Al-Hussein Bin Talal University

Faculty of Engineering

Department of Electrical Engineering

Study plan

2013 – 2014

Vision

The Department of Electrical engineering will provide programs of the highest quality to produce world class engineers who can address challenges of the new millennium.

Mission

The Department of Electrical Engineering will:

- Dedicate itself to providing its students with the skills, knowledge and attitudes that will allow its graduates to succeed as engineers and leaders.
- Maintain a vital state-of-the-art research, which provides its students and faculty with opportunities to create, interpret, apply and disseminate knowledge.
- Prepare its graduates for life-long learning to meet intellectual, ethical and career challenges.

Objectives

The goals of the Electrical Engineering Department are:

- To offer an innovative, design-oriented, accredited undergraduate program with concentrations in Electrical, computer, communication, electronics and signal processing engineering.
- To educate and train students in the principles and methods of Electrical engineering, including the mathematics and science required to analyze and solve problems in different applications.
- To develop skills pertinent to design, including the ability to formulate problems, work in teams, and communicate effectively both orally and in writing with those inside and outside of Electrical Engineering.
- Provide abroad based education in Electrical engineering covering analysis, design, and application of modern Electrical engineering technologies.
- Be responsive to the needs of industry and society, particularly in the south Jordan region.
- Lead in fostering a close relationship between AHU and the local technology community.
- Aspire to introduce our student to the values, principles, morals, and vision that will prepare them for life long learning experience together with the ability to deal with broad spectrum of commercial, legal, and ethical issues.

Outcomes

Students who complete the requirements for the Bachelor of Science in Electrical Engineering, as administered by the faculty of the Department of Electrical Engineering at Al-Hussein Bin Talal University (AHU), are expected, as a minimum, to have:

1. An ability to utilize mathematics, general scientific principles, and computer applications and tools for solving practical Electrical Engineering problems.
2. Fundamental design skills and an ability to conduct experiments, and interpret as well as analyze the collected data and come up with conclusions.
3. An ability to analyze and design systems, components or processes relevant to meet the desired needs.
4. An ability present technical information clearly in both oral and written formats and to communicate effectively both orally and in writing with those inside and outside Electrical and electronics engineering.
5. An awareness of computing profession and its impact in the context of science, society and technology.
6. An ability to tolerate diversity by attaining certain skills, necessary morals and ethical convictions to function and work effectively in multidisciplinary teams.
7. An ability to realize that explosion growth in the field of Electrical Engineering, so they should engage in life-long learning process for a successful career in Electrical Engineering field.
8. Knowledge of contemporary issues in the field of Electrical Engineering.
9. An understanding of professional and ethical responsibilities as an engineer in the field.
10. Hands-on experience with modern engineering tools, software, and instrumentation relevant to Electrical Engineering practice.
11. The capacity to profoundly accent the economy by contributing to base-level production of goods and services.

UNDERGRADUATE CURRICULUM

☞ COURSE NUMBERING SYSTEM:

A seven-digit number of the format **FFDDLKS** is used to designate courses according to the following table:

Faculty	Department	Level (or Year)	Knowledge Field	Sequence
Two digits (FF)	Two digits (DD)	One digit (L)	One digit (K)	One digit (S)

The Faculty of Engineering has the code (**05**). The Department codes at the Faculty are given in the following table:

Code	Department	Code	Department
01	Mining Engineering	05	Communications Engineering
02	Environmental Engineering	06	Computer Engineering
03	Chemical Engineering	07	Mechanical Engineering
04	Civil Engineering	**08**	**Electrical Engineering**

Therefore, Electrical Engineering courses will have numbers of the form **0508LKS**, where the codes L, K and S are described as in the following **example:**

Electrical Circuit (1) (0508211)						
0	5	0	8	2	1	1
Faculty		**Department**		**Level/Year**	**Field**	**Sequence**

No.	Field
0	General
1	Electric circuits
2	Communications
3	Computers
4	Control and Measurements System
5	Electromagnetic
6	Electronics
7	Machines
8	Power Systems
9	Graduation Projects, Field Training and Special Topics

☞ Specialization:

The Department of Electrical Engineering offers the Bachelor of Science (B.Sc.) degree in Electrical Engineering after successfully passing 160 credit hours.

☞ Degree Requirements:

A Bachelor of Science degree in Electrical Engineering at Al-Hussein Bin Talal University (AHU) is awarded in accordance with the Statute stated in the AHU regulations for B.Sc. awarding issued by the Deans' council for awarding scientific degrees and certifications at AHU, and after the successful completion of 160 credit hours, distributed as indicated in the following Table.

☞*Framework for B.Sc. Degree (160 Semester Credits)*

Classification	Credit Hours		
	Compulsory	Elective	Total
University Requirements	**12**	**15**	**27**
College Requirements	**28**	**-**	**28**
Department Requirements:	**93**	**9**	**102**
Free Electives	**-**	**3**	**3**
Total =	**133**	**27**	**160**

☞*UNIVERSITY REQUIREMENTS: (27 Credit Hours)*

University requirements consist of 27 credit hours split into 12 compulsory credit hours and 15 elective credit hours.

- **Compulsory University Requirements: (12Credit Hours)**

Course No.	Course Title	Cr. Hr.	Lecture	Lab.	Prerequisite or *Co-requisite
0201099	Arabic Language	-	-	-	-
0612099	Computer Skills	-	-	-	-
0202099	English Language	-	-	-	-
0100101	Military Sciences	3	3	-	-
0201101	Arabic Language	3	3	-	0201099
0202101	English Language	3	3	-	0202099
0205100	National Education	3	3	-	-
	Total=	**12**			

1. A student who passes the English Language Placement Test with a grade > 80% is exempted from both English-99 (0202099) and English-101(0202101), while a student who passes the English Placement Test with a grade between 50% and 80% is exempted from English-99.
2. A student who passes the Computer Skills Placement Test with a grade > 50% is exempted from Computer Skills (0612099).
3. The Military Sciences course is required from Jordanian students only; graded on Pass/Fail basis. Students graduating from Royal Military faculty and military candidates school and equivalent institutes are exempted from taking this course.

❖ **Elective: (15 Credit Hours)**

Elective Courses with Total of (15) Credit Hours. Student must select 15 credit hours from of the following modules:

- **Humanities**

Course No.	Course Title	Cr.Hr.	Theory	Practical	Pre-requisites
0204101	French Language	3	3	-	-
0206101	Introduction to Library Science	3	3	-	-
0209101	Spanish Language	3	3	-	-
0207101	German Language	3	3	-	-
0201102	Communication skills in Arabic	3	3	-	0201101
0202102	Communication skills in English	3	3	-	0202101

- **Social Sciences and Economy**

Course No.	Course Title	Cr.Hr.	Theory	Practical	Pre-requisites
0701100	Jordan's Contribution to the Human Civilization	3	3	-	-
0412100	Economy in Our Life	3	3	-	-
0411101	Principles of Management	3	3	-	-
0412103	Entrepreneurship	3	3	-	-
0701105	Cultural Heritage and People	3	3	-	-
0100111	Islamic culture	3	3	-	-
0113112	Principles of Psychology	3	3	-	-
0205131	Law in our life	3	3	-	-
0102141	Principles of Education	3	3	-	-
0100172	History of Jerusalem	3	3	-	-
0100173	History of Arabic and Islamic Civilization	3	3	-	-
0111222	Skills	3	3	-	-

- **Science, technology, agriculture, and health**

Course No.	Course Title	Cr.Hr.	Theory	Practical	Pre-requisites
0303100	Introduction of Astronomy	3	3	-	-
0502100	Environmental Issues	3	3	-	-
0100171	Principles of physical education	3	3	-	-

☞ *FACULTY REQUIREMENTS: (28 Credit Hours)*

The Faculty of Engineering requirements consist of 28 Credit Hours distributed as follows:

Course No.	Course Title	Cr. Hr.	Lec Hr.	Lab. Hr.	Prerequisite or *Co requisite
0507231	Engineering Drawing	2	-	6	0612099
0302101	Calculus (1)	3	3	-	-
0303101	General Physics (1)	3	3	-	-
0303102	General Physics (2)	3	3	-	0303101
0302102	Calculus II	3	3	-	0302101
0303103	General Physics Lab (1)	1	-	3	0303101
0303104	General Physics Lab (2)	1	-	3	0303102
0612114	C++ Programming Language	3	3	-	0612099
0501100	Introduction to Engineering	1	1	-	-
0507291	Engineering Workshops	1	-	3	-
0502300	Communication Skills	1	-	-	0202101
0501454	Engineering Economy	3	3	-	0302102
0502200	Numerical Analysis for Engineers	3	3	-	0302102
	Total	**28**			

☞ *DEPARTMENT REQUIREMENTS (102 Credit Hours)*

Department requirements consist of 102 credit hours split into 93 compulsory credit hours and 9 elective credit hours.

❖ Department Core: (93 Credit Hours)

Course No.	Course Title	Cr. Hr.	Lec Hr.	Lab. Hr.	Prerequisite or *Corequisite
0508201	Engineering Applications	1	-	3	0302102
0508201	Engineering Mathematics (1)	3	3	-	0302102
0508203	Engineering Mathematics (2)	3	3	-	0508201
0508211	Electrical Circuits (1)	3	3	-	0303102
0508212	Electrical Circuits (2)	3	3	-	0508211
0505221	Signals and Systems	3	3	-	05082021& 0508201
0511231	Logic Circuits Design	3	3	-	0612114
0511233	Microprocessors and Assembly Language	3	3	-	0511231
0511234	Logic Circuits Design Lab	1	3	-	0511231*
0505261	Electronic (1)	3	3	-	0508211
0508311	Electrical Circuits Lab.	1	-	3	0508212
0505323	Probability and Random Processes	3	3	-	0505221
0505324	Analog Communications	3	3	-	0505323
0511330	Microprocessors and Assembly Language Lab.	3	3	-	0511233*
0508341	Control Systems	3	3	-	0508221
0508342	Control Systems Lab.	1	-	3	0508341
0508343	Instrumentations and Measurements	2	2	-	0508212& 0505261
0508344	Instrumentations and Measurements Lab	1	-	3	0508343
0505351	Electromagnetics (1)	3	3	-	0508203
0505353	Electromagnetics (2)	3	3	-	0505351
0505361	Electronic (2)	3	3		0505261
0505364	Digital Electronics	3	3	-	0505361 & 0511231
0505363	Electronics Lab	1	-	3	0505361
0508371	Electrical Machines (1)	3	3	-	0508351 & 0508212
0505421	Digital Communications	3	3	-	0505324
0511422	Computer Networks	3	3	-	0505421
0511431	Embedded Systems	3	3	-	0511233 & 0508341
0511432	Embedded Systems Lab.	1	-	3	0511431*
0508461	Power Electronics	3	3	-	0508361
0505462	Communication Electronics	3	3	-	0505361& 0505421
0508471	Electrical Machines (2)	3	3	-	0508371
0508472	Electrical Machines Lab.	1	-	3	0508471
0508481	Electrical Power Systems (1)	3	3	-	0508371
0505520	Communication Systems	3	3	-	0505421
0508581	Electrical Power Systems (2)	3	3		0508481
0508582	Electrical Power Lab.	1	-	3	0508581
0508590	Field Training	2	-	-	Completing 110 Cr. Hr.
0508591	Graduation Project (1)	1	-	-	Completing 120 Cr. Hr.
0508592	Graduation Project (2)	2	-	-	0508591

* **Co-Requisit**

❖ **Department Electives: (9 Credit Hours)**

Course No.	Course Title	Cr. Hr.	Lec Hr.	Lab. Hr.	Prerequisite or *Corequisite
0511333	Computer Architecture	3	3	-	0511233
0511420	Audio & Image Processing	3	3	-	0505221 & 0508203
0505424	Digital Signal Processing	3	3	-	0508203 & 0505221
0508441	Industrial Automation	3	3	-	0508341
0508583	Power System Protection	3	3	-	0508581
0508584	Electrical Transmission and Distribution Systems	3	3	-	0508481
0508585	Electrical Wiring	3	3	-	0508481
0505524	Antennas Engineering	3	3	-	0505353
0505523	Mobile Communications	3	3	-	0505421
0505525	Optical Communications	3	3	-	0505353 & 0505421
0511524	Distributed Systems and Applications	3	3	-	0511422
0511520	Advanced Computer Networks	3	3	-	0511422
0511528	Computer Networks Security	3	3	-	0511520
0507350	Introduction to Mechanics of Materials	3	3	-	0303101
0511535	Special Topics in Computer Engineering	3	3	-	Dept. Approval
0505529	Special Topics in Communication Engineering	3	3	-	Dept. Approval
0508586	Special Topics in Power and Control Engineering	3	3	-	Dept. Approval

☞ ***FREE ELECTIVE (3 Credit Hours)***

A course to be taken from university wide open courses.

☞ *STUDY PLAN FOR THE B.SC DEGREE IN ELECTRICAL ENGINEERING*

First Year				
First Term				
Course No.	**Course Title**	**Cr. Hr.**	**Prerequisite1**	**Prereq.2**
0302101	Calculus(1)	3	-	-
0303101	General Physics (1)	3	-	-
	Compulsory University	3	-	-
	University Elective	3	-	-
	Total	**12**		
Second Term				
Course No.	**Course Title**	**Cr. Hr.**	**Prerequisite1**	**Prereq.2**
0302102	Calculus (2)	3	0302101	-
0303102	General Physics (2)	3	0303101	-
0303103	General Physics Lab (1)	1	0303101	-
0612114	C^{++} Programming Language	3	0612099	-
0507231	Engineering Drawing	2	0612099	-
0507291	Engineering Workshops	1	0507291	-
0501100	Introduction to Engineering	1	-	-
	Total	**14**		

Second Year				
First Term				
Course No.	**Course Title**	**Cr. Hr.**	**Prerequisite1**	**Prereq.2**
0508201	Engineering Applications	1	0302102	-
0508202	Engineering Mathematics (1)	3	0302102	-
0508211	Electrical Circuits (1)	3	0303102	-
0511231	Logic Circuits Design	3	0612114	-
0303104	General Physics Lab (2)	1	0303102	-
0502200	Numerical Analysis for Engineers	3	0302102	-
	University Elective	3	-	-
	Total	**17**		
Second Term				
Course No.	**Course Title**	**Cr. Hr.**	**Prerequisite1**	**Prereq.2**
0511233	Microprocessors and Assembly Language	3	0511231	-
0505221	Signal & Systems	3	0508201	0508202
0508203	Engineering Mathematics (2)	3	0508202	-
0511234	Logic Circuits Design Lab.	1	0511231*	-
0508212	Electrical Circuits (2)	3	0508211	-
0505261	Electronics (1)	3	0508211	-
	Total	**16**		

Third Year				
First Term				
Course No.	**Course Title**	**Cr. Hr.**	**Prerequisite1**	**Prereq.2**
0511330	Microprocessors and Assembly Language Lab	1	0511233*	-
0508311	Electrical Circuits Lab	1	0508212	-
0508341	Control Systems	3	0508221	-
0505351	Electromagnetics (1)	3	0508203	-
0505361	Electronics (2)	3	0505261	-
0505323	Probability and Random Processes	3	0505221	-
	Compulsory University	3	-	-
	Total	**17**		
Second Term				
Course No.	**Course Title**	**Cr. Hr.**	**Prerequisite1**	**Prereq.2**
0505363	Electronics Lab	1	0505361	-
0508342	Control Systems Lab	1	0508341	-
0505364	Digital Electronics	3	0511231	0505361
0502300	Communication Skills	1	0202101	-
0508343	Instrumentations and Measurements	2	0505261	0508212
0505353	Electromagnetics (2)	3	0505351	-
0505324	Analog Communication	3	0505323	-
0508371	Electrical Machines (1)	3	0505351	0508212
	Total	**17**		

Fourth Year				
First Term				
Course No.	**Course Title**	**Cr. Hr.**	**Prerequisite1**	**Prereq.2**
0505421	Digital Communication	3	0505324	-
0511431	Embedded Systems	3	0511233	0508341
0508344	Instrumentations and Measurements Lab	1	0508343	-
0508461	Power Electronics	3	0508361	-
0508471	Electrical Machines (2)	3	0508371	-
	University Elective	3	-	-
	Total	**16**		
Second Term				
Course No.	**Course Title**	**Cr. Hr.**	**Prerequisite1**	**Prereq.2**
0505463	Communication Electronics	3	0505421	0505361
0511432	Embedded Systems Lab.	1	0511431*	-
0508582	Electrical Machines Lab.	1	0508471	-
0508422	Analog Communications Lab	1	0505421	-
0508481	Electrical Power Systems (1)	3	0508371	-
0511422	Computer Networks	3	0505421	-
	University Elective	3	-	-
	Total	**15**		

Fifth Year				
First Term				
Course No.	**Course Title**	**Cr. Hr.**	**Prerequisite1**	**Prereq.2**
0508581	Electrical Power Systems (2)	3	0508481	-
0505520	Communication Systems	3	0505421	-
0508591	Graduation Project (1)	1	Completing 120 Cr. Hr.	-
	University Elective	3	-	-
	Department Elective	3	-	-
	Compulsory University	3	-	-
	Total	**16**		
Second Term				
Course No.	**Course Title**	**Cr. Hr.**	**Prerequisite1**	**Prereq.2**
0508582	Electrical Power Lab	1	0508581	-
0501454	Engineering Economy	3	0302102	-
0508592	Graduation Project (2)	2	0508591	-
	Department Elective	3	-	-
	Department Elective	3	-	-
	University Elective	3	-	-
	Total	**15**		
Summer Term				
Course No.	**Course Title**	**Cr. Hr.**	**Prerequisite1**	**Prereq.2**
0508590	Field Training	2	Completing 110 Cr. Hr.	-

Free Elective (3 Credit Hours)

A course to be taken from university wide open courses.

Yearly Distribution Of Gredit Hours

First year	26
Second Year	33
Third Year	34
Fourth Year	31
Fifth Year	33
Free Elective	3
Total	**160**

☞ *COURSES DESCRIPTION*

0508201	**Engineering Applications**	**1 Credit Hours**
	Laplace Transform, solving ODE, Using Matlab to Solve ODE, Using Simulink to solve ODE, Engineering Applications, System modeling.	
Per-/ Co-Requisites:	Calculus (2)	Department Compulsory
0508202	**Engineering Mathematics (1)**	**3 Credit Hours**
	Review of complex numbers and partial derivatives. Ordinary differential equations, first order, second-order and higher-order. Introduction to power series solution of differential equations. Engineering applications. Laplace transforms. Properties of Laplace transform. Using Laplace transform for solving differential equations. Linear algebra. Matrices and determinants. Matrix Eigen value problems. Vector calculus. Dot and cross products. coordinate systems (Cartesian, Polar, cylindrical, spherical). Conversion between coordinate systems.	
Per-/ Co-Requisites:	Calculus (2)	Department Compulsory
0505323	**Probability and Random Processes**	**3 Credit Hours**
	Introduction to probability and Random Variables. Discrete random variable. Continuous random variable. The probability density function. The probability distribution function. Statistics of random variable. Random process, Ergodicity and stationary. Auto correlation function. Power spectral density. Estimating the autocorrelation function and power spectral density from raw data. Input output relations of linear systems.	
Per-/ Co-Requisites:	Signals and Systems	Department Compulsory
0508203	**Engineering Mathematics (2)**	**3 Credit Hours**
	Vector calculus. Gradient of a scalar, Divergence of a vector field, Curl of a vector field. Line integrals. Green's theorem. Surface integrals. Triple integrals. Divergence theorem. Stokes' theorem. Complex Analysis. Complex functions. Complex integration. Power series. Taylor series. Laurent series. Fourier analysis. Fourier Series, integrals, and transforms.	
Per-/ Co-Requisites:	Engineering mathematics (1)	Department Compulsory
0508211	**Electrical Circuits (1)**	**3 Credit Hours**
	Types of circuits and circuit elements. Ohm's and Kirchhoff's Laws. Voltage and current dividers. Dependent sources and their analysis. Nodal and mesh analysis. Source transformation. Superposition. The venin's and Norton's theorems. Inductance and capacitance. Source-free RL and RC circuits. Applications of the unit-step forcing function. The RLC circuit: source-free parallel and series RLC circuit damping types, and complete response of the RLC circuit.	
Per-/ Co-Requisites:	General Physics (2)	Department Compulsory
0508212	**Electrical Circuits (2)**	**3 Credit Hours**
	Sinusoidal forcing function, Phasor concepts, the sinusoidal steady state response. Average power and RMS values. Polyphase circuits: Single phase, three phase (Y) and (Δ) connection. Complex frequency. Frequency response analysis. Bode Plot. Magnetically coupled circuits. Two-port networks and Filters.	
Per-/ Co-Requisites:	Electrical Circuits (1)	Department Compulsory
0508311	**Electrical Circuits Lab**	**1 Credit Hours**
	DC circuit: Kirchhoff's laws and mesh analysis. Thevenin's and Norton's theorems. Superposition theorem. Wheatstone bridge. Transient response: RL, RC, and RLC circuits. AC circuits: impedance concept, frequency response, three-phase circuits. Y- Δ transformation. Maximum power transfer. Two-port networks.	
Per-/ Co-Requisites:	Electrical Circuits (2)	Department Compulsory
0505261	**Electronics (1)**	**3 Credit Hours**
	Introduction to semiconductor materials, pn- junction diode, DC analysis and models, zener diods, Schottky diods, diode circuits: rectifiers, regulators, clippers, clampers, and multiple diode circuits; BJT transistors: DC analysis, biasing, configurations, applications, The field-effect transistor: DC analysis, and JFET MOSFET, configurations, applications.	
Per-/ Co-Requisites:	Electrical Circuits (1)	Department Compulsory
0505361	**Electronics (2)**	**3 Credit Hours**
	basic BJT amplifiers: amplifier configurations, multistage amplifiers, basic FET- amplifiers: amplifier configurations, multistage amplifiers; Frequency response of transistor amplifiers; Operational amplifier: characteristics, application;	

	Differential amplifiers. Feedback Amplifiers and oscillators.	
Per-/ Co-Requisites:	Electronics (1)	Department Compulsory
0511231	**Logic Circuits Design**	**3 Credit Hours**
	Boolean Algebra. Boolean Functions. Digital Logic Gates. Simplification of Boolean Functions: Karnaugh map method. Product of Sums (POS) and Sum of Products (SOP) forms. NAND and NOR implementations. Don't - Care conditions. Combinational logic circuits: Design procedure. Sequential logic circuits. Analysis of clocked sequential circuits.	
Per-/ Co-Requisites:	C++ Programming Language	Department Compulsory
0511234	**Logic Circuits Design Lab**	**1 Credit Hours**
	Logic Gates- Digital Adders-Subtractors- Encoders- Decoders- Demultiplexers- Multiplexers- Latches- flip-flops- Binary Counters- Shift registers	
Per-/ Co-Requisites:	Logic Circuits Design or Co-requisite	Department Compulsory
0502200	**Numerical Analysis for Engineers**	**3 Credit Hours**
	The course is a hands-on exposure to computational tools. The three contact hours of lecture define and simulate problems resulting from engineering disciplines such as electrical engineering. Fundamental knowledge of a high level language such as FORTRAN, BASIC, or C and a software tool such as MATHCAD or MATLAB are necessary. Students will learn to analyze, solve, and interpret the results of engineering problems. The primary goal of the course is to establish an understanding of the processes and limitations of machine computations, and to equip students with the competency to be productive problem solvers.	
Per-/ Co-Requisites:	Calculus (2)	Department Compulsory
0501453	**Engineering Economy**	**3 Credit Hours**
	Principles of engineering economy. Major elements of feasibility studies. Equivalence and compound interest formula. Single, uniform and exponential payment models. Decision criteria for single and multiple alternatives. Present, annual, future worth, internal rate of return, benefit cost ratio, payback methods, the treatment of various cash flows. Income tax effects on decision making and analysis of financial statements. Principles of project management, project scheduling techniques using Gantt and Precedence methods. Theories of management, engineering management and its applications in industry.	
Per-/ Co-Requisites:	Calculus (2)	Department Compulsory
0505462	**Communication Electronics**	**3 Credit Hours**
	Analysis and design of various analog and digital communication circuits including RF amplifiers, oscillators and mixers. AM transmitters and receivers, AM suppressed carrier circuits, FM transmitters and receivers, TV transceiver, A/D and D/A converters, sample and hold circuits, quantizers, encoders.	
Per-/ Co-Requisites:	Electronics (2) & Digital Communications	Department Compulsory
0505364	**Digital Electronics**	**3 Credit Hours**
	BJT gates, RTL basic gates. RTL buffer, DTL basics gate. TTL structure and operation, F10 characteristics, power dissipation. Low power and high speed TTL, open collector TTL, Shottkey TTL, ECL basic gates, MOS gates, NMOS and CMOS and inverters and gates CMOS tri-state gates. State gates. Bilateral switches comparison and interfacing of logic families. Semiconductor ROM and RAM, timing circuits, IC multi-vibrators, programmable electronics	
Per-/ Co-Requisites:	Logic Circuits Design & Electronics (2)	Department Compulsory
0505363	**Electronics Lab**	**1 Credit Hours**
	Diode characteristic, Diode applications: Half -wave and full-wave rectification, clipping and clamping circuits, Special-purpose diodes' (Zener, LED, photo diode, Schottky-barrier diode and varactor diode) characteristics and applications, BJT (CE, CB and CC configurations) input and output characteristics, BJT as a small-signal amplifier (CE, CB and CC) and as a switch, FET (JFET, DMOSFET and EMOSFET) transfer and drain (output) characteristics, FET bias circuits.	
Per-/ Co-Requisites:	Electronics (2)	Department Compulsory
0511233	**Microprocessors and Assembly Language**	**3 Credit Hours**
	Concepts in microprocessor system design, microprocessor applications, and development techniques. Coverage includes microprocessor hardware, software, architecture and buses. 80x86 Intel families, real and protected mode, interrupts and interfacing techniques are explained. Assembly language and programming techniques including subroutines, interrupts, and traps. Advanced microprocessor system architectures such as the Intel Pentium are covered	
Per-/ Co-	Logic Circuits Design	Department Compulsory

0511330	**Microprocessors and Assembly Language Lab**	**1 Credit Hours**
	Familiarization with the Microprocessor Lab. Microprocessor Instruction Set-and Assembly Language Fundamentals. Writing. Debugging. and Executing Various Assembly Language Programs. Memory (RAM) Interfacing. Microprocessor interfacing.	
Per-/ Co-Requisites:	Microprocessor and Assembly Language or Co-requisite	Department Compulsory
0511431	**Embedded Systems**	**3 Credit Hours**
	Introduction to Embedded Systems and Microcontrollers. PIC Microcontroller Architecture PIC Microcontroller Programming. I/O Port Programming and Communication. Hardware Connections and input/output devices interfacing. Data Conversion and Sensor Interfacing. Data Storage. Application of PIC microcontrollers.	
Per-/ Co-Requisites:	Microprocessors and Assembly Language & Control Systems	Department Compulsory
0505351	**Electromagnetics (1)**	**3 Credit Hours**
	Review of Vector Analysis. Static Electric Field. Gauss's Law. Energy and Potential. Conductors and Dielectrics. Steady Magnetic Field. Ampere's Circuital Law. Magnetic Forces and Materials. Boundary Conditions. Time-Varying Fields. Faraday's Law. Displacement Current. Maxwell's Equations in Point Form and Integral Form.	
Per-/ Co-Requisites:	Engineering Mathematics (2)	Department Compulsory
0505353	**Electromagnetics (2)**	**3 Credit Hours**
	Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane waves in free space, power and poynting vector, reflection of plane waves at normal incidence, reflection of plane waves at oblique incidence, transmission lines: parameters, equations, and applications. Smith chart. Waveguides: rectangular waveguides, TE and TM modes. Introduction to antennas.	
Per-/ Co-Requisites:	Electromagnetics (1)	Department Compulsory
0505221	**Signal & Systems**	**3 Credit Hours**
	Signals and Systems: Continuous-Time and Discrete-Time signals, periodic, exponential, and sinusoidal signals, Unit impulse and unit step functions, continuous-time and discrete-time Systems and System Properties. Linear Time-Invariant (LTI) Systems: Discrete-Time LTI systems, the convolution sum, continuous-time LTI systems, the convolution integral, properties of LTI systems, causal LTI systems. The Fourier Transform: Fourier series and its properties. continuous-time Fourier transform, properties of Fourier-Transform. Applications of Fourier transform: Laplace transform and inverse Laplace transform. Analysis of LTI systems using Laplace transform. Z-Transform and its application, Fourier transform of discrete time signals	
Per-/ Co-Requisites:	Engineering Applications & Engineering Mathematics (1)	Department Compulsory
0505324	**Analog Communication**	**3 Credit Hours**
	Introduction to Amplitude Modulation "AM" both full carrier and suppressed carrier; Modulation Index and Percentage of Modulation. Spectrum of AM Signal. AM Power Distribution. Angle Modulation: Frequency Modulation "FM" Principles. Phase Modulation "PM". Relationship between FM and PM. Sidebands and the Modulation Index. Spectrum of FM Signal. FM Versus AM. Principles of Digital Communications: Sampling. Quantization. Coding. Pulse Code Modulation "PCM" schemes. Frequency Division Multiplexing and Time Division Multiplexing. Modeling of noise in communication systems, the noise performance of amplitude, angle and pulse code modulated communication systems, signal to noise ratio, the additive white Gaussian noise, signal interference. Baseband Pulse Transmission: Analog Pulse Modulation (PAM, PWM and PPM), and TDM.	
Per-/ Co-Requisites:	Probability and Random Processes	Department Compulsory
0508341	**Control Systems**	**3 Credit Hours**
	Introduction to Control Systems: Characteristics, time response, steady-state error - first-order and second-order systems. Open loop and closed loop concepts. Transfer Function, time domain, frequency domain. Error types. Stability of Linear Feedback Systems. Root Locus Method: Characteristics, construction, response, and stability. Frequency Response Methods: Bode Diagram: straight-line approximation, stability in the frequency domain, gain margin and phase margin. Nyquist Plot: characteristics, stability criterion, N circles, M circles, inverse Nyquist plot. Nichols Chart. Design of Feedback Control Systems: Principles of design, design with the PD, PI, and PID controllers. Performance evaluation of feedback control systems. Compensation: phase-lead compensation, phase-lag compensation, lead-lag compensation.	
Per-/ Co-Requisites:	Signal & Systems	Department Compulsory
0505424	**Digital Signal Processing**	**3 Credit Hours**
	Introduction: Review of discrete-time signals and systems. Applications of Z-Transform. Discrete-Fourier Transform (DFT). DFT and Circular Convolution. Linear Convolution Using DFT. Fast-Fourier Transform. Transform-Domain Representations of Signals: The Discrete-time Fourier Transform. Transform-Domain Representations of LTI Systems: The Types of Transfer Functions. Stability Condition and Test. Frequency	

	Response of a Rational Transfer Function. The Concept of Filtering: Finite Impulse Response (FIR) and Infinite Impulse Response (IIR) Filters. Digital Filter Design and Structures: FIR Filter design based on the Truncated Fourier Series. FIR Filter design based on the Windowing techniques. Bilinear Transform Method of IIR Filter Design. Basic FIR Digital Filter Structures. Basic IIR Digital Filter Structures. Design Projects: Students are required to design and test the assigned projects about digital filters.	
Per-/ Co-Requisites:	Signal & Systems & Engineering Mathematics (2)	Department Compulsory
0505421	**Digital Communications**	**3 Credit Hours**
	Review of signals. Digital signaling over channels without and with ISI and AWGN. Pulse shaping, equalization, and eye-pattern. Noise in digital modulation techniques and error probability analysis. Matched filter and optimum receivers. Passband Digital Transmission: Signal and system models of binary and M-level ASK, FSK, PSK and DPSK. Signal space representation and receiver model. Error probability analysis of digital modulation techniques for coherent and non-coherent detection. Introduction to information theory, channel capacity and channel coding. Linear block codes. Error correcting capability of linear block codes. Hamming Codes.	
Per-/ Co-Requisites:	Analog Communication	Department Compulsory
0508422	**Communications Lab**	**1 Credit Hours**
	Introduction to spectrum analyzer operation. AM modulation/demodulation. FM modulation/demodulation. PM modulation/demodulation, Noise effect on AM, FM, and PM. Sample and hold, aliasing effect, pulse code modulation, delta modulation, signal to noise ratio, and signaling techniques: PSK, FSK, DPSK, QPSK, and MSK	
Per-/ Co-Requisites:	Digital Communication	Department Compulsory
0508343	**Instrumentations and Measurements**	**2 Credit Hours**
	Basic Measurement Concepts: Types of measurements, Sources and types of measurement errors, steps for minimizing measurement errors. Decibles: dB, dBm, dBmv. Sources of noise and interference and how to minimize their effect. DC and AC bridges: DC Wheatstone bridge and its application. AC bridges: Generalized AC bridge, Schering bridge, Maxwell bridge, Commercial RLC bridges. Analog DC Meters: Construction and operation of PMMC meter. DC Ammeters. Multiple-Range DC Ammeters. Ammeter loading effects. DC voltmeters, multiple-range DC voltmeters, voltmeter loading effects. DC analog ohmmeters, Analog multimeters. Meter calibration. Analog AC meters: Rectifier-based AC meters. Oscilloscopes: Cathode Ray Tube (CRT), vertical and horizontal deflection systems. Oscilloscope Controls: Vertical group, horizontal group, trigger group. Digital Multimeters: Principle of operation of digital voltmeter (DVM), DVM specifications. Digital Multimeter (DMM). Microprocessor-based DMMs. Electronic Counters: Basic frequency counter, the reciprocal counter, the Universal Counter/Timer (UCT). Transducers: RTDs, thermostors, Thermocouples, Strain Gauges, LVDTs, piezoelectric transducers, position transducers, force and pressure transducers, light transducers. Practical applications of transducers. Design Projects: Students shall be assigned simple design projects related to different types of measuring instruments.	
Per-/ Co-Requisites:	Electrical Circuits (2) & Electronics (1)	Department Compulsory
0508342	**Control Lab**	**1 Credit Hours**
	Several experiments that cover the following: first and second order control systems, transient and steady state for step, ramp, and parabolic inputs. Time and frequency response of second order systems. DC motor control. Application of PID controller, Level control. Applications of MATLAB control toolbox and Simulink, , PLC control.	
Per-/ Co-Requisites:	Control Systems	Department Compulsory
0508344	**Instrumentations and Measurements Lab**	**1 Credit Hours**
	Construction and use of potentiometers in DC and AC bridges. DC and AC indicating instruments. Shunts. Transformers and error measurements. Multimeters. Power measurements. Frequency meters and power supplies. Oscilloscopes. Spectrum analyzers.	
Per-/ Co-Requisites:	Instrumentations and Measurements	Department Compulsory
0511422	**Computer Networks**	**3 Credit Hours**
	This course is designed to provide a solid foundation and background in the field of computer networks. The main topics include the basics of computer network systems, Computer Networks and the Internet, an in-depth study of various computer network models and layers such as Application Layer, Transport Layer, Network Layer, Data Link Layer and Physical Layer.	
Per-/ Co-Requisites:	Digital Communications	Department Compulsory
0511520	**Advanced Computer Networks**	**3 Credit Hours**
	This course provides an in-depth knowledge of advanced concepts in computer networks and data communications. General topics include mobile and wireless data communications, multimedia networking, network security, network management, and data communications modeling and simulation	
Per-/ Co-Requisites:	Computer Networks	Department Compulsory
0505520	**Communication Systems**	**3 Credit Hours**

	Review of Voice and Data Communications. Line transmission and voice companders. Waveform shaping and data generation. Digital telephony and introduction to ISDN. Multiple Access Techniques. TDMA, FDMA, CDMA and Hybrid systems. Propagation Models and Antennas. Broadcasting systems Analog and Digital TV Systems, AM and FM broadcasting. Microwave and Optical Fiber Links. Satellite Communications. Satellite transponders, link budget calculation. GPS Systems: satellite configuration, timing signals, modulation and location calculations.	
Per-/ Co-Requisites:	Digital Communications	Department Compulsory
0505524	**Antenna Engineering**	**3 Credit Hours**
	Types of antennas. Radiation mechanism. Fundamental parameters of antennas. Radiation integrals. Wire antennas. Infinitesimal, small, finite length dipoles. Ground effects. Loop antennas. Linear, planar, and circular arrays. Broadband antennas. Introduction to aperture, Microstrip and smart antennas.	
Per-/ Co-Requisites:	Electromagnetics (2)	Department Compulsory
0505525	**Optical Communications**	**3 Credit Hours**
	Introduction to optical fiber waveguides, ray theory and electromagnetic theory for optical propagation, step and graded index fibers, single mode and multimode fibers, transmission characteristics of optical fiber, attenuation, absorption, scattering, bending, dispersion, preparation and fabrication of optical fibers, optical fiber cables, optical sources, LED, Laser, optical detectors, PN photodiode, PIN photodiode, avalanche photodiode APD, optical fiber systems, system design considerations, digital and analog systems, introduction to WDM and optical networks, optical fiber measurements.	
Per-/ Co-Requisites:	Electromagnetics (2) & Digital Communications	Department Compulsory
0511420	**Audio and Image Processing**	**3 Credit Hours**
	A course covering the following topics: point, algebraic and geometric operations on digital images; two-dimensional digital filtering and Fourier transforms; image enhancement, segmentation restoration and compression techniques.	
Per-/ Co-Requisites:	Signal & Systems & Engineering Mathematics (2)	Department Compulsory
0505523	**Mobile Communications**	**3 Credit Hours**
	Introduction, mobile radio environment: short term fading, long term fading, models and prediction of the median path loss, coverage principles: multi-channel and co-channel schemes, quasi-synchronous transmission, cellular concept and frequency reuse, interferences: adjacent channel, co-channel and inter-modulation, modulation techniques, mobile communication systems: analog and digital cellular phone, (TACS, AMPS, GSM and ADC), private and public access mobile radio and radio paging, 3G and 4G mobile systems.	
Per-/ Co-Requisites:	Digital Communications	Department Elective
0508371	**Electrical Machines(1)**	**3 Credit Hours**
	Magnetic circuits. Transformers: single and three phase, ideal and practical, modeling and equivalent circuits. Application of per unit system. Harmonics. DC machines: construction, types, characteristics, speed control. AC machines: induction and synchronous, construction, types, characteristics, modeling, equivalent circuits. Speed control of induction motors.	
Per-/ Co-Requisites:	Electrical Circuits (2) & Electromagnetics (1)	Department Elective
0508471	**Electrical Machines(2)**	**3 Credit Hours**
	Synchronous motors: analysis, performance characteristics, application in power factor correction, and starting methods; testing of synchronous machines; threephase induction motors: classification, analysis, performance characteristics, starting methods, testing, and speed control; single-phase induction motors; special types of motors: stepper motors, universal motors, reluctance motors, and brushless DC motors. Prerequisite: elec. machines 1	
Per-/ Co-Requisites:	Electrical Machines(1)	Department Elective
0508481	**Electrical Power Systems (1)**	**3 Credit Hours**
	Introduction to sources of Electrical energy and power system components. Basic concepts. Per unit quantities. Per unit calculations applied to power systems. The one line diagram. Representation of transmission lines: current, voltages and power relations at both ends, reactive compensation. Symmetrical 3-phase fault calculations. Symmetrical components. Unsymmetrical faults calculations. Load flow: problem definition, Gauss siedal, Newton-Raphson (N-R), decoupled N-R, and fast decoupled N-R methods.	
Per-/ Co-Requisites:	Electrical Machines(1)	Department Elective
0508581	**Electrical Power Systems (2)**	**3 Credit Hours**
	Power system protection: layout of substations, requirements and elements of protection systems, relays. Directional and non-directional over current and earth fault feeder protection. Differential protection as applied to feeders. Principles of distance protection. Economic operation of power systems: the transmission loss equation, an interpretation of transformation "C", classical economic dispatch, automatic generation control, unit commitment. Power system stability: rotor dynamics and the swing equation, the power angle equation, synchronizing power	

	coefficient, equal-area criterion of stability, introduction to multi-machine stability studies. Prerequisite: elec. Power systems 1	
Per-/ Co-Requisites:	Electrical Power Systems (1)	Department Elective
0511524	**Distributed Systems and Applications**	**3 Credit Hours**
	This course will focus on the theory and application of distributed systems. It provides an advanced study and understanding of distributed systems, including inter-process communication, operating systems, middleware, concurrency, and applications. The course also examines the relationship of computer applications to distributed systems architecture and components. Students will apply the principles of distributed systems to research, design, and develop solutions for problems in computer and information systems. Topics to be covered include, characterization of distributed systems, distributed systems design goals, networking and internetworking, client-server and multi-tier architectures, protocols, inter-process communication, reliable and unreliable communication, remote procedure calls and remote method interfaces, operating system architecture and components, process and thread synchronization, middleware, distributed objects, distributed operating systems, performance in distributed systems, file and name service, shared data and transactions, concurrency control, recovery and fault tolerance, and examples of distributed systems.	
Per-/ Co-Requisites:	Computer Networks	Department Elective
0511333	**Computer Architecture**	**3 Credit Hours**
	his course will provide the student with an in-depth study of the organization of the central processing unit, arithmetic logic unit, control unit, instruction set design, and addressing modes of digital computers. Register Transfer model of processors and datapaths are considered. Extensive emphasis is placed on the translation of assembly language instructions into their microsequence operations within the control unit. Both hardwire and microprogramming techniques will be covered. The course also includes: Memory system organization (internal, external, and cache memories), and Input/Output techniques (programmed I/O, interrupt I/O, and DMA). Integer and floating arithmetic. Reduced Instruction Set Computers (RISC) and Complex Instruction Set Computers (CISC) are introduced as well. Parallel architecture and inter-connection networks.	
Per-/ Co-Requisites:	Microprocessors and Assembly Language	Department Elective
0508586	**Special Topics in Electrical Engineering**	**3 Credit Hours**
	One or more advanced topics in Electrical engineering. It is offered only when there is an opportunity to present material not included in the established curriculum or to keep track of latest development in Electrical engineering	
Per-/ Co-Requisites:	Department Approval	Department Elective
0511535	**Special Topics in Computer Engineering**	**3 Credit Hours**
	One or more advanced topics in Computer engineering. It is offered only when there is an opportunity to present material not included in the established curriculum or to keep track of latest development in Computer engineering	
Per-/ Co-Requisites:	Department Approval	Department Elective
0505529	**Special Topics in Communication Engineering**	**3 Credit Hours**
	One or more advanced topics in Communication engineering. It is offered only when there is an opportunity to present material not included in the established curriculum or to keep track of latest development in Communication engineering.	
Per-/ Co-Requisites:	Department Approval	Department Elective
0508441	**Industrial Automation**	**3 Credit Hours**
	Brief introduction about industrial processes and their automation; Elements of pneumatic, hydraulic and electrical control systems; Valves and Actuators; Stepper motors; PID controllers and their tuning; Implementation of digital controller; Control strategies for industrial processes; Programmable logic controller; Real-time issues on signal transmission and control; Communication systems for industrial automation; Data acquisition and Supervisory control; Control of discrete manufacturing processes; Intelligent systems for monitoring ,s supervision and control; Case studies of industrial control systems.	
Per-/ Co-Requisites:	Computer Networks	Department Compulsory
0508585	**Electrical Wiring**	**3 Credit Hours**
	Terms and definitions regarding residential, commercial and industrial wiring installations and the National Electric Code (NEC). Electrical safety and electrical blueprint reading; planning, layout, and installation of electrical distribution equipment; lighting; overcurrent protection; conductors; branch circuits; and conduits. Identify voltage drop values for 3 phase and single phase circuits to determine correct wire size for the application. Determine the correct overcurrent and grounding protection for a given electrical installation. Identify conduit fittings and associated pieces/hardware for doing wiring installations. Inspection and maintenance.	
Per-/ Co-Requisites:	Electrical Power Systems (2)	Department Compulsory

0508583	**Power System Protection**	**3 Credit Hours**
	Review of basic principles. Electromechanical/solid state/computer relays. Current and voltage transformers: steady state and transient performance. Transformer protection. Generator protection. Motor protection. Busbar protection. Fuses: mechanism of interruption of overcurrent & short circuit currents. Maintenance & testing of relays.	
Per-/ Co-Requisites:	Electrical Power Systems (2)	Department Compulsory
0508584	**Electrical Transmission & Distribution Systems**	**3 Credit Hours**
	Review to basic principles, relationship between utilities, consumers and regulatory authorities. Basic considerations and substation layout. Distribution transformers: Types, connections, and voltage regulation. Distribution equipment: Circuit breakers, re-closers, fuses, lightning protection. Grounding, Insulation coordination. Line construction. Basic consideration of transmission systems: System operation, stability, voltage level, HVDC, compensation. Transmission line Mechanical calculation conductors: Span, sag, tension, vibration, construction example, projects on design 132 KV OHL's and transmission systems.	
Per-/ Co-Requisites:	Electrical Power Systems (1)	Department Compulsory
0511528	**Computer Networks Security**	**3 Credit Hours**
	Basic computer networks security and cryptography concepts. Algorithms and protocols used incomputer and network security. Concepts and techniques for access to computer systems andnetwork resources; identification and authentication; protection of information againstintentional and unintentional attacks and threats. Cryptography and encryption of data;encryption algorithms and their information theory foundations; computer software for dataencryption. TCP/IP security, Email security, Web security, firewalls, intrusion detection systems.Security in wireless computer networks.	
Per-/ Co-Requisites:	Advanced Computer Networks	Department Elective
0511432	**Embedded Systems Lab.**	**1 Credit Hours**
	Introduction to Lab- PIC Programming- Embedded Systems Hardware/Software Design and Basic HMI- Embedded Systems Peripherals- Lab project.	
Per-/ Co-Requisites:	Embedded Systems or Co-requisite	Department Compulsory
0508582	**Electrical Power Lab.**	**1 Credit Hours**
	Voltage distribution over a string of suspension insulators. I-t fuse characteristic. Measurement of symmetrical components in unbalanced systems. Power flow relations at the ends of transmission lines. Earthing of power system neutral. Network analyzer. Comparison of the characteristics of static and electromechanical relays. Characteristics of time lag O/C relays. Differential relays. Directional relays. Load flow.	
Per-/ Co-Requisites:	Electrical Power Systems (2)	Department Compulsory
0508472	**Electrical Machines Lab.**	**1 Credit Hours**
	Transformer magnetic circuits. Testing of single and 3-phase transformers. DC generators. Speed control of DC motors. Testing and operational characteristics of alternators. Testing and operational characteristics of synchronous motors. Testing and operational characteristics of induction motors.	
Per-/ Co-Requisites:	Electrical Machines(2)	Department Compulsory
0508590	**Field Training**	**3 Credit Hours**
	A training period of (8) weeks to be spent in the industry (inside or outside Jordan) under the follow-up of an academic member from the department, periodical as well as a final reports and oral examinations are required.	
Per-/ Co-Requisites:	Completing 110 Cr. Hr	Department Compulsory
0508591	**Graduation Project (1)**	**1 Credit Hours**
	A problem will be assigned to the student in one of the different electrical engineering tracks. He will be asked to rely on himself to find a solution for the problem (which could be practical or theoretical). It is expected from the student to develop the abilities of research and independent work and to train himself to observe a time table to perform his project and to be capable to explain and express his findings in a professional manner.	
Per-/ Co-Requisites	Completing 120 Cr. Hr	Department Compulsory
0508592	**Graduation Project (2)**	**2 Credit Hours**
	Design: All phases of Graduation Project II will be designed in a systematic manner under the guidance of the Project Student is required to finish the work he started in project(1). Student is required, whenever it is possible, to use the appropriate and available software to solve his problem, simulate his solution, to build a prototype and perform all needed measurements. The student will be required to write down his final year project as a complete report (dissertation) according to the department instructions.	
Per-/ Co-Requisites	Graduation Project (1)	Department Compulsory
0508461	**Power Electronics**	**3 Credit Hours**

	Power semiconductor devices: Diodes, Thyristors, Controllable switches such as GTO, MOSFETS, protection of devices and circuits, single-phase and three-phase uncontrolled and phase-controlled rectifiers, dc-dc switch mode convertor, dc-ac inverters	
Per-/ Co-Requisites	Electronics (2)	Department Compulsory