as Ecotect and ENVI-met. Ecotect's classes describe the difference between an analytical space model and a geometric model, import a gbXML file into Ecotect, import a DXF file into Ecotect, discover where to find weather files, review the differences between various weather data sources, load weather data into different analysis tools, convert weather data exported from Autodesk Green Building Studio into Ecotect Analysis software, analyze the impacts of the massing and layout of a building on energy consumption, identify the form constraints imposed by Right-To-Light issues with the adjacent development, discuss the key factors in determining human comfort, use the psychrometric tools, perform a daylight analysis, change materials assignments in Ecotect and Green Building Studio.

Through ENVI-met course, student will have the skills for appraisal of urban spaces master plans, physical planning of built environment morphology and help to draw a picture about the role of materials and vegetation on pedestrian perception and comfort. The students will be able to carry out a simulation of flow around and between buildings and the exchange processes of heat and vapour at the ground surface and at walls. This course work gives students the opportunity to develop their current studio project. In addition to the assistance available through the workshops, students are supervised on a one – to – one basis for Ecotect & ENVI-met course work.

1444 Sustainable Urban Design 1

The sustainable urban design studio discusses in detail the approaches and principles of urban design approaches and levels of analysis, design of sustainable urban environment in natural and man-made context and the development of the students' skills to apply various urban design approaches in Egyptian settings. It will study the contemporary problems and process of urban design and physical planning. It will include an analysis of the design and organization of space, activities, movements, and interaction networks of the urban physical environment, urban tissue, visual perception, urban form, analysis and design of urban spaces and paths, images and mental maps, community development: socio-economic and environmental aspects.

1445 Enviromental Control 1

The course introduces the environmental systems, ecosystems, the relation between man & nature. It promotes for environmental control from the aspect of man with nature rather than man controlling nature. It emphasise on behaviour and performance of a building and its components as a climatic modifier to provide human comfort and energy savings through climate and architectural design, factors of climate, human comfort criteria and ranges, thermal design criteria and its principles, the architectural and mechanical methods of natural ventilation, cooling, heating, lighting and acoustics. It gives the knowledge of heat loss and head gain, U-Value, thermal resistance, and the basics of building physics calculations. The students should have the knowledge of environmental control building strategies.

1448 Architecture in Field 1

This course takes places mainly at construction sites where the students have the opportunity to see various stages of the construction process of a building starting from excavation, foundation, skelton, masonry, installation and finishing for different type of construction.

1450 Green Design Studio 4

This green design studio continues the previous theme of "Passive Design & Green Architecture". It expands the scope of green technology in architecture. It introduce the student to the architectural design of complex, multi functional buildings comprising wide span elements, realizing architectural design for multi functional buildings and groups of buildings taking into consideration internal and external space studies. It focuses on the ways in which the nature of the structural system, method of construction and building materials affect and inform the process of design and the final form. By means of experimental physical models, students should be able to select green building materials and methods of appropriate physical/formal characteristics to create an iconic building.

1454

Sustainable Urban Design 2

The sustainable urban design studio introduces skill needed to build within contemporary cities and the new approaches of urban design. It examines the green city concept and its approaches, principles, processes, rating systems, indexes and methods. It will explore as well the urban quality of life. Students analyze an existing environment and propose solutions that fosters relationships between its intended activities and the larger urban territory and redefines the urban environment. The course also introduces skills needed to build within a landscape establishing continuities between the built and natural world. Students learn to build appropriately through analysis of landscape and climate for a chosen site and conceptualize design decisions through drawings and models

1455

Environmental Control 2

This course is considered as a continuation of Environmental Control (1) with explanation and application of Egyptian Energy Efficiency Building Code for residential and commercial buildings in the different climatic zone of Egypt.

The environmental control building systems and strategies will be presented for different case studies from past to modern dealing specifically with building heating, cooling, lighting, water, waste, and acoustics. This course places an emphasis on the integration of spatial, visual, and environmental performance aspects of buildings. Innovative environmental solutions will be illustrated throughout the course.

A small project will be examined focusing on building control and diagnostics. It concentrates on the empirical evaluation of the built environment (building components and systems, interactions between building, occupants and environmental conditions) in view of multiple performance criteria.

1460

Green Design Studio 5

The main theme of this studio is "Live projects: From green building to sustainable city". This senior level (Green Design Studio 5) allows students to expand on functional, structural and environmental issues developed in earlier design studios within a socio/cultural and contextual frame of reference. Live projects should provide the opportunity to develop appropriate conceptual and theoretical agendas and to challenge preconceptions related to the notion of building typology and analysis of real-life situations requiring program research. Students should learn how to develop the design program from users' requirements and behavioural patterns, and how to plan for socio/cultural, environmental and economical sustainability.

1464 Sustainable Urban Design 3

The sustainable urban design studio emphasises on ecological urban design strategies, including critiques of recent practices, proposals for future design strategies, and measures of performance with main focus on housing and residential neighbourhoods. The students will work in groups in the studio projects focus on topics related to sustainable urban design practice. It will emphasize a multi-scalar approach to the urban site (local, neighbourhood and metropolitan scales), and view urban design as an interdisciplinary practice that negotiates between diverse actors in the urban dynamic. The course advocates working from the “ground up” rather than adopting a “top down” master-planning approach. It takes advantage of architecture’s traditional concerns for site specificity, spatial experience, construction logics, economics of organization, morphology and physical form, while also engaging realms of knowledge associated with other disciplines.

1465 Working Drawings 1

This course is a continuation of Working Drawings (1). The students will prepare a complete integrated working drawings and design for a given (pre- designed) project, including wide spans, general conditions and specification, quantity surveying, analysis of bids, cost analysis, shop and as built drawings.

1466 Technical Installation

This course builds on the fundamentals of surveying and building construction; and also the environmental control systems dealing specifically with building heating, cooling, lighting, water, waste, and acoustics. This course places an emphasis on the integration of spatial, visual, and environmental performance aspects of buildings. Innovative environmental solutions will be illustrated throughout the course. The course deals with subjects like thermal comfort criteria and indices, storages and insulation, air conditioning and ventilation, heating and cooling loads, central distribution and package units, mechanical ventilation, heating appliances and systems, artificial efficient lighting mechanisms, light source and luminance design, nature of acoustics, sound analysis, acoustic design and noise control, electrical supply and distribution and fire fighting. It offers as well introduction to the hydraulic services: water supply, water recycling, sewerage, sewer and rain water drainage, sanitary installation and eco sanitation.

1468 Architecture in Field 2

This course takes places mainly at construction sites where the students have the opportunity to see various stages of the construction process of a building starting from excavation, foundation, skelton, masonry, installation and finishing for different type of construction.

1470

Green Design Studio 6

This green design studio continues the previous theme of "Live projects: From green building to sustainable city". It introduces the analytical study of green design alternatives for public and residential projects, to reach architectural and urban forms and configuration together with the criteria of green building rating systems in all different categories of sustainable site, energy, water, material, indoor environmental quality, management and innovation..

The Green Design Studios have a dynamic approach to learning which offers an enormous potential for design creativity and innovation in green architecture including a strong studio culture which provides a community of learning, crossing the traditional boundaries of teacher and learner.

Most of the projects in the Green Design studios in this program will be real projects that tackling the concept and pillars of sustainable development in Egypt. These projects will be practical and realistic from the aspects of program, requirements and regulations.

On site and hands on projects will be main parts of teaching to greatly increase the level of understanding through the site experience.

1473

Geographic Information Systems

This course aims mainly to provide the students with the fundamentals surveying and of the (GIS), image processing and interpretation of remote sensing data, classical and spatial statistics topology and Spatial Operations, Projections, Scale and Coordinate Systems, Thematic Mapping, GIS Analysis, Cartography, Network modelling & surface modelling, remote Sensing and Raster modelling, the business Case for GIS, Practical Applications of GIS, Data Storage Strategies, Enterprise GIS, GIS Application for sustainable Development.

1475

Working Drawing 2

The course aims to prepare the students to understand construction documents, communicate construction information with sketches and to create drawings and specifications. These modules consist of: 1) reading and interpreting construction documents, 2) hand drawn sketches, from existing mock-ups, from existing drawings, from assigned details of existing campus buildings, from only given material and connection parameters, 3) CAD drawings of plans, elevations, wall sections, building sections, architectural and construction details, fenestration details, portioning, schedules. The students will prepare a complete working drawings and design for a given (preliminary design) project.

1481 Low Cost Green Housing

The course provides an overview on housing development in the country, introduces major policies, reforms, legislation and movements. It compares traditional and contemporary housing, examines mass housing problems with emphasis on housing for low and middle income groups, and outlines the problems of housing in our local context with reference to others in the developing world. It examines dynamic relationship among key actors: beneficiaries, government, and funder.

The main focus of this course will be the green housing solutions from design, new construction techniques and policies point of view. It emphasises on cost recovery, affordability, replicability, user selection, and project administration. Extensive case examples provide basis for comparisons in the developing world.

1487 Architecture B Sc Project 1

The student selects one of the initiated projects with the academic support of the academic staff, by the end of the proposed project, the student has to fulfill satisfactory the following, Understanding of both theoretical and practical aspects of the problem in his project ,Ability to search for references and to survey modern technology ,Ability to suggest solution for the problem and apply it on the project ,Ability to illustrate the main work of the project in an acceptable form.

1488 Architecture in Field 3

This course takes places mainly at construction sites where the students have the opportunity to see various stages of the construction process of a building starting from excavation, foundation, skeleton, masonry, installation and finishing for different type of construction.

1492 Environmental Psychology

This course will explore the nature and nuances of interrelationships between people and their surroundings by examining an array of critical issues in environmental psychology. Here, the environment is broadly defined to include not only our physical surroundings (both natural and built) but also the larger, socio-cultural and political milieu in which people live. Starting with foundational theories on place attachment and place identity, the course will cover classic issues that help inform urban ecological design, such as relationships to nature, landscape preferences, personal space, territoriality, and crowding. Moreover, it addresses the emerging importance of the politics of place, as manifest through the appearance, meanings and uses of urban public space. It will be concluded with a closer look at design processes and the ways which they can be enriched through an environmental psychology perspective. In addressing these issues, the course will provide a critical framework for understanding the role of the environment and architecture in our everyday lives and how they affect our behaviors. Through reading, discussion, in-class activities and assignments, students will develop the ability to analyze environment-and-behavior issues and understand the ways that green architect exert influence on the environment. It will help them to create more effective and appropriate environments that address human

1493 Sustainable Landscape Design

This course introduces the principles of sustainable LANDSCAPE architecture. It aims to establish knowledge and skills about Biosphere and eco- system, organization of various outdoor spaces according to Egyptian climatic zones, site investigation, functional concepts, preliminary design and master planning. It covers both hardscape and softscape components of landscape projects. In addition, it should apply the basics of environmental design and building technologies in the field of landscape design. application of the principles and techniques of landscape design through design exercises of site planning and area development for a chosen sites in different climatic zones.

This course introduces the principles of sustainable LANDSCAPE architecture. It aims to establish knowledge and skills about Biosphere and eco- system, organization of various outdoor spaces according to Egyptian climatic zones, site investigation, functional concepts, preliminary design and master planning. It covers both hardscape and softscape components of landscape projects. In addition, it should apply the basics of environmental design and building technologies in the field of landscape design. Application of the principles and techniques of landscape design through design exercises of site planning and area development for a chosen sites in different climatic zones.

1494 Islamic Architecture

The course aims to study the local & regional Islamic architecture in depth and it introduces the characters and elements of Islamic architecture in Egypt, Iraq, Iran, India, North Africa, Spain, Yemen and South – East Asia with main focus on the concepts of environmental responsive design.

By studying the socio-historical contexts within which Islamic architecture developed, students will discuss major themes, chronological developments, and regional variations in both religious and secular architecture. Additionally, by examining cross-cultural communications, students will explore pivotal interactions between Islamic and non-Islamic architectural traditions.

1495 Building Economics

This course aims to introduce the principles and tools of building economics, project analysis and evaluation, economic feasibility (definitions, elements, principles....etc), design economics/ cost, contracting execution , life cycle cost, building performance/ operation efficiency, cost and operation qualitative and quantitative project analysis, evaluation criteria, pre-execution and post occupancy project evaluation, new directives.

1496 Ethics and Legislation

The course introduces ethical issues in engineering practice, conflicts between business demands and professional ideals, social and ethical responsibilities of technologists, codes of professional ethics, .work ethics and professional ethics. It emphasise the legal rule: mandatory and complementary, sources of law, application of Laws, holders of right; Natural persons, Juristic persons, theory of obligation; definition, forms, sources of obligations, Unified Building Law, Labour Law, Safety and Vocational Laws, the contract; parties, formation, validity, effect, interpretation, responsibilities, dissolution, and compensation of damage.

1497 Architecture B Sc Project 2

Continuation of B Sc Project IA dissertation on the project is submitted on which the student is examined orally

1498 Energy Simulation Software

The course aims to introduce Energy simulation program such as the DesignBuilder software which is an interface to EnergyPlus and a state-of-the-art software tool for checking building energy, carbon, lighting and comfort performance. It offers the students with needed skills to use this software and rapidly compare the function and performance of building designs and deliver results on time and on budget, building energy consumption and CO2 emissions output suitable for building energy code compliance checking, calculate the internal temperatures and comfort output using the full range of EnergyPlus comfort indicators, Integrate daylighting simulation to allow checking for optimal use of natural light, modelling lighting control systems, calculate air flows within naturally ventilated buildings using EnergyPlus AirFlowNetwork, use different heating and cooling types.

Total Number of Courses: 124