German Jordanian University
Deanship of Graduate Studies


Master of Science
In
Computer Engineering/Non-Thesis


Study Plan
Academic Year 2017/2018

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# 1. Introduction

Computer Engineering (CE) combines the knowledge, skills, and discoveries in electrical engineering and computer science to build real-life computer systems. It covers several technology fields including computer hardware, software engineering and development, electronics, digital systems, telecommunication and network systems, multimedia, image and signal processing, robotics, and software-hardware integration. Computer engineers play a key role in almost all industries, such as telecommunication, banking and financial services, software development, government and city services, aerospace industry, health care, and manufacturing. The advent of computers has facilitated a systems approach to solving many problems in science, business, and industry.

The Department of Computer Engineering at GJU offers a unique and powerful Master of Science Program whose successful completion opens the doors to rewarding professional careers, postgraduate studies, and lifelong learning.

# 2. Program Objectives

The primary objectives of the MCE program are to:
1. Provide master level education that enables our graduates to pursue rewarding professional careers, postgraduate studies, and lifelong learning.
2. Provide the ICT industry with professional engineers who have sound postgraduate qualification, comprehensive understanding of computer engineering, and ability to tackle complex engineering problems .
3. Create better understanding of the practical applications and profitability of computer systems among industry managers and professionals.
4. Carry out research to solve problems of the local and global industry and to promote a computer system infrastructure for better productivity and quality.

# 3. Learning Outcomes

The primary learning outcomes of the MCE program are:
1. Provide a solid theoretical education, practical engineering experience, and a comprehensive curriculum that improves the critical thinking and innovation skills of students.
2. Provide students with the education and training in the field of computer engineering that allow them to make real contributions to the society and lead their careers.
3. Build an awareness of computing practices in industry and emerging technologies, emphasizing a working knowledge of current computer design and development techniques.

# 4. Enrollment

Students wishing to enroll in the Master's degree program in Computer Engineering must have:

A. Obtained a Bachelor of Science degree in the following disciplines:
- Computer science
- Computer Information Systems
- Management Information Systems
- Computer Engineering
- Communications Engineering
- Software Engineering
- Electrical/Electronic Engineering
- Mechanical Engineering
- Mechatronics Engineering

With a GPA of not less than 70% or equivalent.

B. Passed the TOEFL Exam with a minimum score of 500 or equivalent.

C. A relevant working experience is preferable.

Students holding other degrees need to consult with the program director for application. Students are expected to have background spanning the following:

1. Computer Systems Hardware and Software
2. Programming, data and object structures

Above is a minimum foundation of essential prerequisite knowledge needed for all students pursuing this program. Students admitted with B.Sc. in Electrical/Electronic Engineering, Mechanical Engineering, and Mechatronics Engineering must take a set of computer systems foundation courses. These foundation courses are offered at the graduate level, representing a common body of knowledge, and cover more material at a more conceptual level than comparable undergraduate courses.

# 5. Degree requirements - Non-Thesis Track

Students must complete the following requirements to obtain the mater degree in Computer Engineering:

A. A total of 24 credit hours CE core courses at GJU. Core courses (24 credit hours) to be taken at GJU: CE 701, CE 702, CE703, CE 704, CE 705, CE 724, CE 733, and CE 743.
B. A total of 9 credit hours specialization courses at GJU or other German partner universities.
C. Comprehensive examination, after completing all the core and elective courses successfully and obtaining the department approval.

| Classification | GJU semester credit Hours | | | |
|---|---|---|---|---|
| | Compulsory | Electives | Total | German Partner University |
| Computer Engineering Core Courses | 24 | - | 24 | |
| Specialization | | 9 | | 9* |
| Comprehensive examination | 0 | | 0 | |
| Total = | | | 33 | |

\* This number of credit hours may vary depending on the specialization at the German partner University. It is also possible that a student takes these credit hours as electives at GJU.

The core courses provide students with a broad knowledge of computer systems, advanced topics in operating systems and computer architecture, networking, and distributed systems. The core courses are to be taken at GJU in during the first three semesters of the program.

After completion of the first year, students have their choice of specialized courses to be offered at GJU or taken at the German partner universities. The specialization tracks are as follows:

Autonomous system
For the Autonomous System specialization, the curriculum provides students with in-depth knowledge of robotics, artificial systems, and computer technologies. Students are required to choose specialization tracks related to their work experience.

Hardware System Design
For the Hardware System Design specialization, the curriculum provides students with in-depth knowledge of hardware design and implementation, digital systems,

parallel architecture, and hardware/software co-design.

Computer Network

For the Computer Network specialization, the curriculum provides students with extensive knowledge and training in the theoretical and practical aspects of computer networks, network design and management, distributed systems, and wireless communications.
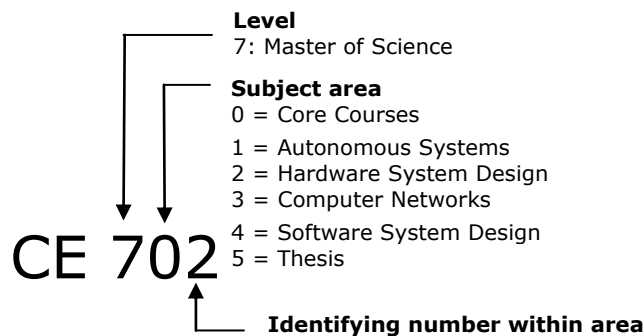
Software System Design

For the Software System Design specialization, the curriculum provides students with extensive knowledge and training in the theoretical and practical aspects of software systems, including operating systems, system requirements, software analysis and design, and multi-agent systems.

6. Curriculum

The numbering system is structured as follows (from left to right):
1. Alpha digits - CE: Computer Engineering
2. Level digit - 7: Master of Science
3. Subject area digits; One digit: serial number within a given area

**Level**
7: Master of Science

**Subject area**
0 = Core Courses
1 = Autonomous Systems
2 = Hardware System Design
3 = Computer Networks
4 = Software System Design
5 = Thesis

# CE 702

**Identifying number within area**

Core Courses

Core courses (24 credit hours) to be taken at GJU: CE 701, CE 702, CE703, CE 704, CE 705, CE 724, CE 733, and CE 743.

| Course code | Course name | Credit Hours | Prerequisite |
|---|---|---|---|
| CE 701 | Probability and Stochastic Modeling | 3.0 | |
| CE 702 | Parallel and distributed systems | 3.0 | - |
| CE 703 | Advanced computer architecture and organization | 3.0 | |
| CE 704 | Network and communication systems | 3.0 | |
| CE 705 | Real-time systems | 3.0 | - |
| CE 724 | Hardware/ software co-design | 3.0 | |
| CE 733 | Network Design and Security | 3.0 | |
| CE 743 | Advanced software analysis and design | 3.0 | |
| Total = | | 24 | |

Elective Courses

Elective courses: 9 credit hours - **Autonomous Systems** to be taken at GJU selected from the list of the following courses

| Course code | Course name | Credit Hours | Prerequisite |
|---|---|---|---|
| CE 711 | Advanced Software Technology | 3.0 | |
| CE 712 | Autonomous Mobile Robots | 3.0 | - |
| CE 713 | Mathematics for Robotics and Control | 3.0 | |
| CE 714 | Principles of Cognitive Robots | 3.0 | |
| CE 715 | Computer Vision | 3.0 | |
| CE 716 | Machine learning and Pattern Recognition | 3.0 | |
| CE 717 | Image Processing | 3.0 | |
| CE 718 | Optimization Methods | 3.0 | |
| Total = | | 9 | |

Elective courses: 9 credit hours – **Hardware system design** to be taken at GJU selected from the list of the following courses

| Course code | Course name | Credit Hours | Prerequisite |
|---|---|---|---|
| CE 721 | Introduction to VLSI | 3.0 | |
| CE 722 | Parallel architecture and parallel algorithms | 3.0 | - |
| CE 723 | Advanced digital systems | 3.0 | |
| Total = | | 9 | |

Elective courses: 9 credit hours – **Computer Networks** to be taken at GJU selected from the list of the following courses

| Course code | Course name | Credit Hours | Prerequisite |
|---|---|---|---|
| CE 731 | Computer Communications and Networks | 3.0 | |
| CE 732 | Fundamentals of Telecommunication Networks | 3.0 | - |
| CE 734 | Network Management | 3.0 | |
| CE 735 | Protocol Design and Validation | 3.0 | |
| CE 736 | Fault-Tolerant Distributed Systems | 3.0 | |
| CE 737 | Wireless Communications | 3.0 | |
| CE 738 | Modeling and Analysis of Telecommunications Networks | 3.0 | |
| CE 739 | Real-time and Multimedia Communication over Internet | 3.0 | |
| Total = | | 9 | |

Elective courses: 9 credit hours **– Software System Design** to be taken at GJU selected from the list of the following courses

| Course code | Course name | Credit Hours | Prerequisite |
|---|---|---|---|
| CE 741 | Advanced Operating Systems | 3.0 | |
| CE 742 | Systems Requirements | 3.0 | - |
| CE 743 | Advanced software analysis and design | 3.0 | |
| CE 745 | Multi-Agent Systems | 3.0 | |
| Total = | | 9 | |

Comprehensive examination
The comprehensive examination must be taken after completing all the core and elective courses successfully and obtaining the department approval.

| Course code | Course name | Credit Hours | Prerequisite |
|---|---|---|---|
| CE 799 | Comprehensive examination | 0 | Department approval |
| Total = | | 0 | |

# 7. Study Plan Guide

First year (at GJU):

| First Term | | | |
|---|---|---|---|
| Course No. | Course Title | Credit hours | Prerequisite |
| CE 701 | Probability and Stochastic Modeling | 3 | |
| CE 702 | Parallel and distributed systems | 3 | |
| | Total | 6 | |

| Second Term | | | |
|---|---|---|---|
| Course No. | Course Title | Credit hours | Prerequisite |
| CE 704 | Network and communication systems | 3 | |
| CE 705 | Real-time systems | 3 | |
| | Total | 6 | |

Second year (at GJU):

| First Term | | | |
|---|---|---|---|
| Course No. | Course Title | Credit hours | Prerequisite |
| CE 703 | Advanced computer architecture and organization | 3 | |
| CE 743 | Advanced software analysis and design | 3 | |
| | Total | 6 | |

| Second Term | | | |
|---|---|---|---|
| Course No. | Course Title | Credit hours | Prerequisite |
| CE 733 | Network Design and Security | 3 | |
| | Technical Elective Course | 3 | |

| | Total | 6 | |
|---|---|---|---|

Third year (at GJU):

| First Term | | | |
|---|---|---|---|
| Course No. | Course Title | Credit hours | Prerequisite |
| CE 724 | Hardware/ software co-design | 3 | |
| | Technical Elective Course | 3 | |
| | Technical Elective Course | 3 | |
| | Total | 6 | |

| Second Term | | | |
|---|---|---|---|
| Course No. | Course Title | Credit hours | Prerequisite |
| CE799 | Comprehensive examination | 0 | |
| | Total | 0 | |

# 8. Course Description

CE 701 - Probability and Stochastic Modeling

Random variables, probability distribution and density functions, functions of random variables, Markov chains, Chapman-Kolmogorov equations, classification of states, limiting probabilities, branching processes, time-reversible processes, Poisson processes, continuous-time Markov chains, birth and death processes, transition probabilities.
Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0

CE 702 - Parallel and distributed systems

This course covers various fundamental aspects of parallel and distributed computing systems and the techniques used for software development on these systems. The topics covered in the course include   parallel hardware architecture such as multi-core, computer cluster, distributed and shared memory, hierarchical memory, graphics processing unit (GPU); multi-thread (OpenMP), multi-process,

message passing (MPI); scheduling and synchronization; parallel algorithm design and multithreaded programs development; high-performance software engineering techniques; parallel applications such as matrix multiplication, matrix transposition, fast Fourier transform, sorting algorithms.

Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0

## CE 703 - Advanced Computer Architecture and organization

This course provides in-depth coverage of fundamental architecture and implementation techniques for modern processor chips. It covers topics such as advanced pipelining, superscalar execution, out-of-order processing, speculative execution, VLIW, data parallelism, multithreading, graphics processors, and multi-core chips. The students will become familiar with complex trade-offs between performance-power-complexity and the common techniques for addressing the challenges in historical and modern processors. A central part of this course is a group project on an open research question. This course assumes a solid background on basic computer organization including instruction set design, pipelining, caching, and virtual memory.

Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0

## CE 704 - Network and communication systems

Fundamentals of network technology based on a layered protocol stack (OSI and IP models), telephone network and Internet architecture, transport protocols (UDP, TCP), upper application layer protocols (such as HTTP, FTP, and SMTP), analysis of link layer protocols and their performance. Wireless LANs, framing and error detection in the data link layer, ARQ protocols, introduction to queuing theory, collision protocols (e.g. ALOHA, CSMA), fast packet switching, routing in data Networks, optimal routing, flow and congestion control, network management fundamentals.
Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0

## CE 705 - Real-time systems

Introduction to real-time systems, real-time scheduling including: multiprocessor scheduling, real-time operating systems (kernels), real-time communication, real-time programming languages, reliability and fault-tolerance, and real-time system requirements and design methods; Design, analysis, and implementation of real-time kernel mechanisms and real-time applications using kernels such as Linux and programming languages such as C++.
Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0

CE 711 - Advanced Software Technology

Advanced techniques for software development, focusing on object-oriented programming: OO model, interfaces, encapsulation, messages, classes, objects, inheritance; overview of constructs, iteration, sequence, selection, classes, objects, exceptions and exception handling, and main APIs

Offered at BRSU

Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0


CE 712 - Autonomous Mobile Robots

This course acquaints students with basic and advanced concepts of robotics and sensorimotorical systems, and essential concepts and techniques for mobility and navigation.

Offered at BRSU

Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0


CE 713 - Mathematics for Robotics and Control

Mathematical introduction to modeling, analysis and control of robotic systems; Theoretical frameworks for modeling, analysis (kinematics and dynamics) and control of generic robotic mechanical systems, rooted in rich traditions of mechanics and geometry; Serial-chain and parallel-chain manipulators, wheeled mobile robots (and hybrid combinations of these systems).

Offered at BRSU

Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0


CE 714 - Principles of Cognitive Robots

Concept of cognitive robots, robot design inspired by developmental mechanisms of psychologists and cognitive neuroscientists, machine learning techniques (neural computation, acoustic packaging), robotics principles and methods

Offered at BRSU

Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0

CE 715 - Computer Vision

This course covers various algorithms and methods that enable a machine to understand images and videos. The topics covered in this course include image formation, feature detection, segmentation, multiple view geometry, camera geometry, 3-D reconstruction, recognition and learning, and video processing.

Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0

CE 716 – Machine Learning and Pattern Recognition

This course provides a broad introduction to machine learning and statistical pattern recognition. The topics covered in this course include supervised learning (generative/discriminative learning, parametric/non-parametric learning, neural networks, and support vector machines); unsupervised learning (clustering, dimensionality reduction, kernel methods); learning theory (bias/variance tradeoffs; VC theory; large margins); reinforcement learning and adaptive control. The course will also discuss recent applications of machine learning, such as to robotic control, data mining, autonomous navigation, bioinformatics, speech recognition, and text and web data processing.

Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0

CE 717 – Image processing

This course provides a solid background in the fundamentals of digital image processing. It covers various image processing techniques, including image representation, 2D linear systems theory, 2D Fourier analysis, digital filtering, image enhancement, and segmentation. Students in this course will be exposed to real-world applications of image processing in industry, science, engineering, and medicine. Through assignments and course project, students will become familiar with the image processing facilities available in the MATLAB numeric computation environment as well as the Open Source Computer Vision (OpenCV) library.
Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0

CE 718 – Optimization Methods

This course provides an introduction to various optimization methods and algorithms, including Unconstrained Optimization Methods (One-dimensional Search Methods, Gradient Methods, Newton's Method, Conjugate Direction Methods, Quasi-Newton Methods, Solving Linear Equations, Global Search Algorithms (e.g., Simulated Annealing Algorithm, Particle Swarm Optimization, and Genetic algorithms)), Linear Programming (Simplex Method, Duality, Non-simplex Methods), and Nonlinear Constrained Optimization Methods (Problems with Equality Constraints, Problems with Inequality Constraints, Convex Optimization Problems, and Algorithms for Constrained Optimization).
Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0

CE 721 - Introduction to VLSI Systems

MOS transistors, static and dynamic MOS gates, MOS circuit fabrication, design rules, resistance and capacitance extraction, power and delay estimation, scaling, MOS combinational and sequential logic design, registers and clocking schemes, memory, data-path, and control-unit design; Elements of computer-aided circuit analysis, synthesis, and layout techniques.

Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0

CE 722 - Parallel Architectures and Parallel Algorithms

Parallelism in processors; multi-core processors; classification of parallel architectures; multiprocessor architectures; interconnections networks; Amdahl's law; abstract parallel machine models; templates for parallel algorithms; searching, merging, sorting; graph algorithms (traversing, spanning trees, connected components); numerical algorithms (matrix algorithms, linear equations). Data dependencies; shared memory computing (threads, Open MP); message passing computing; parallelization strategies (embarrassingly parallel, partitioning, pipelined, synchronous); load balance.

Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0

CE 723 - Advanced Digital Systems

The course covers advanced topics in digital design, with a special emphasis on how to model, simulate, synthesize and optimize large and complex subsystems. It also covers some of the practical industrial aspects of modern design, including use of hardware description languages (e.g. VHDL) for structured modeling and simulation. Other topics include: controller synthesis and optimization, iterative circuits, high-speed combinational arithmetic circuits, fault tolerance and soft error mitigation, power optimization strategies, asynchronous design, FPGA structures, and floating point arithmetic.

Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0

CE 724 - Hardware/ software co-design

The foundations of this lecture lie in the areas of sensors, signal processing, microcontrollers and hardware design. HW/SW co-design deals with the question of which parts of an algorithm should go into software and which into hardware.

Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0

## CE 731 - Computer Communications and Networks

Framing and error detection in the data link layer, ARQ protocols, introduction to queuing theory, Burke's theorem and networks of queues, packet multiple access and the Aloha protocol, fast packet switching, routing in data Networks, optimal routing, flow and congestion control.
Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0

## CE 732 - Fundamentals of Telecommunication Networks

Fundamentals of network technology based on a layered protocol stack, telephone network and Internet architecture, network protocols (IP), transport protocols (UDP, TCP), upper layer protocols (such as HTTP, FTP, and SMTP), analysis of link layer protocols and their performance, Wireless LANs and their protocols such as CSMA/CD and CSMA/CA.
Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0

## CE 733 - Network Design and Security

Methods and techniques for the design of computer networks, management and business perspectives on network design, estimation of traffic demand and application requirements, network cost analysis, topological design, capacity planning and network optimization, availability analysis and survivable network design. Furthermore, this course covers the following main security topics: Cryptography algorithms: Computer Networks concepts. Data encryption algorithms DES, Advanced encryption AES, Hash functions, Trusting issues, Legal and ethical issues in computer security. Access control, System management, User authentication, files protection, designing trusted OS. Writing secure code, Malicious Software, Viruses, static and dynamic buffer overflow attacks, data encapsulation, coupling and cohesion concepts, e-mail security. Threats in networks, network security controls, firewalls, intrusion detection, VPN networks, Key management, RSA algorithm, Digital signature, IPSec, Certificate authorities CA, Denial of service attacks DoS, High-speed network and cloud security (e.g., MPLS Security).
Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0

## CE 734 - Network Management

Protocols and architectures for network management, techniques for planning, controlling, organizing and decision making for telecommunications network, which includes security, fault management, configuration, and maintenance.
Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0

## CE 735 - Protocol Design and Validation

Prerequisites (Fundamentals of Telecommunication networks): Introduction to OSI model and IP/TCP protocols and services, Protocol modeling techniques: FSM models, Petri net models, Hybrid models. Temporal logic; Protocol specification

languages of ISO: Estelle model and language. Lotos model and language; Protocol implementation and techniques from formal specification to implementation. Protocol verification techniques: communicating FSM, reachability analysis, verification using checking, protocol design validation. Protocol performance: performance parameters, performance measurement by simulation, extensions to Estelle. Protocol testing: test architectures, test sequences, test sequence languages, test design methodology.
Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0


## CE 736 - Fault-Tolerant Distributed Systems

Fundamentals of the design and analysis of fault-tolerant systems, Models for distributed systems, Fault/error models, Techniques for providing hardware/software redundancy, Fault-detection in multiprocessors, Stable storage, Recovery strategies for multiprocessors (check pointing), System diagnosis, Software design faults, Experimental validation techniques, Case studies in fault-tolerant distributed systems.
Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0


## CE 737 - Wireless Communications

Prerequisites (Fundamentals of Telecommunication networks): Transmission media, analog transmission and multiplexing, digital transmission and multiplexing, link calculations, satellite transmission, microwave transmission, fading channels, nonlinear channels, intermodulation, multiple-access techniques: TDMA, FDMA, point-to-multipoint communications systems, performance objectives, measurement techniques, mobile communications systems.
Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0


## CE 738 - Modeling and Analysis of Telecommunications Networks

Prerequisites (Fundamentals of Telecommunication networks): Application of queuing theory to the analysis of the performance of telecommunication systems; Poisson arrival process and its properties; Birthdeath processes applied to queuing, service distributions; performance measures of a queuing systems; examples of queuing systems in equilibrium; finite and infinite server and population models; Erlang blocking formulae; method of stages.; Networks of queues; product-form solution for open and closed queuing networks; computational algorithms for queuing networks; the imbedded Markov chain technique applied to queues with general service distribution, analysis of multiple access techniques, TDMA, FDMA, polling, CDMA, ALOHA and CSMA.
Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0

## CE 739 - Real-time and Multimedia Communication over Internet

Prerequisites (Fundamentals of Telecommunication networks): Review of Internet architecture and protocols. Network impairments: jitter and delay. RTP: transport protocols for real-time data. Packet scheduling, QoS in the Internet: differentiated services, integrated services, Resource reservation protocol (RSVP), Multi-protocol label switching (MPLS). Voice/Fax/Video over IP. Internet-to-PSTN. Protocols and standards - H.323, Session Initiation Protocol (SIP) and Media Gateway Control Protocol (MGCP). Internet telephony signaling, and Interoperability issues.
Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0


## CE 741 - Advanced Operating Systems

This course focuses on advanced operating system topics and recent developments in operating systems research, including advanced concepts of Process/Thread Management, inter-process communication, Kernel memory functions, device drivers, and interrupts. The course also involves readings and lectures on classic and new papers. Topics: virtual memory management, synchronization and communication, file systems, protection and security, operating system structure and extension techniques, fault tolerance, and history and experience of systems programming.

Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0


## CE 742 - Systems Requirements

This course covers the use of systems requirements engineering to develop and maintain large-scale software systems. The topics included in the course include introduction to requirements engineering, project initiation, operation modeling, verification and validation, risks managing, requirements selection, requirements prioritization, requirements managing, requirements engineering, and software design.
Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0

## CE 743 – Advanced Software Analysis and Design

This course covers the theoretical and practical aspects of software systems architecture and design. The topics of the course include covers software specification, software analysis and design, software architecture modeling and design patterns, advanced object-oriented analysis and design. The course provides students with extensive understanding of unified modeling language (UML), design patterns and architectural styles, designing and describing a software system architecture using design patterns, and applying semi-formal notations to specify a software system architecture, design structure, and design behavior.
Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0

CE 744 - Hardware/ software co-design

The foundations of this lecture lie in the areas of sensors, signal processing, microcontrollers and hardware design. HW/SW co-design deals with the question of which parts of an algorithm should go into software and which into hardware.
Credit Hours: 3, Lecture Hours: 48, Lab Hours: 0


CE 799 - Comprehensive Examination (0 Credit Hours)

After the successful completion of all core and elective courses with a minimum cumulative average of 75%, students should be able to pass a comprehensive, four hours, exam. To pass, the student should have an overall grade of minimum 70%. The exam aims to measure the students' ability to understand and link the basic and advanced concepts they have learned throughout their study duration.
Credit Hours: 0, Lecture Hours: 0, Lab Hours: 0

## 9. Tuition and fees

The following table gives a breakdown of tuition and fees at GJU:

| Fees | Jordan Dinars |
|---|---|
| Credit hour fee | 120 |
| Other Fees | |
| Admission/Acceptance Fees | 120 |
| Refundable Collateral Fees | 150 |
| Registration Fees\ per semester | 120 |
| Computer Fees\ per semester | 60 |
| Medical Insurance Fee\ per semester | 50 |

## 10.      Contact information

For application and other enquiries, please contact:

E-mail: CEMaster@gju.edu.jo

Tel: +962 6 429 4100

URL: http://www.gju.edu.jo/content/graduate-programs-2459