University of Jordan

Faculty of Engineering & Technology

Study Plan

Master Degree

In

Electrical Engineering/Communication (Thesis Track)

Year plan

2005

STUDY PLAN
MASTER IN Electrical Engineering /Communication
(Thesis Track)

Plan Number			2005	T

I. GENERAL RULES CONDITIONS:

1. This plan conforms to the valid regulations of programs of graduate studies.
2. Areas of specialty of admission in this program:
   - Holders of the Bachelor's degree in:
   Electrical Engineering or any of its specializations (branches).

II. SPECIAL CONDITIONS: None.

III. THE STUDY PLAN : Studying (33) Credit Hours as follows:
1. Obligatory courses: (18) Credit Hours:

Course No.	Course Title	Credits	Theory	Prac.	Pre-request
0903701	Digital Signal Processing and Filtering	3	3	-	-
0903720	Random Variables and Stochastic Processes	3	3	-	-
0903721	Digital Communications I	3	3	-	-
0903722	Information Theory and Coding	3	3	-	0903721
0903723	Analysis of Communication Networks	3	3	-	0903720
0903750	Electromagnetic Fields and Radiating Systems	3	3	-	-

2. Elective Courses: Studying (6) Credit hours from the following:

Course No.	Course Title	Credits	Theory	Prac.	Pre-request
0903702	CAD for Communications	3	3	-	-
0903724	Analysis and Design of Communication Systems	3	3	-	-
0903725	Wireless Communication Systems	3	3	-	-
0903726	Statistical Communication Theory	3	3	-	0903720
0903727	Digital Communications II	3	3	-	0903721
0903728	Data Communication Systems	3	3	-	-
0903729	Selected Topics in Communications *	3	3	-	-
0903751	Electromagnetic Wave Propagation	3	3	-	0903750
903752	Antenna Theory and Design	3	3	-	0903750
0903753	Optical Communication Systems	3	3	-	0903750

* To be studied once regardless of the topic.

3. Thesis: 9 Credit hours (0903799).

Course Description

0903701 Digital Signal Processing and Filtering   (3 credits)
Review of discrete time signals and systems. Z-transform. Discrete and fast Fourier transform.   FIR and IIR filter design.   Multirate digital signal processing.   Introduction to digital signal processing system design. Applications of digital signal processing.

0903702   CAD for Communications   (3 credits)
Using MATLAB and SIMULINK for simulating communication systems. Signal coding/shaping and channel impairment simulations. The role of CAD systems in receiver design and optimization. Mathematical modeling of communication systems. Numerical solutions of linear and non-linear equations. Eigenvalue and eigenverctor problems. Introduction to circuit design and VLSI CAD tools (e.g., PSpice, Verilog HDL, Xilinx, etc).

0903720   Random Variables and Stochastic Processes   (3 credits)
Probability and random variables. Distribution and density functions. Functions of random variables. Two random variables and sequences of random variables. Multidimensional random variables. Stochastic Processes. Markov chains. Spectral representation of stochastic processes. Spectral estimation. Project.

0903721   Digital Communications I   (3 credits)
Introduction to Communication Systems. Baseband and Bandpass digital modulation techniques: Line Codes, ASK, FSK, PSK, DPSK, QAM. Performance measures: power, bandwidth, bit error rate. Carrier and symbol synchronization. Signal design for band-limited channels. Signal design for fading channels. Project.

0903722   Information Theory and Coding   (3credits)
Prereq. 0903721

Information measures and channel capacity. Source coding. Rate-Distortion theory. Linear block codes, Cyclic codes, BCH codes, convolutional codes. Burst error correcting codes. Maximum likelihood decoding of convolutional codes. Performance of block and convolutional codes in additive white Gaussian channel. Trellis coded modulation. Turbo codes and parity check codes.

0903723   Analysis of communication Networks   (3 credits)
Prereq. 0903720

Introduction to queueing theory and traffic engineering. Markov chains, steady-state and balance equations. Continuous and discrete arrival models. Basic queueing systems. Erlang formulas. Applications to telephony systems and aata networks, performance parameters (blocking probability, delay, throughput and reliability). Systems with vacations, priority systems, polling and reservation systems. Network simulation. Project.

0903724 Analysis and Design of Communications Systems   (3 credits)
Review of analog communications. Noise and distortion. Design and analysis of communication links (Microwave, Satellite, etc). Communication channels. Performance of communication systems. Audio and video broadcasting systems. Project.

0903725   Wireless Communication Systems   (3 credits)
Review of Multiple Access Techniques: TDMA, FDMA, CDMA, OFDMA. Design of wireless communication systems: modulation, propagation, channel estimation, equalization and coding. Cellular systems (GSM/3G/4G), Synchronous and Asynchronous CDMA and code synchronization. CDMA performance and multi-user interference cancellation. Satellite communication systems. Indoor communication systems, wireless LANs and wireless protocols.

0903726   Statistical Communication Theory   (3 credits)
Prereq. 0903720
Introduction to classical detection and estimation theory: simple and composite binary detection problems. M-hypothesis. Random and nonrandom parameter estimation and multiple parameter estimation. Representation of random processes. Detection of signals in white Gaussian noise. Linear and nonlinear estimation. Kalman Filters. Project.

0903727   Digital Communications II   (3 credits)
Prereq. 0903721
Review of digital modulation techniques. Partial response signaling. Multiple Access Techniques: TDMA, FDMA, CDMA, OFDMA. Combined coding and modulation: Trellis coded modulation (TCM). Multiple-In multiple-Out (MIMO) systems and spatial filtering. Performance measures. Project.

0903728   Data Communication Systems   (3 credits)
Introduction to communication and switching networks. Asynchronous and synchronous transmission, SDH/SONET. Design and planning of telephony systems. Broadband access technologies. Internetworking and the Internet Protocol (IP), routing in IP. Quality of Service (QOS). Voice over IP (VoIP). Audio and video streaming. IP network planning. Integration of data and cellular/wireless networks. Security issues. Project.

0903729   Selected Topics in Communications   (3 credits)
Subjects to be specified when course is offered.

0903750   Electromagnetic Fields and Radiating Systems   (3 credits)
Review of Maxwell's equations including the boundary conditions. Wave equation and the general plane wave in lossless, lossy and good conducting media. Energy flow and the pointing vector. Reflection, refraction and scattering of electromagnetic waves. Modes classification and the general concept of transmission lines including two conductors system (coaxial cable)

and one conductor system (waveguides). The resonant cavities. Radiation of electromagnetic waves and antennas.

0903751   Electromagnetic Wave Propagation   (3 credits)
Prereq. 0903750
Wave components and polarization. Wave equation. Reflection, refraction, diffraction and transmission of waves. Huygence's principal. Behavior of unguided electromagnetic waves in atmosphere and the effect of earth surface. Physics of the atmosphere. Wave Propagation in the Troposphere. Space wave. Surface wave. Physics of the Ionosphere. Wave Propagation in the Ionosphere. Sky Wave. Effect of the earth magnetic field. Special topics in electromagnetic wave propagation.

0903752   Antenna Theory and Design   (3 credits)
Prereq. 0903750
The concept of radiation. Antenna types and their parameters. The electric and magnetic vector potentials. Wire antennas. Wire antennas above conducting surfaces. Loop antennas. Antenna arrays, analysis and synthesis. Numerical techniques in antennas. Mutual coupling in antennas. Aperture antennas including slots and horns. Reflector antennas. Special topics in antennas.

0903753   Optical Communications Systems   (3 credits)
Prereq. 0903750
General overview of the course. Optical fibers, Attenuation and dispersion, guided wave propagation, modes in optical fiber.   Laser generation, semiconductor lasers. Light amplifiers and their applications. Optical modulation techniques.   Multiplexing methods.   Optical detectors and receivers, quantum efficiency, responsivity and bandwidth. Optical communication systems: optical modems, digital optical networks. Nonlinear optics and Soliton systems. Simulation techniques and practical aspects. Research Project.

0903799 Thesis   (9 credits)

MASTER IN: Electrical Engineering – Communication

(None Thesis Track)

Plan Number			2005	N

IV.   GENERAL RULES CONDITIONS:

3. This plan conforms to the valid regulations of programs of graduate studies.
4. Areas of specialty of admission in this program:
    - Holders of the Bachelor's degree in
      Electrical Engineering or any of its specializations (branches).

V.   SPECIAL CONDITIONS: None.

VI.   THE STUDY PLAN : Studying (33) Credit Hours as follows:
1.   Obligatory courses: (24) Credit Hours:

Course No.	Course Title	Credits	Theory	Prac.	Pre-request
0903701	Digital Signal Processing and Filtering	3	3	-	-
0903720	Random Variables and Stochastic Processes	3	3	-	-
0903721	Digital Communications I	3	3	-	-
0903722	Information Theory and Coding	3	3	-	0903721
0903723	Analysis of Communication Networks	3	3	-	0903720
0903724	Analysis and Design of Communication Systems	3	3	-	-
0903750	Electromagnetic Fields and Radiating Systems	3	3	-	-
0903753	Optical Communication Systems	3	3	-	0903750

2. Elective Courses: Studying (9) Credit hours from the following

Course No.	Course Title	Credits	Theory	Prac.	Pre-request
0903702	CAD for Communications	3	3	-	-
0903725	Wireless Communication Systems	3	3	-	-
0903726	Statistical Communication Theory	3	3	-	0903720
0903727	Digital Communications II	3	3	-	0903721
0903728	Data Communication Systems	3	3	-	-
0903729	Selected Topics in Communications *	3	3	-	-
0903751	Electromagnetic Wave Propagation	3	3	-	0903750
0903752	Antenna Theory and Design	3	3	-	0903750

* To be studied once regardless of the topic.

3. Comprehensive Exam 0903798

STUDY PLAN
MASTER IN Electrical Engineering /Communication
(Thesis Track)

Plan Number			2005	T

VII. GENERAL RULES CONDITIONS:

5. This plan conforms to the regulations of the general frame of the programs of graduate studies.
6. Areas of specialty of admission in this program:
   - Holders of the Bachelor's degree in:
   Electrical Engineering or any of its specializations (branches).

VIII. SPECIAL CONDITIONS: None.

IX. THE STUDY PLAN : Studying (33) Credit Hours as follows:
1. Obligatory courses: (18) Credit Hours:

Course No.	Course Title	Credits	Theory	Prac.	Pre-request
0903701	Digital Signal Processing and Filtering	3	3	-	-
0903720	Random Variables and Stochastic Processes	3	3	-	-
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0903722	Information Theory and Coding	3	3	-	0903721
0903723	Analysis of Communication Networks	3	3	-	0903720
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2. Elective Courses: Studying (6) Credit hours from the following:

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903752	Antenna Theory and Design	3	3	-	0903750
0903753	Optical Communication Systems	3	3	-	0903750

* To be studied once regardless of the topic.

3. Thesis: 9 Credit hours (0903799).

Course Description

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0903702   CAD for Communications   (3 credits)

Using MATLAB and SIMULINK for simulating communication systems. Signal coding/shaping and channel impairment simulations.   The role of CAD systems in receiver design and optimization. Mathematical modeling of communication systems. Numerical solutions of linear and non-linear equations. Eigenvalue and eigenverctor problems.   Introduction to circuit design and VLSI CAD tools (e.g., PSpice, Verilog HDL, Xilinx, etc).

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Introduction to Communication Systems. Baseband and Bandpass digital modulation techniques: Line Codes, ASK, FSK, PSK, DPSK, QAM. Performance measures: power, bandwidth, bit error rate. Carrier and symbol synchronization. Signal design for band-limited channels. Signal design for fading channels. Project.

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Prereq. 0903721

Information measures and channel capacity. Source coding. Rate-Distortion theory. Linear block codes, Cyclic codes, BCH codes, convolutional codes. Burst error correcting codes. Maximum likelihood decoding of convolutional codes. Performance of block and convolutional codes in additive white Gaussian channel. Trellis coded modulation. Turbo codes and parity check codes.

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Prereq. 0903720

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0903797   Comprehensive

0903799 Thesis   (9 credits)