



الجامعة الألمانية الأردنية
German Jordanian University

German Jordanian University

**School of Sustainable Systems and
Engineering (SSSE)**

Electrical and Energy Department

Bachelor of Science in Energy

Engineering

Vision

The vision of the Energy Engineering Department is to be internationally recognized for excellence in education, pioneering research and in full compliance with international standards of quality assurance.

Mission Statement

The mission of the Energy Engineering Department is to provide high quality education in the multidisciplinary field of Energy Engineering; materialize partnerships with industry by addressing the everchanging market needs for future engineers, while providing students with the knowledge and experience for future professional leadership.

Educational Objectives

- **Objective 1: Technical Knowledge**

Provide the technical knowledge of energy engineering from both the electrical and mechanical engineering aspects and principles, along with the required supporting knowledge of mathematics, science and computing fundamentals. Emphasis is made on the specialty areas of Renewable Energy and Electrical Power.

- **Objective 2: Technical Skills**

Develop the skills needed to perform and design experimental projects. Develop the ability to formulate problems and projects, and to plan a solution process deploying diverse technical knowledge and skills.

- **Objective 3: Communications Skills**

Develop the ability to organize and present information effectively whether orally, written or visual.

- **Objective 4: Preparation for Further Study**

Provide sufficient breadth and depth for successful subsequent graduate study and lifelong learning.

- **Objective 5: Preparation for the Profession**

Provide an appreciation for the broad spectrum of issues arising in professional practice, including teamwork, leadership, safety, ethics, service, economics, and professional organizations.

Program Learning Outcomes

- a) An ability to apply knowledge of mathematics, science and engineering.
- b) An ability to design and conduct experiments, as well as to analyze and interpret data.
- c) An ability to design a system, component, or process to meet desired needs.
- d) An ability to function in teams.
- e) An ability to identify, formulate and solve engineering problems.
- f) An understanding of professional and ethical responsibility.
- g) An ability to communicate effectively.
- h) A broad education necessary to understand the impact of electrical engineering solutions in a global and societal context.
- i) A recognition of the need for an ability to engage in life-long learning.
- j) A knowledge of contemporary issues.
- k) An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

These constitute the ABET a-k criteria.

ENERGY ENGINEERING CURRICULUM

Course Coding and Numbering

- A five to seven-character code is used to designate courses as in the following table:

Department	Level/Year	Field	Sequence
Two to Four Letters	X (Number)	Y (Number)	Z (Number)

- Therefore, courses in Energy Engineering will have numbers of the form ENE XYZ.
- The Department codes for the course in this study plan:

Code	Department
ARB	Arabic
CHEM	Chemistry
CS	Computer Science
ECE	Electrical and Computer Engineering
ENE	Energy Engineering
ENGL	English
GERL	German

Code	Department
IE	Industrial Engineering
MATH	Mathematics
ME	Mechatronics Engineering
MECH	Mechanical and Maintenance Engineering
MILS	Military Science
NE	National Education
PHYS	Physics

- The middle digit for Energy Engineering courses denotes the course field as in the following table:

Middle Digit	Specialization
0	General Engineering
1	Electrical Engineering
2	Mechanical Engineering
3	Energy Engineering
4	Electrical Power
9	Engineering Training, Graduation Projects, Special Topics

Specializations

The Department of Energy Engineering awards the Bachelor of Science (B.Sc.) degree after successfully passing 180 credit hours. The B.Sc. degree in Energy Engineering can be obtained in one of two specializations: Renewable Energy Engineering and Electrical Power Engineering.

Degree Requirements

Classification	Credit hours
1. University requirements	27
2. School requirements	43
3. Department Requirement	98
4. Study in Germany	12
Total Credit hours	180

List of Courses

Framework for the B.Sc. Degree for the Energy Engineering Department

1. University Requirements (27 Credit Hours)

a. Compulsory (21 Credit Hours)

Course ID	Course Title	Credit Hours	Lecture	Lab	Pre-requisite
ARB 099	Arabic 099 *	0	0	3	-
ARB 100	Arabic *	3	3	0	-
ENGL 098	English I *	0	0	3	-
ENGL 099	English II *	0	0	3	ENGL 098
ENGL 101	English III *	1	0	3	ENGL 099
ENGL 102	English IV *	1	0	3	ENGL 101
ENGL 201	English V *	2	0	3	ENGL 102
ENGL 202	English VI *	2	0	3	ENGL 201
GERL 101	German I *	3	0	9	-
GERL 102	German II	3	0	9	GERL 101
NE 101	National Education (in Arabic)	3	3	0	ARB 099
	National Education (in English)	3	3	0	ENGL 101
MILS 100	Military Sciences	3	3	0	Only for Jordanian
Total=		21			

*Student's score on placement test will decide the course level to start from

b. University Electives (6 Credit Hours)

Course ID	Course Title	Credit Hours	Lecture	Lab	Pre-requisite
DES 101	Arts' Appreciation (in Arabic)	3	3	0	ARB 099
	Arts' Appreciation (in English)	3	3	0	ENGL 101
PE 101	Sports and health	3	3	0	ARB 099
EI 101	Leadership and Emotional Intelligence	3	3	0	ENGL 101
IC 101	Intercultural Communication	3	3	0	ENGL 101
BE 302 OR SE 301	Business Entrepreneurship OR Social Entrepreneurship and Enterprises	3 OR 3	3	0	ENGL 101
SFTS 101	Soft Skills	3	3	0	ENGL 101

2. School Requirements (43 Credit Hours)

Course ID	Course Title	Credit Hours	Lecture	Lab	Pre-requisite Or Co-requisite(#)
CHEM 103	General Chemistry I	3	3	0	-
CHEM 106	General Chemistry lab	1	0	3	#CHEM 103
CS 116	Computing fundamentals	3	3	0	#CS 1160
CS 1160	Computing fundamentals lab	1	0	3	#CS 116
ENE 437	Economics of Natural Resources Engineering	3	3	0	MATH 203
GERL 201	German III	3	0	9	GERL 102
GERL 202	German IV	3	0	9	GERL 201
IE 0121	Probability and Statistics	3	3	0	MATH 101
IE 0141	Engineering Workshop	1	1	0	-
MATH 101	Calculus I	3	3	0	-
MATH 102	Calculus II	3	3	0	MATH 101
MATH 203	Applied Mathematics for Engineers	3	3	0	MATH 102
MATH 205	Differential equations	3	3	0	#MATH 203
ME 0111	Computer Aided Engineering Drawing	3	3	0	CS 116
PHYS 103	Physics I	3	3	0	-
PHYS 104	Physics II	3	3	0	PHYS 103 #PHYS 106
PHYS 106	General Physics Lab	1	0	3	#PHYS 104
Total=		43			

3. Department Requirement & Study in Germany (110 Credit Hours)

a. Compulsory (86 Credit Hours)

Course ID	Course Title	Credit Hours	Lecture	Lab	Pre-requisite Or Co-requisite(#)
GERL 301	German V	3	0	9	GERL 202
GERL 302	German VI	3	0	9	GERL 301
ENE 211	Fundamentals of Electrical Circuits	3	3	0	PHYS 104 #MATH 203
ENE 212	Electrical Circuits and Systems Analysis	3	3	0	ENE 211
ENE 213	Electrical Circuits Lab	1	0	3	ENE 211
ENE 214	Electronics	3	3	0	ENE 211
ENE 215	Electronics Lab	1	0	3	ENE 213, ENE 214
ECE 333	Electromagnetics	3	3	0	MATH 203
MECH 0221	Thermodynamics	3	3	0	MATH 102
MECH 0222	Fluid Mechanics	3	3	0	MATH 102, PHYS 103
ENE 301	Introduction to Digital Systems and Microcontrollers	3	2	2	#ENE 214
ENE 302	Statistical and Numerical Methods for Energy Engineers	3	3	0	MATH 205
ENE 311	Electrical Machines	3	3	0	ENE 212, ECE 333
ENE 312	Power Electronics	3	3	0	ENE 212, ENE 214
ENE 313	Electrical Machines Lab	1	0	3	ENE 311
ENE 314	Power Electronics Lab	1	0	3	ENE 312
ENE 316	Introduction to Communication Systems for Energy Engineers	3	3	0	ENE 212
ENE 321	Heat Transfer	3	3	0	MECH 0221, MECH 0222, MATH 205
ENE 322	Introduction to Energy Systems	3	3	0	ENE 321
ENE 323	Fluid Mechanics Lab	1	0	3	MECH 0222
ENE 399	Field Training	0	-	-	University Regulations
ME 0346	Instrumentations and Measurements	2	2	3	ENE 211, MATH 205, #ME 0347
ME 0347	Instrumentation and Measurements Lab	1	0	3	#ME 0346
ENE 401	Energy Systems Simulation Lab	1	0	3	ENE 312, ENE 322, #ENE 444

ENE 432	Power Plant Engineering	3	3	0	ENE 322
ENE 434	PV Technology I	3	3	0	ENE 212, ENE 214, ENE 322
ENE 441	Power Systems	3	3	0	ENE 302, ENE 311
ENE 442	Power Systems Lab	1	0	3	ENE 441
ENE 443	Electrical Power Generation, Transmission & Distribution	3	3	0	ENE 441
ENE 444	Modeling and Control of Energy Systems	3	3	0	MATH 205, ENE 311
ENE 499	International Internship	12	0	36	ENE 399
ENE 598	Graduation Project I	1	0	3	ENE 499
ENE 599	Graduation Project II	3	0	9	ENE 598
Total=		86			

b. Compulsory Renewable Energy Track (12 Credit Hours)

Course ID	Course Title	Credit Hours	Lecture	Lab	Pre-requisite Or Co-requisite(#)
ENE 433	Solar Energy I	3	3	0	ENE 322
ENE 435	Wind Energy Technology	3	3	0	ENE 311, ENE 312, ENE 322
ENE 436	Renewable Energy lab	1	0	3	ENE 322
ENE 438	Energy lab	1	0	3	ENE 322
ENE 537	Energy Efficiency, management and laws	3	3	0	ENE 322
ENE 538	Energy Efficiency Lab	1	0	3	ENE 434, ENE 436
Total=		12			

c. Compulsory Electrical Power Track (12 Credit Hours)

Course ID	Course Title	Credit Hours	Lecture	Lab	Pre-requisite Or Co-requisite(#)
ENE 411	Electric Drives	3	3	0	ENE 312, ENE 444
ENE 412	Electric Drives Lab	1	0	3	ENE 411
ENE 541	Power System Analysis	3	3	0	ENE 441
ENE 542	Power System Protection	3	3	0	#ENE 541
ENE 543	Power System Protection Lab	1	0	3	#ENE 542
ENE 544	Power Systems Integrations Lab	1	0	3	ENE 301, ENE 314, ENE 442
Total=		12			

d. Elective Renewable Energy Track (12 Credit Hours)

Course ID	Course Title	Credit Hours	Lecture	Lab	Pre-requisite Or Co-requisite(#)
ENE 521	Thermal and Hydrodynamic equipment	3	3	0	ENE 321
ENE 524	Geothermal and Hydropower systems	3	3	0	ENE 322
ENE 525	Fuel Cell & Hydrogen Production Technology	3	3	0	ENE 322
ENE 526	Bio-Energy Technology	3	3	0	ENE 322
ENE 527	Techno-economics of energy systems	3	3	0	ENE 322
ENE 528	Applied Refrigeration	3	3	0	ENE 321
ENE 530	Modeling and Simulation	3	3	0	ENE 401
ENE 531	Environmental and Energy Engineering	3	3	0	ENE 322
ENE 532	Advanced Renewable Energy Systems	3	3	0	ENE 322
ENE 533	Solar Energy II	3	3	0	ENE 433, ENE 434
ENE 534	Low Carbon Buildings	3	3	0	ENE 321
ENE 535	PV Technology II	3	3	0	ENE 434
ENE 536	Thermal Energy Storage	3	3	0	ENE 322
ENE 539	Energy Audit	3	3	0	ENE 434, ENE 441
ENE 522	Heating Ventilating and Air Conditioning (HVAC)	3	3	0	ENE 321
ENE 523	Turbomachinery	3	3	0	MECH 0222
ENE 595-A	Special Topics	1	1	0	-
ENE 595-B	Special Topics	2	2	0	-
ENE 595-C	Special Topics	3	3	0	-

e. Elective Electrical Power Track (12 Credit Hours)

Course ID	Course Title	Credit Hours	Lecture	Lab	Pre-requisite Or Co-requisite(#)
ENE 511	Power Semiconductor Devices	3	3	0	ENE 312
ENE 512	Special Electrical Machines	3	3	0	ENE 311
ENE 513	Electronic Circuit Design	3	3	0	ENE 214, ENE 301
ENE 514	Mixed Signal Test Engineering	3	3	0	ENE 301, ME 0346
ENE 515	Electrochemical Energy Storage	3	3	0	ENE 322
ENE 516	Smart-Grids	3	3	0	ENE 312, ENE 316, ENE 441
ENE 517	Switched Mode Power Supplies	3	3	0	ENE 312
ENE 545	Power System Quality	3	3		ENE 441
ENE 546	High Voltage Engineering	3	3	0	ENE 441
ENE 547	Power Electronic Applications in Power Systems	3	3	0	ENE 312
ENE 548	Power System Stability	3	3	0	ENE 541
ENE 549	Power System Reliability	3	3	0	ENE 541
ENE 595-A	Special Topics	1	1	0	-
ENE 595-B	Special Topics	2	2	0	-
ENE 595-C	Special Topics	3	3	0	-

CATALOGUE DESCRIPTION OF ENERGY ENGINEERING COURSES

ENE 211 Fundamentals of Electrical Circuits (3CH) (Pre-requisite: PHYS 104; Co-requisite: MATH203)
SI units, voltage and current; Ohm's and Kirchhoff's Laws, circuits with dependent sources; simple resistive circuits: series, parallel and delta to wye; techniques of circuit analysis: nodal and mesh analyses, source transformation, Thevenin and Norton equivalents; amplifiers; inductance, capacitance and mutual inductance; natural and step responses of RL and RC circuits; natural and step response of series and parallel RLC circuits; sinusoidal steady state analysis.

ENE 212 Electrical Circuits and Systems Analysis (3CH) (Pre-requisite: ENE 211)
average, reactive and complex power, power measurements; polyphase circuits, mutual inductances; Laplace Transforms, frequency response, impulse and step response, passive and active filters, Fourier series and the Fourier Transform, two-port circuits.

ENE 213 Electrical Circuits Lab (1CH) (Pre-requisite: ENE 211)
resistive circuits, potentiometers, superposition, Thevenin theorem, maximum power transfer, RLC current and voltage characteristics, frequency response of RL and RC circuits, series and parallel resonant circuits.

ENE 214 Electronics (3CH) (Pre-requisite: ENE 211)
semiconductor material, covalent bond model, doping, PN junction, the diode (IV-characteristics, reverse behavior, zero and forward biasing, ideal and real diode), Zener diode, Schottky diode, diode circuit analysis, half-wave rectifier circuits, full-wave rectifier circuits, dynamic switching behavior of the diode, diode applications, Bipolar Junction Transistor (BJT) (NPN and PNP transistors, i-v characteristics, DC analysis (Q-point) & AC small-signal analysis), Field- Effect Transistors (FETs) (Junction FET (JFET) transistor, Metal-Oxide Semiconductor FET (MOSFET) transistor) and i-v characteristics of FET transistors, DC analysis (Q-point) & AC small-signal analysis. Ideal Operational Amplifiers (Op-amps) and their applications.

ENE 215 Electronics Lab (1CH) (Pre-requisite: ENE213, ENE 214)
diode circuits, DC and AC characteristics of BJT and FET amplifiers, operational amplifiers and applications, Lab project.

ENE 301 Introduction to Digital System and Microcontrollers (3CH) (Co-requisite: ENE 214)
Combinational and sequential circuit design using Boolean algebra and Karnaugh Maps, digital circuit design using random logic gates, interfacing circuits, interrupt signals and routines, analog and digital peripherals programming: digital I/Os, timers, ADC, Low power modes of operation and application of microcontrollers.

ENE 302 Statistical and Numerical Methods for Energy Engineers (3CH) (Pre-requisite: MATH205)
introduction to MatLab, error analysis, interpolation, extrapolation, curve-fitting, solving systems of linear equations, root-finding for non-linear equations, numerical differentiation and integration, numerical solutions to ordinary differential equations.

ENE 311 Electrical Machines (3CH) (Pre-requisite: ENE 212, ECE 333)

transformers: performance characteristics, three-phase connections, autotransformers; DC machines: performance equations, generator and motor characteristics, starting and speed control of motors; single phase induction motors; three-phase induction motors: operation, performance calculations, starting and speed control; synchronous machines: generator and motor operation; small synchronous motors; universal motors;

ENE 312 Power Electronics (3CH) (Pre-requisite: ENE 212, ENE 214)

power semiconductor devices: types, drive circuits, protection circuits, and power loss calculation; AC-DC converters: uncontrolled and fully-controlled single-phase and three-phase rectifiers, half-controlled rectifiers; DC-DC converters: step-down, step-up, and step-down/up converters; DC-AC converters: single-phase and three-phase inverters; AC-AC converters: cycloconverters, ac voltage controllers.

ENE 313 Electrical Machines Lab (1CH) (Pre-requisite: ENE 311)

transformers, three-phase transformer methods of connection, DC motors, DC generators, three-phase induction motors, single-phase induction motors, three-phase synchronous generator and motor, AC series motor, lab project.

ENE 314 Power Electronics Lab (1CH) (Pre-requisite: ENE 312)

uncontrolled single phase half wave rectifier, uncontrolled single phase full wave rectifier, uncontrolled three phase rectifiers, controlled single phase rectifiers, controlled three phase rectifiers, DC chopper (buck converter), DC chopper (boost converter), DC chopper (buck boost converter), single phase AC inverter, lab project.

ENE 316 Introduction to Communication Systems for Energy Engineers (Pre-requisite: ENE 212)

equivalent low-pass models, AM modulation and demodulation, FM modulation and demodulation, sampling and quantization, pulse width modulation, tuned circuits and crystals, light emitting diodes, optoelectronics integrated circuits.

ENE 321 Heat Transfer (3CH) (Pre-requisite: MECH 0221, MECH 0222, MATH205)

conduction: steady state (1D and 2-D), transient state; convection: forced (external and internal), natural convection and heat exchangers; radiation: black body radiation, radiative properties, shape factors and gray surfaces radiation.

ENE 322 Introduction to Energy Systems (3CH) (Pre-requisite: ENE321)

thermodynamic, mechanical, and electrical aspects of modern energy conversion systems; traditional systems (steam electric power plants, gas turbines, internal combustion engines, refrigeration systems); renewable systems (solar, wind, geothermal); combined heat and power and co-generation; economic and environmental aspects of energy conversion.

ENE 323 Fluid Mechanics Lab (1CH) (Pre-requisite: MECH 0222)

fluid properties: density, specific gravity, viscosity; fluid characteristics; continuity, conservation of energy; fluid behavior: center of pressure, pipe flow, open channel flow; and pump performance.

ENE 399 Field Training (0CH) (Pre-requisite:)

University Regulations;

ENE 401 Energy Systems Simulation Lab(1CH) (Pre-requisite: ENE 312, ENE 322 Co-requisite: ENE 444)

Mathematical and algebraic modeling, linear programming, programming and simulation of Power Systems, renewable energy systems, energy economy modelling.

ENE 411 Electric Drive (3CH) (Pre-requisite: ENE 312, ENE 444)

DC-motor drives using controlled AC-DC converters; DC-motor drives using DC-DC converters; frequency-controlled induction-motor drives; slip energy recovery; synchronous motor drives using inverters and cycloconverters; variable reluctance drives: switched reluctance and stepper-motor drives using bridge inverters.

ENE 412 Electric Drive Lab (1CH) (Pre-requisite: ENE 411)

DC-motor drives using controlled AC-DC converters, DC-motor drives using DC-DC converters, Frequency-controlled Induction-motor drives, Synchronous motor drives using inverters and cycloconverters.

ENE 432 Power Plant Engineering (3CH) (Pre-requisite: ENE 322)

introduction to power plants engineering, energy: A Measure for work potential, gas power cycles, vapor and combined power cycles, thermal power plant components, steam and gas turbine, steam generators, condenser and condensate, feed-water systems compressors, pumps.

ENE 433 Solar Energy I (3CH) (Pre-requisite: ENE 322)

heat transfer phenomena (radiation, convection, conduction) in solar thermal systems; materials used in solar thermal applications and their properties: selective treatments, phase change materials, transparent insulating surfaces; design methodologies and calculation of solar thermal systems and equipment; heat transfer calculation software; testing of solar thermal collectors and solar thermal systems; applications of solar energy: absorption cooling systems, solar thermal energy system as a primary source of electricity; solar thermal concentration (solar thermo-electric).

ENE 434 PV Technology I (3CH) (Pre-requisite: ENE 212, ENE 214, and ENE 322)

characteristics of sunlight and types of solar irradiance, sun position calculator, solar radiation potential assessment with fixed inclination (tilt) and orientation (azimuth) angles; semiconductor and silicon PN junction photovoltaic (PV) cells; Photovoltaic (PV) effect of silicon solar cells; the behavior and performance of silicon PV cells; PV cell properties and design; IV-characteristics of ideal and real PV cells; ideal silicon cell IV-curve equation and modelling; real silicon cell equation; PV cells interconnections and fabrication of wafer based and thin-film PV modules; datasheets of commercial PV modules; PV power system components: PV battery charge controllers, DC/AC inverters and batteries; datasheets of PV charge controllers, inverters and batteries; PV mounting structures; electrical single line diagram and module arrangement layout; design and sizing of off-grid/standalone PV systems; design and sizing of on-grid/grid-connected PV systems; Specific Energy Yield (SEY) and Performance Ratio (PR) of grid-connected PV systems; economics of PV systems (time value of money, capital cost, savings, simple payback period, return on investment and internal rate of return).

ENE 435 Wind Energy Technology (3CH) (Pre-requisite: ENE 311, ENE 312, and ENE 322)

Introduction to Wind energy technology, basic characteristics of wind, site characterization statistical methods of wind analysis, wind resources assessment, fundamental principles of wind turbines, aerodynamics, mechanical and electrical components of wind turbines, performance analysis of wind turbines/farms, wind turbines integrations into power systems, environmental and social impact of wind technology, economics of wind technology.

ENE 436 Renewable Energy Lab (1CH) (Pre-requisite: ENE 322)

assessment of the viability of a wind power, solar radiation, solar thermal, PV or biomass system for a given site; measurement and data collection techniques; analyzing and evaluation these renewable energy resources and calculate savings fractions, backup energy needs, financing options, and economic analyses; the principles of solar home design, solar hot water, and space heating and solar cooling for both new and existing construction; investigation of the potentials of renewable energy technologies to help solve environmental and economic problems within society.

ENE 437 Economics of Natural Resources Engineering (1CH) (Pre-requisite: MATH 203)

introduction to engineering economy, importance of engineering economics, price elasticity and its application, cost concepts and design economics, cost-estimation techniques, the time value of money, evaluating a single project, comparison and selection among alternatives, depreciation and income taxes, climate change and energy-related environmental externalities.

ENE 438 Energy Lab (1CH) (Pre-requisite: ENE 331)

data measurements, collection, analysis, evaluation and basic fabrications techniques for major renewable energy systems such as: wind energy, PV and solar thermal, biomass and hydro systems; sizing for each system and calculate predicted energy yield; feasibility for specific locations;

ENE 441 Power Systems (3CH) (Pre-requisite: ENE 302, ENE 311)

introduction to power systems, transformers, series impedance of transmission lines, capacitance of transmission lines, current and voltage relations on a transmission line, impedance and admittance models and network calculations, Gauss-Seidel and Newton-Raphson methods to solve nonlinear algebraic equations, power flow, symmetrical faults.

ENE 442 Power Systems Lab (1CH) (Pre-requisite: ENE 441)

transmission line performance under different operating conditions, load characteristics, real and reactive power flow and control for a transmission line, characteristics of different types of sequence components, balanced and unbalanced faults, power system transients and stability.

ENE 443 Electrical Power Generation, Transmission and Distribution (3CH) (Pre-requisite: ENE 441)

substation design, distribution systems, transmission systems, transformers, high voltage cables, introduction to power system protection, circuit breakers, switch gear, introduction to power quality, wiring and grounding.

ENE 444 Modeling and Control of Energy Systems (3CH) (Pre-requisite: MATH 205, ENE 311)

Transfer functions, Block diagrams, Signal flow graphs, State-space description, Mathematical modeling of physical systems, Time-domain analysis, Root locus techniques, Frequency-domain analysis and design, Compensation design, closed loop control of electrical systems, resonant systems.

ENE 499 International Internship (12CH) (Pre-requisite: ENE 399)

University Regulations.

ENE 511 Power Semiconductor Devices (3CH) (Pre-requisite: ENE 312)

carrier transport physics, breakdown phenomenon in semiconductor devices, power bipolar transistors, thyristors, power Junction Field-Effect Transistors (JFET), power diodes, power Metal-Oxide-Semiconductor Field-Effect Transistors (MOSFET), power MOS-bipolar devices.

ENE 512 Special Electrical Machines (3CH) (Pre-requisite: ENE 311)

linear Electric machines: comparison with rotating machines; linear induction motors: simplified electromagnetic field theory, force equation, characteristics; superconducting AC generators and motors; variable reluctance motors: performance and characteristics; printed circuit motors.

ENE 513 Electronic Circuit Design (3CH) (Pre-requisite: ENE 214, ENE 301)

feedback amplifiers, oscillators, power amplifiers, current mirrors, active loads, differential amplifiers, active filters, internal structure of operational amplifiers, integrated analog circuits and applications.

ENE 514 Mixed Signal Test Engineering (3CH) (Pre-requisite: ENE 301, ME 0346)

mixed signal testing, the test specification process, DC and parametric measurements, measurement accuracy, tester hardware, sampling theory, DSP-based testing, analog channel testing, digital channel testing, design for test, data analysis, test economics.

ENE 515 Electrochemical Energy Storage (3CH) (Pre-requisite: ENE 322)

electrochemical energy storing technologies with emphasis on: supercapacitors, batteries, electrode materials, power and energy density, electrochemical characterization techniques, different cell setups.

ENE 516 Smart-Grids (3CH) (Pre-requisite: ENE 312, ENE 316, ENE 441)

This course presents a new concept in power systems, by integrating Power systems with Power electronics, Communications and information technology. In addition, the concept of involving intelligent control using SCADA system will be presented.

ENE 517 Switched Mode Power Supplies (3CH) (Pre-requisite: ENE 312)

power capabilities and switching speeds of power semiconductors; DC-DC switched-mode converters: types, design, control, applications; DC-AC switched-mode inverters: types, design, control of AC output, applications; computer simulation of switched-mode converters.

ENE 521 Thermal and Hydrodynamic equipment (3CH) (Pre-requisite: ENE 321)

thermal and hydrodynamic equipment design, operation, maintenance and selection of flowing items: boilers, heat exchangers, piping system and fitting, burners, pumps; for these equipment.

ENE 522 Heating Ventilating and Air Conditioning (HVAC) (3CH) (Pre-requisite: ENE 321)

psychrometric principles, thermal comfort, air conditioning processes, inside and outside design conditions, heating load calculations, infiltration, cooling load calculations, solar gain, design of heating and air conditioning systems, HVAC equipment and components.

ENE 523 Turbomachinery (3CH) (Pre-requisite: MECH 0222)

impulse and reaction turbines, velocity diagrams, energy equations and degree of reaction, total pressure correlation, turbine design, three dimensional analysis, free vortex design, estimation of stage and design point performance.

ENE 524 Geothermal and Hydropower systems (3CH) (Pre-requisite: ENE 322)

geothermal systems: geothermal exploration techniques, drilling techniques and logging methods, reservoir physics, well test analysis, monitoring & forecasting, direct and indirect use of geothermal resources, visualization and modeling techniques, design, sizing, analysis and environmental impacts of geothermal systems (geothermal power plants and its types and heat pump systems; hydropower systems: hydropower systems including mini, small and large scale plants; general overview of types of hydropower plants, planning, assessment of hydropower resources, dam design, mechanical and electrical equipment, economic analysis of hydropower plant and the environmental impacts.

ENE 525 Fuel Cell & Hydrogen Production Technology (3CH) (Pre-requisite: ENE 322)

fundamentals of fuel cells & hydrogen production technology, basic structure of fuel cells, operations and conversion of chemical potential energy into electrical energy, evaluation of the cell performance, and characterization.

ENE 526 Bio-Energy Technology (3CH) (Pre-requisite: ENE 322)

Introduction to biomass; low-carbon energy systems including: biopower, bioheat and biofuels; scientific examination of feedstock conversion technologies and scale up for industrial production, end products, and their applications; concepts of sustainability, Life Cycle Analysis (LCA) ; bioenergy systems; advantages of low-carbon energy in developing a low-carbon economy and society.

ENE 527 Techno-economics of energy systems (3CH) (Pre-requisite: ENE 322)

economic competitiveness of renewable energy systems for utility scale electric generation systems, design parameters for the installation and operation of photovoltaic and wind energy systems, building-integrated applications of renewable energy sources, design methodologies of hybrid systems, techno-economic feasibility, funding resources and positive environmental impact assessment for energy saving systems, energy storage technology selection, energy consumption analysis and assessment of energy saving potential and development of energy saving recommendations.

ENE 528 Applied Refrigeration (3CH) (Pre-requisite: ENE 321)

vapor compression cycle; alternative cycles: absorption cycle, multiple effect cycles, ejector cycles, expansion cycles, electric and magnetic cycles; refrigerants: the properties, refrigerant mixtures, refrigeration system components.

ENE 530 Modeling and Simulation (3CH) (Pre-requisite: ENE 401)

Modeling techniques of system's Components. Simulation techniques of Systems. This course introduces the basic deterministic optimization techniques which includes LaGrange multiplies, search method, linear and dynamic programming. These techniques are applied to energy-related problems. Moreover, Simulation techniques related to thermal and electrical systems are introduced.

ENE 531 Environmental and Energy Engineering (3CH) (Pre-requisite: ENE 322)

environmental issues associated with human activity; mass and energy transfer, environmental chemistry, water and air pollution, pollutant transport modeling, pollution management, and risk assessment, and global atmospheric change; physical, chemical, and biological systems relating to the quality of water, land and air environments; topics relating energy to environmental engineering including: carbon production, heat and energy transfer and thermal pollution.

ENE 532 Advanced Renewable Energy Systems (3CH) (Pre-requisite: ENE 322)

analysis of alternative and renewable energy systems; methods of integrating these solutions with society; sustainable energy; principles, possibilities, and limits of alternative and renewable energy.

ENE 533 Solar Energy II (3CH) (Pre-requisite: ENE 433, ENE 434)

design of solar thermal and solar photovoltaic power generating units in various modes, financial and related environmental implications, case studies and actual application of available software for design of solar power systems.

ENE 534 Low Carbon Buildings (3CH) (Pre-requisite: ENE 321)

low carbon buildings; methods for balancing architectural and human requirements; relationship between building design and: thermal comfort inside the building, lighting performance, heating, cooling and lighting loads; psychrometric chart to analyze climate and human comfort; the effects of common passive solar strategies on building design; different thermal comfort models; determine the thermal and lighting performance of a building using manual methods and software; appropriate passive solar and low energy design strategies; assess solar access at a site using manual methods; energy assessment tools for building simulation; energy efficiency techniques in the residential sector.

ENE 535 PV Technology II (3CH) (Pre-requisite: ENE 434)

solar radiation basics; PV technology basics; emerging PV technologies: Building Integrated PV (BIPV) and Concentrated PV system (CPV); PV tracking systems: 1-axis and 2-axis; PV system types (on-grid and off-grid); testing and commission of PV systems; maintenance of PV systems; large-scale PV systems planning, design and sizing; hybrid systems planning, design and sizing; PV grid connection requirements and codes; construction and installation of PV systems; cost breakdown of PV systems; tender documents preparation for PV systems; technical and financial evaluation of PV tenders; economics of PV systems.

ENE 536 Thermal Energy Storage (3CH) (Pre-requisite: ENE 322)

energy storage technologies with emphasis on thermal energies storage, energy storage strategies for system optimization, sensible heat, latent heat, inorganic phase change materials, organic phase change materials, Quasi-latent heat, heat pumps.

ENE 537 Energy Efficiency, Management and Laws (3CH) (Pre-requisite: ENE 322)

technical and physical processes involved in energy usage in: residential, commercial, industrial and transport sectors; economic tools required to justify expenditure on energy efficiency programs; "whole system" design and analysis; policy and environmental requirements to enhance implementation of energy efficiency measures;

ENE 538 Energy Efficiency Lab (1CH) (Pre-requisite: ENE 434, ENE 436)

Energy efficiency in existing buildings in terms of: energy use, indoor comfort, use, technical and economic feasibility, cultural values; system perspectives such as: energy supply and environmental aspects; energy simulations in buildings; peer critique; energy efficiency measures for apartment buildings evaluation.

ENE 539 Energy Audit (3CH) (Pre-requisite: ENE 441)

lighting fundamentals, energy utilities and rates, and identification of opportunities for efficiency changes in buildings. Topics include scientific principles of energy, light and heat, energy codes and standards, metering and monitoring. Students will examine the economic, regulatory, and infrastructure issues affecting implementation of energy efficiency measures as well as their potential for solving energy and environmental problems.

ENE 541 Power System Analysis (3CH) (Pre-requisite: ENE 441)

fault analysis, symmetrical components, unsymmetrical faults, transient stability, economic dispatch and operation.

ENE 542 Power System Protection (3CH) (Co-requisite: ENE 541)

power system protection, fault analysis, instrument transformers, overcurrent protection, distance protection, differential protection, pilot protection, generator protection, motor protection, transmission line protection, transformer protection, bus protection, radial reactor and shunt capacitor protection.

ENE 543 Power System Protection Lab (1CH) (Co-requisite: ENE 542)

protective relaying, fuses, time overcurrent relays, instantaneous relays, differential relaying for transformers, distance relaying, current and voltage transformers.

ENE 544 Power System Integrations Lab (1CH) (Pre-requisite: ENE 301, ENE 314, ENE 442)

application and integration of hardware and software techniques for modern power systems.

ENE 545 Power System Quality (1CH) (Pre-requisite: ENE 441)

power quality concepts, wiring and grounding issues, voltage sags, voltage variations, transients, harmonics, longer duration voltage variation, distributed generation and power electronics, instrumentation and analyzers.

ENE 546 High Voltage Engineering (1CH) (Pre-requisite: ENE 441)

generation and measurement of high voltage, electrostatic field and field stress control, electrical breakdown in gases, solids and liquids, non-destructive insulation test techniques, over-voltages and insulation coordination.

ENE 547 Power Electronic Applications in Power Systems (1CH) (Pre-requisite: ENE 312)

semiconductor devices for power engineering applications, common power electronic circuits, impact of power electronics loads on power quality, HVDC converter plant, transmission plant control strategies, flexible AC transmission: conventional and advanced devices, shunt compensation, static VAR compensation, series compensation, angle compensation, quadrature boosters, unified power flow controller.

ENE 548 Power System Stability (1CH) (Pre-requisite: ENE 541)

power system stability concepts, the classical machine model, modeling of synchronous machines, modeling of loads, excitation system types, dynamic models of excitation system, response of a power network to disturbances, small signal stability, voltage stability.

ENE 549 Power System Reliability (1CH) (Pre-requisite: ENE 541)

power system reliability concepts, modern random processes methods, the universal generating function method, Monte Carlo simulation, reliability of generation systems, reliability assessment of transmission lines, reliability assessment of transformers, and reliability of distribution systems.

ENE 598 Graduation Project I (1CH) (Pre-requisite: ENE 499)

project preparation by forming teams supervised by faculty member, selecting the project scope; understand the theory, background and application; understand the ethical and professional issues in engineering practice; final presentation and report are required.

ENE 599 Graduation Project II (3CH) (Pre-requisite: ENE 598)

practical implementation of the project approved in the first portion of the graduation project sequence; a final report and presentation are required.

CATALOGUE DESCRIPTION OF COURSES TAUGHT BY OTHER DEPARTMENTS

ARB 100 Arabic (3CH) (Pre-requisite: -)

Grammar and structure. Rectifying weakness in linguistic application; training in sound reading. Dictation; use of language in a manner free from grammatical and linguistic errors; accurate expression of intended meaning. Study and analysis of literary texts through the discussion of linguistic, grammatical and writing skills therein.

CHEM 103 General Chemistry I (3CH) (Pre-requisite: -)

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

CHEM 106 General Chemistry lab (1CH) (Co-requisite: CHEM 103)

Performing Chemical Experiments based on the general chemistry course.

CS 116 Computing Fundamentals (3CH) (Co-requisite: CS 1160)

Basic computer skills, programming concepts, algorithms, variables and data types; arithmetic, logical, relational, Boolean, and assignment operators; simple input and output statements, selection structures, loop structures, single and multidimensional arrays, character strings, functions, data structures, pointers, input/output file operations.

CS 1160 Computing Fundamentals Lab (1CH) (Co-requisite: CS 116)

Lab session every week to offer hands-on experience on the topics that are covered in CS116, which are: algorithms, variables and data types; arithmetic, logical, relational, Boolean, and assignment operators; simple input and output statements, selection structures, loop structures, single and multidimensional arrays, character strings, functions, data structures, pointers, input/output file operations.

ENGL 098 English I (0CH) (Pre-requisite: -)

Students will focus on English at an elementary level concentrating on the receptive skills of reading and listening, and the productive skills of writing and speaking. These will include such things as independent clauses, verb tenses, modal verbs, adverbs, short dialogues, reading simple material and answering short questions, writing short meaningful sentences, listening to short conversations.

ENGL 099 English II (0CH) (Pre-requisite: ENGL 098)

Students will focus on English at a pre intermediate level concentrating on the receptive skills of reading and listening and the productive skills of writing and speaking. These will include such things as comparatives and superlatives, quantifiers, possessive adjectives and pronouns, vocabulary building, roleplay activities for speaking, reading comprehension and writing short descriptive paragraphs.

ENGL 101 English III (1CH) (Pre-requisite: ENGL 099)

Students will focus on English at an intermediate level concentrating on the receptive skills of reading and listening and the productive skills of writing and speaking. These will include collocations, tense review, affirmative, negative statements, synonyms and antonyms, time clauses, conditionals, active and passive forms, reported speech, phrasal verbs, reading comprehension with detailed questions, vocabulary and writing developed descriptive and opinion essays.

ENGL 102 English IV (1CH) (Pre-requisite: ENGL 101)

Students will focus on English at an upper intermediate level concentrating on the receptive skills of reading and listening and the productive skills of writing and speaking. Model verb review, silent letters and proper pronunciation, jobs and careers, requests and offers, more phrasal verbs with vocabulary building, relative clauses and relative pronouns, narrative tenses for writing exercises, wishes and regrets, reading and comprehending longer passages with direct and inference questions of medium difficulty, hypothesizing, and writing fully developed descriptive, argumentative and analytical essays of 350 words.

ENGL 201 English V (2CH) (Pre-requisite: ENGL 102)

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

ENGL 202 English VI (2CH) (Pre-requisite: ENGL 201)

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

GERL 101 Germany I (3CH) (Pre-requisite: -)

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

GERL 102 Germany II (3CH) (Pre-requisite: GERL 101)

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

GERL 201 Germany III (3CH) (Pre-requisite: GERL 102)

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

GERL 202 Germany IV (3CH) (Pre-requisite: GERL 201)

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

GERL 301 German V (3CH) (Pre-requisite: GERL 202)

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

GERL 302 German VI (3CH) (Pre-requisite: GERL 301)

Can understand and assimilate appropriately written and spoken texts, which are relevant in a university-referred context. Can implement appropriately writings and actions of speech, which are relevant in a university-referred context.

IE 0121 Probability and Statistics (1CH) (Pre-requisite: MATH 101)

Descriptive statistics, probability concepts, discrete and continuous random variables and distributions, joint probability distributions, covariance and correlation of random variables, point and interval estimation for single sample, sampling distributions, and statistical inference for single sample.

IE 0141 Engineering Workshop (1CH) (Pre-requisite: -)

General safety, materials and their classifications, measuring devices and their accuracy, theoretical background and practical exercises including, carpentry, welding, mechanical fasteners, drills, lathes, milling machines, and sheet-metal working.

MATH 101 Calculus I (3CH) (Pre-requisite: -)

This course introduces the student to the calculus of single-valued functions. Topics include: limits, continuity, rates of change, rules for differentiating, differentials and local linear approximations, maxima and minima problems, L'Hôpital's rule, related rates, logarithmic and implicit differentiation, inverse trigonometric and hyperbolic functions, Rolle's Theorem, the mean-value theorem, and applications of derivatives and integrals. An overview of integration, basic techniques for integration, algebraic techniques of integration and applications of integrations are also included.

MATH 102 Calculus II (3CH) (Pre-requisite: MATH 101)

Sequences and series, power series, convergence theorems: integral, ratio, and alternating - series tests, Polar coordinates and functions, integration and differentiation of polar functions, Vectors in three-dimensional space, spherical and cylindrical coordinates, Vector valued functions, Partial derivatives, Multiple integrals, Topics in vector calculus.

MATH 203 Applied Mathematics for Engineers (3CH) (Pre-requisite: MATH 102)

Vector analysis in Cartesian coordinates; Curvilinear coordinates and transformations to Cartesian, Spherical, and Cylindrical coordinates; line integrals, surface integrals, Green's theorem, Gauss's divergence theorem, and Stokes's theorem. Scalar and vector potential. Review of Series. Linear Algebra; Matrices and linear equations; Matrices and Linear Operators; Determinants, Eigenvalues and eigenvectors. Complex Numbers and Complex Variable; Representation of complex numbers, DeMoivre's formula, Powers and roots of complex numbers, Functions of complex variable.

MATH 205 Differential equations (3CH) (Co-requisite: MATH 203)

First-order ordinary differential equations, Second-order ordinary differential equations, System of ODEs. Solution Techniques including Laplace transforms, Fourier series: eigenvalue problems and expansions in orthogonal functions. Partial differential equation: classification, separation of variables, solution by series and transform methods. Models in Applied Mathematics; Applications to illustrate typical problems and methods of applied mathematics in solid and fluid mechanics, fields of physics, dynamics and vibrations, wave phenomena, diffusion phenomena, heat conduction, and biological processes.

ME 0111 Computer Aided Engineering Drawing (3CH) (Pre-requisite: CS 116)

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

ME 0346 Instrumentations and Measurements (2CH) (Pre-requisite: ENE 211, MATH 205; Co-requisite: ME 0347)

Introduction to instrumentation, Units, Dimensions and standards, Error measurements, Statistical analysis of experimental data, Op-Amp circuits in instrumentation, Basic electrical measurement and sensing devices: physics of electric, magnetic, chemical sensors displacements, area, pressure, flow, temperature, thermal and transport properties, force, torque and strain measurements. Smart sensors and networking of sensor systems. Data acquisition and processing.

ME 0347 Instrumentation and Measurements Lab (1CH) (Co-requisite: ME 0346)

Measurements with different micrometers & Vernier measuring instruments, angular measurements, roundness & concentricity of cylindrical work pieces, tool maker's microscope, optical projectors, surface measurements. Analysis of experimental data and error estimation. Basic electrical measurement and sensing devices: physics of electric, magnetic, chemical sensors, displacement, area, pressure, flow, temperature, thermal and transport properties, force, torque and strain measurements. Smart sensors and networking of sensor systems. Data acquisition and processing.

MILS 100 Military Sciences (3CH) (Pre-requisite: only for Jordanians)

History of the Jordanian Arab Army. United Nations Peace Keeping Forces. Preparation of the nation for defense and liberation. History of the Hashemite Kingdom of Jordan and its development.

NE 101 National Education (3CH) (Pre-requisite: ARB 099 or ENGL 101)

In a context of striving towards democracy like the one Jordan enjoys today, the meaning and practice of active and responsible citizenship becomes more crucial. It is often argued that democracy requires "democrats" to flourish, and become well established. Democrats are those women and men who recognize pluralism, inclusion, positive engagement, and participation as the main values that govern their interaction with the state as citizens and with each other as diverse people of different interests. In this course you will be able to understand your rights and responsibilities as Jordanian citizen, expand your knowledge about the frameworks, and processes that regulates citizen-state relationships as well as the basic necessary skills for you to practice your citizenship rights in a civic manner.

PHYS 103 Physics I (3CH) (Pre-requisite: -)

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

PHYS 104 Physics II (3CH) (Pre-requisite: PHYS 103; Co-requisite: PHYS 106)

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

PHYS 106 General Physics Lab (1CH) (Co-requisite: PHYS 104)

Developing a good understanding of a few important concepts in Mechanical physics, Learning to apply these concepts to familiar and unfamiliar situations and Gaining the ability to reason qualitatively and quantitatively about Mechanics.

MECH 0221 Thermodynamics (3CH) (Pre-requisite: MATH 102)

Introduction to thermodynamics concepts, properties of pure substances, first law of thermodynamics: analysis of closed systems, analysis of open systems under steady and unsteady conditions, second law of thermodynamics, entropy.

MECH 0222 Fluid Mechanics (3CH) (Pre-requisite: MATH 102, PHYS 103)

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

TENTATIVE COURSE SCHEDULE

First Semester / First Year				
Course Number	Course Title	CH	Pre-requisite	Co-requisite
ENGL 098	English I *	0	-	
GERL 101	German I *	3	-	
CS 116	Computing fundamentals	3	-	CS 1160
CS 1160	Computing fundamentals lab	1	-	CS 116
MATH 101	Calculus I	3	-	
PHYS 103	Physics I	3	-	
CHEM 103	General Chemistry I	3	-	
CHEM 106	General Chemistry lab	1	-	CHEM 103
MILS 100	Military Sciences	3	Only for Jordanian	
Total		20		

Second Semester / First Year				
Course Number	Course Title	CH	Pre-requisite	Co-requisite
ENGL 099	English II *	0	ENGL 098	
ARB 100	Arabic *	3	-	
MATH 102	Calculus II	3	MATH 101	
GERL 102	German II	3	GERL 101	
PHYS 104	Physics II	3	PHYS 103	PHYS 106
PHYS 106	General Physics Lab	1	-	PHYS 104
ME 0111	Computer Aided Engineering Drawing	3	CS 116	
IE 0141	Engineering Workshop	1	-	
NE 101	National Education (in Arabic)	3	ARB 099	
	National Education (in English)		ENGL 101	
Total		20		

Summer Semester / First Year				
Course Number	Course Title	CH	Pre-requisite	Co-requisite
University Elective	See Elective Table above	3	-	
	Any Course from First Year table above student could not take and/or pass		-	
Total		3		

*Student's score on placement test will decide the course level to start from

First Semester / Second Year				
Course Number	Course Title	CH	Pre-requisite	Co-requisite
ENGL 101	English III *	1	ENGL 099	
GERL 201	German III	3	GERL 102	
MECH 0221	Thermodynamics	3	MATH 102	
ENE 211	Fundamentals of Electrical Circuits	3	PHYS 104	MATH 203
MATH 203	Applied Mathematics for Engineers	3	MATH 102	
MATH 205	Differential equations	3		MATH 203
University Elective	See Elective Table above	3		
Total		19		

Second Semester / Second Year				
Course Number	Course Title	CH	Pre-requisite	Co-requisite
ENGL 102	English IV *	1	ENGL 101	
GERL 202	German IV	3	GERL 201	
IE 0121	Probability and Statistics	3	MATH 101	
ENE 212	Electrical Circuits and Systems Analysis	3	ENE 211	
ENE 214	Electronics	3	ENE 211	
ECE 333	Electromagnetics	3	MATH 203	
ENE 301	Introduction to Digital Systems and Microcontrollers	3		ENE 214
ENE 302	Statistical and Numerical Methods for Energy Engineers	3	MATH 205	
Total		22		

Summer Semester / Second Year				
Course Number	Course Title	CH	Pre-requisite	Co-requisite
	Any Course from First Year table above student could not take and/or pass	3	-	
Total				

First Semester / Third Year				
Course Number	Course Title	CH	Pre-requisite	Co-requisite
ENGL 201	English V *	2	ENGL 102	
GERL 301	German V	3	GERL 202	
ENE 316	Introduction to Communication Systems for Energy Engineers	3	ENE 212	
MECH 0222	Fluid Mechanics	3	MATH 102, PHYS 103	
ENE 213	Electrical Circuits Lab	1	ENE 212	
ENE 311	Electrical Machines	3	ENE 212, ECE 333	
ENE 312	Power Electronics	3	ENE 214, ENE 212	
ENE 323	Fluid Mechanics Lab	1		MECH 0222
ENE 444	Modeling and Control of Energy Systems	3	MATH 205, ENE 311	
Total		22		

Second Semester / Third Year				
Course Number	Course Title	CH	Pre-requisite	Co-requisite
ENGL 202	English VI *	2	ENGL 201	
ENE 215	Electronics Lab	1	ENE 214, ENE 213	
ENE 313	Electrical Machines Lab	1	ENE311	
ENE 314	Power Electronics Lab	1	ENE 312	
GERL 302	German VI	3	GERL 301	
ENE 321	Heat Transfer	3	MECH 0221, MECH 0222, MATH205	
ENE 322	Introduction to Energy Systems	3	ENE 321	
ENE 432	Power Plant Engineering	3	ENE 322	
ENE 441	Power Systems	3	ENE 311, ENE 302	
Total		20		

Summer Semester / Second Year				
Course Number	Course Title	CH	Pre-requisite	Co-requisite
ENE 399	Field Training	0	University Regulations	
Total				

German Year

First Semester / Fourth Year				
Course Number	Course Title	CH	Pre-requisite	Co-requisite
From Specialization Elective Course list	Technical Elective	3		
	Technical Elective	3		
	Technical Elective	3		
	Technical Elective	3		
Total		12		

Second Semester / Fourth Year				
Course Number	Course Title	CH	Pre-requisite	Co-requisite
ENE 499	International Internship	12	ENE 399	
Total		12		

Renewable Energy Track

First Semester / Fifth Year				
Course Number	Course Title	CH	Pre-requisite	Co-requisite
ME 0346	Instrumentations and Measurements	2	ENE 211, MATH 205	ME 0347
ME 0347	Instrumentation and Measurements Lab	1		ME 0346
ENE 401	Energy Systems Simulation Lab	1	ENE 312, ENE 322, #ENE 444	
ENE 434	PV Technology I	3	ENE 322, ENE 212, ENE 214	
ENE 442	Power Systems Lab	1	ENE 441	
ENE 443	Electrical Power Generation, Transmission & Distribution	3	ENE 441	
ENE 537	Energy Efficiency, management and laws	3	ENE 322	
ENE 433	Solar Energy I	3	ENE 322	
ENE 598	Graduation Project I	1	ENE 499	
Total		18		

Second Semester / Fifth Year				
Course Number	Course Title	CH	Pre-requisite	Co-requisite
ENE 435	Wind Energy Technology	3	ENE 311, ENE 312, ENE 322	
ENE 436	Renewable Energy lab	1	ENE 322	
ENE 438	Energy lab	1	ENE 322	
ENE 538	Energy Efficiency Lab	1	ENE 434, ENE 436	
ENE 599	Graduation Project II	3	ENE 598	
ENE 437	Economics of Natural Resources Engineering	3	MATH 203	
Total		12		

Electrical Power Track

First Semester / Fifth Year				
Course Number	Course Title	CH	Pre-requisite	Co-requisite
ME 0346	Instrumentations and Measurements	2	ENE 211, MATH 205	ME 0347
ME 0347	Instrumentation and Measurements Lab	1		ME 0346
ENE 401	Energy Systems Simulation Lab	1	ENE 312, ENE 322, #ENE 444	
ENE 434	PV Technology I	3	ENE 322, ENE 212, ENE 214	
ENE 442	Power Systems Lab	1	ENE 441	
ENE 443	Electrical Power Generation, Transmission & Distribution	3	ENE 441	
ENE 411	Electric Drives	3	ENE 312, ENE 444	
ENE 541	Power System Analysis	3	ENE 441	
ENE 598	Graduation Project I	1	ENE 499	
Total		18		

Second Semester / Fifth Year				
Course Number	Course Title	CH	Pre-requisite	Co-requisite
ENE 412	Electric Drives Lab	1	ENE 411	
ENE 543	Power System Protection Lab	1		ENE 542
ENE 544	Power Systems Integrations Lab	1	ENE 301, ENE 314, ENE 442	
ENE 542	Power System Protection	3		ENE 541
ENE 599	Graduation Project II	3	ENE 598	
ENE 437	Economics of Natural Resources Engineering	3	MATH 203	
Total		12		