Study Plan
Masters of Science in Computer Engineering and Networks
(Thesis Track)

I. General Rules and Conditions
   1. This plan conforms to the regulations of the general frame of programs of graduate studies at the University of Jordan.
   2. Candidates for admission in this program are holders of the Bachelor's degree in the following specialties (Fourth policy):
      a) Computer Engineering
      b) Electrical Engineering
      c) Networks Engineering
      d) Communications Engineering
      e) Electronics Engineering
      f) Mechatronics Engineering

II. The Study Plan: Studying (33) credit hours as follows:
   1. Obligatory courses listed in Table 1; (15) Credit Hours.

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Title</th>
<th>Credit hrs.</th>
<th>Pre-requisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>0903720</td>
<td>Random Variables and Stochastic Processes</td>
<td>3</td>
<td>-</td>
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<tr>
<td>0903723</td>
<td>Analysis of Communications Networks</td>
<td>3</td>
<td>0903720</td>
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<tr>
<td>0907721</td>
<td>Network Systems Design</td>
<td>3</td>
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<tr>
<td>0907731</td>
<td>Advanced Computer Architecture</td>
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<tr>
<td>0907741</td>
<td>Distributed Systems</td>
<td>3</td>
<td>0907721</td>
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</table>
2. Elective courses selected from the list shown in Table 2; (9) Credit Hours.

<table>
<thead>
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<tr>
<td>0903721</td>
<td>Digital Communications I</td>
<td>3</td>
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<td>0903725</td>
<td>Wireless Communication Systems</td>
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<td>0903728</td>
<td>Data Communication Systems</td>
<td>3</td>
<td>-</td>
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<tr>
<td>0903730</td>
<td>Multimedia Streaming</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>0907702</td>
<td>Computer Performance Evaluation</td>
<td>3</td>
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<td>0907722</td>
<td>Networks and Systems Security</td>
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<td>0907733</td>
<td>Parallel Processors</td>
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<tr>
<td>0907779</td>
<td>Special Topics in Computer Engineering and Networks</td>
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</table>

3. Masters Thesis, 0907799; (9) Credit Hours.
Study Plan
Masters of Science in Computer Engineering and Networks
(Non-Thesis Track)

I. General Rules and Conditions
1. This plan conforms to the regulations of the general frame of programs of graduate studies at the University of Jordan.
2. Candidates for admission in this program are holders of the Bachelor's degree in the following specialties (Fourth policy):
   a) Computer Engineering
   b) Electrical Engineering
   c) Networks Engineering
   d) Communications Engineering
   e) Electronics Engineering
   f) Mechatronics Engineering

II. The Study Plan: Studying (33) credit hours as follows:
1. Obligatory courses listed in Table 3; (24) Credit Hours.

<table>
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<td>0907741</td>
<td>Distributed Systems</td>
<td>3</td>
<td>0907721</td>
</tr>
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</table>
2. Elective courses selected from the list shown in Table 4; (9) Credit Hours.

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<td>0907779</td>
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</tbody>
</table>

3. The Comprehensive Exam (0907798).
III. Course Descriptions

0903720 Random Variables and Stochastic Processes (3 Credit Hours)

0903721 Digital Communications I (3 Credit Hours)

0903723 Analysis of communication Networks (3 Credit Hours)
Pre-requisite: 0903720

0903725 Wireless Communication Systems (3 Credit Hours)

0903728 Data Communication Systems (3 Credit Hours)
0903730 **Multimedia Streaming** (3 Credit Hours)

0907702 **Computer Performance Evaluation** (3 Credit Hours)

0907721 **Network Systems Design** (3 Credit Hours)
This course gives a broad view of the current state of computer networking research. Topics include: Internet architecture; Internet routing: the Border Gateway Protocol (BGP), routing characterization, routing security, Internet AS relationships, traffic engineering, end host congestion control; quality-of-service, network security: intrusion detection systems, worms, and honeypots; mobile and wireless networking; peer to peer and overlay networking; content distribution networks; sensor networks; critical network infrastructure services: Domain Name Server (DNS), mail servers, etc.; network measurement: distance estimation, bandwidth measurement, trouble shooting tools; network management.

0907722 **Networks and Systems Security** (3 Credit Hours)
Pre-requisite: 0903720
**0907723 Wireless Networks**  
*(3 Credit Hours)*  
**Pre-requisite: 0907721**  
Introduction to wireless networks: physical layer, MAC and IEEE 802.11, HIPERLAN, Bluetooth, channel assignment and channel hopping, power control and rate control, multi-radio, network layer, mobile IP, and naming, routing in mobile networks, transport protocol in wireless networks; types of wireless networks: wireless mesh networks, sensor networks, cellular networks, delay tolerant networks, RFID and WiMax; wireless network management and security: localization, network usage studies, network diagnosis, network security.

**0907731 Advanced Computer Architecture**  
*(3 Credit Hours)*  
Subjects in scientific methodologies, review of computer design principles, processor design, RISC processors, pipelining, and memory hierarchy. Instruction level parallelism (ILP), dynamic scheduling, multiple issue, speculative execution, and branch prediction. Limits on ILP and software approaches to exploit more ILP. VLIW and EPIC approaches. Thread-level parallelism, multiprocessors, chip multiprocessors, and multi-threading. Cache coherence and memory consistency. Advanced memory hierarchy design, cache and memory optimizations, and memory technologies. Advanced topics in storage systems. Designing and evaluating I/O systems.

**0907732 Advanced Embedded Systems**  
*(3 Credit Hours)*  
0907733 Parallel Processors (3 Credit Hours)
In-depth study of the design, engineering, and evaluation of modern parallel computers. Fundamental design: naming, synchronization, latency, and bandwidth. Architectural evolution and technological driving forces. Parallel programming models, communication primitives, programming and compilation techniques, multiprogramming workloads and methodology for quantitative evaluation. Latency avoidance through replication in small-scale and large-scale shared memory designs; cache-coherency, protocols, directories, and memory consistency models. Message passing: protocols, storage management, and deadlock. Efficient network interface, protection, events, active messages, and coprocessors in large-scale designs. Latency tolerance through prefetching, multithreading, dynamic instruction scheduling, and software techniques. Network design: topology, packaging, k-ary n-cubes, performance under contention. Synchronization: global operations, mutual exclusion, and events. Alternative architectures: dataflow, SIMD, systolic arrays.

0907741 Distributed Systems (3 Credit Hours)
Pre-requisite: 0907721

0907779 Special Topics in Computer Eng. and Networks (3 Credit Hours)
Topics of special interest in current computer engineering and networks issues. The course description is specified by the department at every course offering.