Al-Hussein Bin Talal University

Faculty of Engineering

Department of Communications Engineering

Study plan

2014

Vision

The Department of communication 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 Communication 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 Communication Engineering Department are:

- To offer an innovative, design-oriented, accredited undergraduate program with concentrations in computer, communication, electronics and signal processing engineering.
- To educate and train students in the principles and methods of communication 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 Communication Engineering.
- Provide abroad based education in communication engineering covering analysis, design, and application of modern communication 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 Communication Engineering, as administered by the faculty of the Department of Communication 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 communication 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 communication 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 communication engineering, so they should engage in life-long learning process for a successful career in communication engineering field.
8. Knowledge of contemporary issues in the field of communication 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 communication 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, Communications Engineering courses will have numbers of the form **0505LKS**, where the codes L, K and S are described as in the following **example:**

Microwave Engineering (0505481)						
0	5	0	5	5	2	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 Communications Engineering offers the Bachelor of Science (B.Sc.) degree in Computer Engineering after successfully passing 160 credit hours.

☞ Degree Requirements:

A Bachelor of Science degree in Communications 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 (2)	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	Electronics (1)	3	3	-	0508211
0505311	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	-	0505221
0508342	Control Systems Lab.	1	-	3	0508341
0508343	Instrumentations and Measurements and	2	2	-	0508212& 0505261
0508344	Instrumentations and Measurements and Lab.	1	-	3	0508343
0505351	Electromagnetics (1)	3	3	-	0508203
0505353	Electromagnetics(2)	3	3	-	0505351
0505361	Electronics (2)	3	3		0505261
0505364	Digital Electronics	3	3	-	0505361 & 0511231
0505363	Electronics Lab	1	-	3	0505361
0505421	Digital Communications	3	3	-	0505324
0505423	Analog Communications Lab.	1	-	3	0505324
0511431	Embedded Systems	3	3	-	0511233 & 0508341
0505424	Digital Signal Processing	3	3	-	0505221 & 0508203
0505365	Digital Electronics Lab	1	-	3	0505364
0505462	Communication Electronics	3	3	-	0505361& 0505421
0505463	Communication Electronics Lab.	1	-	3	0505462
0505424	Digital Communication Lab.	1	-	3	0505421
0505524	Antenna Engineering	3	3	-	0505353
0505521	Microwave Engineering	3	3	-	0505353
0505520	Communication Systems	3	3	-	0505421
0505522	Antenna and Microwave Lab.	1	-	3	0505524 & 0505521
0505525	Optical Communications	3	3	-	0505421 & 0505353
0505533	Communication and Computer Networks	3	3	-	0505421
0505528	Advanced Communications Lab.	1	-	3	0505520
0505590	Field Training	3	-	-	Completing 110 Cr. Hr.
0505591	Graduation Project (1)	1	-	-	Completing 120 Cr. Hr.
0505592	Graduation Project (2)	2	-	-	0505591

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

Course No.	Course Title	Cr. Hr.	Lec Hr.	Lab. Hr.	Prerequisite or *Corequisite
0505523	Mobile Communications	3	3	-	0505421
0511420	Audio & Image Processing	3	3	-	0505221 & 0508203
0505428	Television Engineering	3	3	-	0505421
0505427	Information Theory and Coding	3	3	-	0505421
0505541	Modeling and Simulation of Communication Systems	3	3	-	0505520
0505526	Satellite Communications	3	3	-	0505421
0511436	Digital Control Systems	3	3	-	0508341
0508371	Electrical Machine (1)	3	3	-	0508212 & 0505351
0505527	Radar Engineering	3	3	-	0505521
0505429	Telecommunication Transmission Systems	3	3	-	0505421
0507350	Introduction to Mechanics of Materials	3	3	-	0303101
0505529	Special Topics in Communication Engineering	3	3	-	Dept. Approval

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

A course to be taken from university wide open courses.

* **Co-Requisite**

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

First Year				
First Term				
Course No.	**Course Title**	**Cr. Hr.**	**Prerequisite1**	**Prereq.2**
0202101	English Language	3	*	
0302101	Calculus(1)	3		
0303101	General Physics (1)	3		
	Compulsory University	3		
	Total	**12**		
Second Term				
Course No.	**Course Title**	**Cr. Hr.**	**Prerequisite1**	**Prereq.2**
	Compulsory University	3		
0201101	Arabic Language	3		
0302102	Calculus (2)	3	0302101	
0303102	General Physics (2)	3	0303101	
0303103	General Physics Lab (1)	1	0303101	
0612114	C^{++} Programming Language	3	0612099	
	Total	**16**		

(*) Should be taken by those students who pass the English proficiency exam.

Second Year				
First Term				
Course No.	**Course Title**	**Cr. Hr.**	**Prerequisite1**	**Prereq.2**
	Compulsory University	3	-	
0303104	General Physics Lab (2)	1	0303102	
0507291	Engineering Workshops	1		
0508202	Engineering Mathematics (1)	3	0302102	
0508211	Electrical Circuits (1)	3	0303102	
0511231	Logic Circuits Design	3	0612114	
0507231	Engineering Drawing	2	0612099	
0501100	Introduction to Engineering	1	-	
0508201	Engineering Applications	1	0302102	
	Total	**18**		
Second Term				
Course No.	**Course Title**	**Cr. Hr.**	**Prerequisite1**	**Prereq.2**
0502200	Numerical Analysis for Engineers	3	0302102	
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**
	Compulsory University	3	-	
0502300	Communication Skills	1	0202101	
0508311	Electrical Circuits Lab	1	0508212	
0508341	Control Systems	3	0508221	
0505351	Electromagnetics (1)	3	0508203	
0505361	Electronics (2)	3	0505261	
0505323	Probabilities and Random Processes	3	0505221	-
	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
0511233	Microprocessors and Assembly Language	3	0511231	
0508343	Instrumentations and Measurements	2	0505261	0508212
0505353	Electromagnetics (2)	3	0505351	
0505324	Analog Communication	3	0505324	
	Total	**16**		

Fourth Year				
First Term				
Course No.	**Course Title**	**Cr. Hr.**	**Prerequisite1**	**Prereq.2**
0505421	Digital Communication	3	0505324	
0501454	Engineering Economy	3	0302102	
0505423	Analog Communications Lab	1	0505324	
0505424	Digital Signals Processing	3	0505221	0508203
0511330	Microprocessors and Assembly Language Lab	1	0511233*	
0505365	Digital Electronics Lab	1	0505364	
	University Elective	3		
	Total	**16**		
Second Term				
Course No.	**Course Title**	**Cr. Hr.**	**Prerequisite1**	**Prereq.2**
0505462	Communication Electronics	3	0505421	0505361
0511431	Embedded Systems	3	0511233	0508341
0505463	Communication Electronics Lab	1	0505462	
0508344	Instrumentations and Measurements Lab	1	0508343	
0505426	Digital Communication Lab	1	0505421	
0505521	Microwave Engineering	3	0505353	
	University Elective	3		
	Department Elective	3		
	Total	**18**		

Fifth Year				
First Term				
Course No.	**Course Title**	**Cr. Hr.**	**Prerequisite1**	**Prereq.2**
0505533	Communication &Computer Networks	3	0505421	
0505520	Communication Systems	3	0505421	
0505524	Antenna Engineering	3	0505353	
0505591	Graduation Project (1)	1	Completing 120 Cr. Hr.	
	University Wide Elective	3		
	Department Elective	3		
	Total	**16**		
Second Term				
Course No.	**Course Title**	**Cr. Hr.**	**Prerequisite1**	**Prereq.2**
0505522	Microwaves and Antenna Lab	1	0505524	0505521
0505528	Advanced Communications Lab.	1	0505520	
0505592	Graduation Project (2)	2	0505591	
	University Wide Elective	3		
	Department Elective	3		
	Total	**10**		
Summer Term				
Course No.	**Course Title**	**Cr. Hr.**	**Prerequisite1**	**Prereq.2**
0505590	Field Training	3	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	29
Second Year	33
Third Year	33
Fourth Year	35
Fifth Year	27
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	**Electric 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	**Electric 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:	Electric Circuits (1)	Department Compulsory
0508311	**Electric 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:	Electric 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:	Electric 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:	Microprocessors 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
0505365	**Digital Electronics Lab**	**1 Credit Hours**
	Basic TTL circuits. TTL characteristics, MOS characteristics, Basic MOS logic mono-stable and astable multivibrators; comparators and Schmitt triggers; A/D and D/A converters; IC timers; sweep voltage waveforms; sample and hold circuit, interfacing of logic gates. Operational amplifiers: applications of inverter and non-inverter, differentiator and integrator.	
Per-/ Co-Requisites:	Digital Electronics	Department Compulsory
0505463	**Communication Electronics Lab**	**1 Credit Hours**
	Oscillators, Large-signal amplifiers: voltage, current and power gain, Modulation and demodulation circuits. Phase Locked Loop (PLL) circuits, Active and passive filters	
Per-/ Co-Requisites:	Communication Electronics	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:	General Physics (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
0505423	**Analog Communication Lab**	**1 Credit Hours**
	Tuned circuits and crystals; AM modulators; AM demodulators; super heterodyne radio receiver; FM modulators; FM demodulators; harmonic analysis of modulated waveforms.	
Per-/ Co-Requisites:	Analog 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
0505533	**Communication &Computer Networks**	**3 Credit Hours**
	Introduction to Communication Networks, Switching Techniques, TCP/IP protocol, The OSI model and applications.	

	Introduction to queuing theory. Network capacity improvements using coding techniques. Wireless Networking, Wireless Communication Technology,. Wireless LANs, Bluetooth, WiFi, WiMax.	
Per-/ Co-Requisites:	Digital Communications	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
0505426	**Digital Communications Lab**	**1 Credit Hours**
	Familiarization, sampling technique, time division multiplexing, pulse time modulation and demodulation, pulse code modulation and synchronization, delta modulation and demodulation, sigma delta modulation and demodulation, delta modulation circuit design, ASK, FSK, PSK and carrier generation, QPSK, coded transmission and reception.	
Per-/ Co-Requisites:	Digital Communications	Department Compulsory
0505528	**Advanced Communications Lab.**	**1 Credit Hours**
	Cell analysis and planning. Frequency management and channel assignment. GSM network evaluation and performance measurements of cells through frequency noise technique measurements of signal to noise ratio.	
Per-/ Co-Requisites:	Communication Systems	Department Compulsory
0505521	**Microwave Engineering**	**3 Credit Hours**
	Primarily a terminal undergraduate course concerning high frequency energy generation and transmission. Topics include waveguides, microwave oscillators, principles of solid-state microwave devices, and propagation of radio waves in the atmosphere.	
Per-/ Co-Requisites:	Electromagnetics (2)	Department Compulsory
0505524	**Antenna Engineering**	**3 Credit Hours**
	Introductory antenna theory and design. Fundamentals and definitions, simple radiating systems, arrays, line sources, wire antennas, broadband antennas, and antenna measurements. analyses and synthesis, horn and dish antennas, overview of micro strip antennas, introduction to the method of moments.	
Per-/ Co-Requisites:	Electromagnetics (2)	Department Compulsory
0505522	**Antennas and Microwaves Lab.**	**1 Credit Hours**
	Basic antennas, directive antennas, radiated horn antenna gain measurements, power gain and beam width horn measurements, horn and parabolic dish antennas measurements, measurements of microwave power, voltage standing wave ratio and impedance, waveguide attenuators, microwave tuners, directional couplers, series and shunt tees, microwave detectors and mixers.	
Per-/ Co-Requisites:	Microwave Engineering & Antenna Engineering	Department Compulsory
0505428	**Television Engineering**	**3 Credit Hours**
	Physical foundations of TV. Television Image Pickup and Display Devices, Generation of the TV Signal, Scanning and Deflection Stages, Synchronization of scanning, transmitting and received TV Tubes, Color Television, Broadcast color television systems, Fundamentals of digital television.	
Per-/ Co-Requisites:	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
0505427	**Information Theory and Coding**	**3 Credit Hours**
	Discrete sources and entropy: Overview of digital communication and storage systems. Discrete information and entropy. Source coding. Huffman coding. Dictionary coding and Lempel-Ziv Coding. Arithmetic coding. Channels and channel capacity: The discrete memoryless channel model. Channel capacity and the binary symmetric channel. Block coding and Shannon's second theorem. Linear Block Error-Correcting Codes: General considerations. Binary field and binary Vector space. Linear block codes. Decoding linear block codes. Hamming codes. Cyclic Codes: Definition and properties of cyclic codes. Polynomial representation of cyclic codes. Generation and decoding of cyclic codes. Convolutional Codes: Definition of convolutional codes. Structure properties of convolutional codes. The Viterbi algorithm. Hard-Decision and Soft-Decision decoding of Viterbi coder	
Per-/ Co-	Digital Communications	Department Elective

Requisites:		
0505541	**Modeling & Simulation of Communication Systems**	**3 Credit Hours**
	This course presents the simulation of communication systems using software packages. Analogue Modulations such as AM, FM as well as digital modulations such as ASK, PSK, QAM, FSK will be simulated using a software tool such as MATLAB and Simulink. Optical communication link will be modeled and designed using VPI tools, ns-2, etc., will be used to model and simulate a networks	
Per-/ Co-Requisites:	Communication Systems	Department Elective
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
0505526	**Satellite Communications**	**3 Credit Hours**
	History of satellite communications, orbital mechanics, look angle determination, transponders, antennas, satellite link design, satellite system parameters: effective isotropic radiated power, transmit power, equivalent noise temperature, noise density, carrier-to-noise density ratio, satellite system link equations, satellite multiple-access arrangements, frequency division multiplexing, multiple accessing, spade system, time-division multiple-access, code-division multiple-access, earth station technologies, satellite television: network distribution and direct broadcasting, satellite TV receiver, technical requirements.	
Per-/ Co-Requisites:	Digital Communications	Department Elective
0511436	**Digital Control Systems**	**3 Credit Hours**
	Introduction to discrete signals and systems, difference equations, state space methods, analysis of discrete systems by Z-transform methods. Response, steady state response, sampled data systems, Routh-Hurwitz criterion, Jerry's stability test, root locus, Nyquist criterion, bode diagram, bilinear transformation, PID controllers, and compression.	
Per-/ Co-Requisites:	Control Systems	Department Elective
0508371	**Electric 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) & Electromagnetic (1)	Department Elective
0505527	**Radar Engineering**	**3 Credit Hours**
	Basic theory for design and analysis of radar systems that perform target and surface imaging. Concepts and definitions, the radar range equation, modern radar design, wideband waveforms, and signal processing, synthetic high resolution radar, synthetic aperture concepts.	
Per-/ Co-Requisites:	Microwave Engineering	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
0505525	**Optical Communications**	**3 Credit Hours**
	Light propagation using ray and electromagnetic mode theories, dielectric slab waveguides, optical fibers, attenuation and dispersion in optical fibers, optical fiber transmitters and receivers, electro-optical devices, and optical fiber measurement techniques, performance evaluation of fiber optic systems, and system design considerations.	
Per-/ Co-Requisites:	Digital Communications & Electromagnetic (2)	Department Elective
0505429	**Communication Transmission Systems**	**3 Credit Hours**
	Introduction to Communication Systems & transmission media, Multiplexing Techniques, Propagation of RF waves, Microwave Communication Systems, Satellite Communication Systems, Satellite Multiple-Access arrangements, Telephony and Telephone Network.	
Per-/ Co-Requisites:	Digital Communications	Department Elective

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
0505590	**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
0505591	**Graduation Project (1)**	**1 Credit Hours**
	All students must undertake a team project related to communication engineering and electronics. This project might include designing and implement hardware for communication systems. As simulation project is one whose main purpose is to design and implement a software system that solves a well-understood problem pertaining to communication systems. A research project is one whose main purpose is experimentation or investigation into a (possibly) ill-understood problem. The team is required to submit a formal project report along with a presentation of the software/hardware product developed. In case of a research project, results of experimentation or theoretical analysis and simulation must be presented.	
Per-/ Co-Requisites	Completing 120 Cr. Hr	Department Compulsory
0505592	**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 Supervisor. A list of components and cost estimate will be prepared and submitted to the Project Supervisor for approval. The design will be put in a final form following the remarks of the Project Supervisor. Implementation and testing the design in the laboratory. Any required computer simulation will be carried out. Lab/simulation results will be compared with those obtained theoretically. The overall functioning of the complete project will be tested to ensure that the project is functioning in accordance with the given specifications. A final project report covering the complete project work carried out in Graduation Project II will be written following the guidelines given in the Faculty of Communication Engineering. Oral Presentation will be prepared for twenty-minute presentation session. The main focus of the presentation will be on the work accomplished in Graduation Project II. In the same session, the students will also demonstrate the working prototype for the completed project.	
Per-/ Co-Requisites	Graduation Project (1)	Department Compulsory
0505528	**Advanced Communications Lab.**	**3 Credit Hours**
	Code division multiple access (CDMA). GSM system, mobile station and base station interaction. GPS system. Spread spectrum technique, modulation and demodulation, direct sequence spread spectrum DSSS, frequency hopping spread spectrum FHSS. Concepts of satellite communication, satellite communication link, changing uplink and downlink frequency, audio- video satellite link between transmitter and receiver. Concepts of optical communication, optical power measurements, characteristics of LED and photodiodes, determination of the acceptance angle and numerical aperture of optical fibers, losses measurement, OTDR measurement of fiber length, attenuation and splice losses.	
Per-/ Co-Requisites	Communication Systems	Department Compulsory