Course Description

August 20, 2022

This document covers only the most relevant courses. They are described in the same order as they are mentioned on this list (and the next page). You can review each by scrolling down or by clicking on each.

Note:
Please keep in mind that our university does not offer any conversion formula for converting Iranian credit system to ECTS. So I had no choice but to use other websites and sources that were familiar with the Iranian system. Should you have any questions regarding duration of classes and semesters, lecture and practice hours, final projects, lecture periods, course content, etc. please do not hesitate to contact me.

Computer Science and Engineering

- Fundamentals of Computer and Programming
- Advanced Programming
- Data Structure
- Algorithm Design
- Operating Systems
- Computer Structure and Machine Language (The Theory of Formal Languages and Automata)
- Database (Principles of Database Design)
- Assembly and Machine Languages
- Microprocessor and Assembly Language
- Hardware and Software Design (Co-design)
- System Analysis and Design (Software Engineering 1)
- Signals and Systems
- Artificial Intelligence and Expert Systems
- Fundamentals of Computer Vision
- Principles of Robotics
- Computer Networks
- Internet Engineering
- Principles of Compiler Design
- Logic Circuits
- Computer Architecture
- Designing Digital Computer Systems
- Electric Circuits
- Digital Electronics and Very Large-scale Integration (VLSI)
- Fundamentals of Speech & Language Processing
- Microprocessors Laboratory

- Operating Systems Laboratory
- Computer Workshop

Mathematics

- General Mathematics 1 (Calculus 1)
- General Mathematics 2 (Calculus 2)
- Engineering Probability
- Differential Equations
- Engineering Mathematics
- Discrete Mathematics
- Linear Algebra
- Numerical Analysis

Other Disciplines

- English for Specific Purposes
- Research Methods and Presentation
- Physics 1
- Physics 2
- Physics Lab 2

Course Title	Fundamentals of Computer and Programming	**Course Code**	1912011
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	–
Co-requisite	–
Text Book(s)	• Harvey Deitel and Paul Deitel, C++ How to Program, 8 Edition, Pearson,2015.
Course Description	An introduction to computer programming using a high level programming language. Concepts and topics covered include the basic components of algorithms (primitive operations, variables, sequencing operations, conditionals/branching, repetition/loops, and subroutines/functions/recursive functions), problem decomposition, abstraction, testing and debugging, pseudo-code, file based input and output, use of a modern development environment, good coding style, pointers/references, dynamic memory allocation and basic data structures (arrays, records/structs, objects).

Course Title	Advanced Programming	**Course Code**	1912002
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	Fundamentals of Computer and Programming
Co-requisite	–
Text Book(s)	• P. Deitel and H. Deitel, Java: How to Program,. 9th Edition, Prentice Hall Inc., 2011. • B. Eckel, Thinking in Java. 4th Edition, Prentice Hall Inc., 2006.
Course Description	1. Top-Down design approach. 2. Basic Object-Oriented principles: modeling based on real world, abstraction. 3. Object-Oriented programming components: Object, Class, Method, Constructor. 4. Inheritance and Polymorphism. 5. Memory management – Introduction to dynamic memory allocation. 6. Generic programming. 7. Exception Handling. 8. I/O handling. 9. Collections. 10. Graphical User Interface programming. 11. Introduction to concurrent and parallel programming. 12. Debug and test tools.

Course Title	Data Structure	**Course Code**	1912003
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	Advanced Programming, Discrete Mathematics
Co-requisite	–
Text Book(s)	• T. Cormen, C. Leiserson, and R. Rivest,. Introduction to Algorithms. McGraw-Hill Inc., 2001. • E. Horowitz and S. Sahni, Fundamentals of Computer Algorithms, Computer Science Press, Rockville, MD, 1984.
Course Description	Covers the design, analysis, and implementation of data structures and algorithms to solve engineering problems using an object-oriented programming language. Topics include elementary data structures, (including arrays, stacks, queues, and lists), advanced data structures (including trees and graphs),the algorithms used to manipulate these structures, and their application to solving practical engineering problems.

Course Title	Algorithm Design	**Course Code**	1912004
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	Data Structures
Co-requisite	–
Text Book(s)	• T. Cormen, C. Leisorson, and R. Rivest. Introduction to Algorithms, 3rd Edition, McGraw-Hill Inc., 2001.
Course Description	This course is concerned with issues that arise in the design of algorithms for solving computational problems. In the first part methods a number of standard algorithm design paradigms are presented and example applications of these examined. In the second part of the course some theoretical issues in algorithm design are examined: the concepts of computability and computational tractability are introduced and some examples of computational problems with no feasible algorithmic solution are presented.

Course Title	Operating Systems	**Course Code**	1914009
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	Data Structures, Computer Architecture
Co-requisite	–
Text Book(s)	• P. Silberschatz, B. Galvin, and G. Gagne, Operating System Concepts. 8th Edition, John Wiley Inc., 2010.
Course Description	A fundamental overview of operating systems. Topics covered include: Operating system structures, processes, process synchronization, deadlocks, CPU scheduling, memory management, file systems, secondary storage management.

Course Title	Computer Structure and Machine Language (The Theory of Formal Languages and Automata)	**Course Code**	1914059
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	Data Structures
Co-requisite	–
Text Book(s)	• P. Linz, An Introduction to Formal Languages and Automata. 5th Edition, Jones and Barlett Publishers, 2011. • M. Sipser, Introduction to the theory of computation. 2nd Edition, PWS Publishing Company, 2006.
Course Description	The course introduces some fundamental concepts in automata theory and formal languages including grammar, finite automaton, regular expression, formal language, push-down automaton, and Turing machine. Not only do they form basic models of computation, they are also the foundation of many branches of computer science, e.g. compilers, software engineering, concurrent systems, etc. The properties of these models will be studied and various rigorous techniques for analyzing and comparing them will be discussed, by using both formalism and examples.

Course Title	Database (Principles of Database Design)	**Course Code**	1912030
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	Data Structures
Co-requisite	–
Text Book(s)	• A. Silberschatz, H. Korth, S. Sudarshan, Database System Concepts, 6th Edition, McGraw-Hill, 2009. • R. Ramakrishnan and J. Gehrke, Database Management Systems. 3rd Edition. McGraw-Hill Inc., 2003.
Course Description	The course aims to give a broad introduction to relational database systems, including the relational data model, query languages, index and file structures, query processing and optimization, concurrency and recovery, transaction management, and database design, plus optional material if time permits.

Course Title	Assembly and Machine Languages	**Course Code**	1912005
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	-
Co-requisite	–
Text Book(s)	• Carter, Paul A. PC Assembly Language. Lulu. com, 2007. • Hyde, Randall. The art of assembly language. No Starch Press, 2010.
Course Description	• Introduction to Machine Language, Assembly Language and Applications • x86 Architecture, Processor History, Registers, 16bit, 32bit and 64 bit architectures and basic commands, Object files, Libraries, The compiler and the Linker, Compiling and Linking C to assembly, Writing standalone assembly programs under Linux. • Binary, decimal, hex and octal numbers, conversion between them, Signed integers, two's complement, Carry and Overflow, the FLAGS Register, Extending bit size, Bit operations, Bitwise AND OR NOT XOR, the test command, Shift and rotate operations, Multiplication and Division • Unconditional Jump, conditional jumps, Signed and unsigned Comparisons, Loop instructions, Working with memory, implementing global variables, Little endian vs Big endian systems • Subprograms, Indirect addressing, indirect jump, The stack, the stack segment, the stack pointer register (ESP), push and pop commandsm, Argument passing,call and ret commands,indirect call, implementing pointers to functions, Calling conventions, calling conventions in C, Implementing local variables on stack, The base register (EBP) • Modular Programming in C and assembly, Interfacing assembly with C, Calling assembly routines from C, Calling C routines in assembly, the AT&T syntax, Recursion, Inline assembly, The C Pre-processor and Macros, Netwide assembler, Introduction to Interrupts, Software vs Hardware interrupts, Calling software interrupts, System Calls, General indirect addressing, Load Effective Address • Implementing arrays, Implementing 2D, 3D and N-D arrays, row-major vs column-major implementation, Segmentation, Introduction to floating point • SIMD, MMX, SSE, AVX and FMA Instruction sets • Introduction to reverse engineering, disassembling, debugging and reassembling, C compiler optimization

Course Title	Microprocessor and Assembly Language	Course Code	1914043
Credit Hours	3 (Theoretical)	ECTS Credit Hours	6.9

Pre-requisite	Computer Architecture
Co-requisite	–
Text Book(s)	• Muhammad Ali Mazidi, "The AVR Microcontroller and Embedded Systems Using Assembly and C", 2010. • Richard H. Barnett, Sarah Cox, Larry O'Cull, "Embedded C Programming and the Atmel AVR", Delnmar Cengage Learning Publishing, 2011.
Course Description	This course aims to provide information and public knowledge about microprocessors and microcontrollers such as the AVR series. The tutorial is general and it uses the ATMega16 to ATMega64 as examples. This course assists the students in understanding concepts related to the exciting technology around embedded systems and helps them to develop simple programs and to design electronic circuits using AVR based Atmel microcontrollers. The contents of the course are as follows: • Electronical memories and their structure (SRAM, DRAM, ROM, PROM, EPROM, EEPROM, . . .) • Non-electronic memories and their internal organization (Hard disk, CD, DVD, . . .) • CPU – Memory connection styles and their addressing methods • Introduction to microprocessors • AVR Atmega16, 32, 64 • Inside Atmega64, General Purpose Registers (GPR), internal and external memories, computational unit • Port programming • Jump, conditional jump, implementing control structures (conditioning and loops) using jump instructions • Direct and indirect addressing mode • Signed and unsigned multiplication and division • Bit operations, logical and arithmetic shifts, rotate, bitwise AND, OR, NOT and XOR • Stack and its structure, subroutines, call and ret instructions • Interrupt and its related registers • Atmega64 Timer/Counter • Analog to Digital and Digital to Analog Converters

Course Title	Hardware and Software Design (co-design)	**Course Code**	1914005
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	Computer Architecture
Co-requisite	–
Text Book(s)	• P. R. Schaumont, A Practical Introduction to Hardware/Software Codesign. Springer, 2010. • K. Karuri and R. Leupers, Application Analysis Tools For ASIP Design. Springer, 2011
Course Description	The objective of this course is to present techniques for co-design of embedded that consist of hardware and software components. The course covers the following subjects: models for describing hardware and software components, hardware software partitioning and scheduling, concurrent design, connecting hardware and software components, prototyping and emulation and power energy optimization. We also teach SystemC language for modeling hardware-software co-design in this course. It is a new modeling language based on C that allows engineers to program software and hardware modules of the same project easily. The course has some exercises that are distributed in the lecture and a final project that is a design and implementation of an embedded system example using System C language.

Course Title	Systems Analysis and Design (Software Engineering I)	**Course Code**	1912032
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	Advanced Programming
Co-requisite	–
Text Book(s)	• L. D. Bentley and J. L. Whitten, Systems Analysis and Design for the Global Enterprise. 7th Edition, McGraw-Hill, 2007. • C. Larman, Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development. Addison Wesley, 2004.
Course Description	System analysis and design deal with planning the development of information systems through understanding and specifying in detail what a system should do and how the components of the system should be implemented and work together. System analysts solve business problems through analyzing the requirements of information systems and designing such systems by applying analysis and design techniques. This course deals with the concepts, skills, methodologies, techniques, tools, and perspectives essential for systems analysts. This course also allows students to gain first-hand knowledge on project management and development, using Agile methodologies (Scrum). Students conduct a group project in 3 sprints. If time permits, it also reviews clean code and testing standards.

Course Title	Signals and Systems	**Course Code**	1914016
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	Engineering Mathematics
Co-requisite	–
Text Book(s)	• A. V. Oppenheim, A. S. Willsky, and S. H. Nawab, Signals and Systems. 2nd Edition, Prentice-Hall, 1996. • R. E. Ziemer, W. H. Tranter, and S. R. Fannin, Signals and Systems, Continuous and Discrete. 4th Edition, Prentice-Hall, 1998.
Course Description	Continuous signals and systems: block diagrams, linearity, causality, stability and time-invariance, linear time-invariant (LTI) systems, impulse response; Convolution sum and integral; Convolution and correlation; introduction to Stochastic Signals. Fourier techniques in signals and systems: Fourier series and transform of signals; Frequency response of continuous time LTI circuits and systems; Fourier transforms and continuous spectra; Applications, correlation and power spectrum.

Course Title	Artificial Intelligence and Expert Systems	**Course Code**	1916028
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	Data Structures
Co-requisite	–
Text Book(s)	• S. Russel and P. Norving, Artificial Intelligence: A Modern Approach. 3rd Edition, Prentice Hall, 2010.
Course Description	The course deals with a broad range of artificial intelligence (AI) topics. It introduces the programming languages for artificial intelligence Prolog and Lisp. The course begins with an introduction to AI applications, predicate calculus, and state space search. Then it delves into some central areas of artificial intelligence such as heuristic strategies, problem solving, knowledge representation, expert systems, and machine learning.

Course Title	Fundamentals of Computer Vision	**Course Code**	1916033
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	Signal and Systems
Co-requisite	–
Text Book(s)	• R. C. Gonzalez and R. E. Woods, Digital Image Processing. 3rd Edition, Prentice-Hall, 2008. • R. Jain, R. Kasturi, B. G. Schunck, Machine Vision. McGraw-Hill, 1995.
Course Description	This course provides an introduction to computer vision, including fundamentals of image formation, camera imaging geometry, feature detection and matching, stereo, motion estimation and tracking, image classification, scene understanding, and deep learning with neural networks. We will develop basic methods for applications that include finding known models in images, depth recovery from stereo, camera calibration, image stabilization, automated alignment, tracking, boundary detection, and recognition. We will develop the intuitions and mathematics of the methods in class, and then learn about the difference between theory and practice in projects. It also has about 15 coding assignments in Python, using libraries and frameworks such as OpenCV, Numpy, Scikit-learn, for gaining hands-on experience on methods discussed in the class. There are also two semester projects, one of them involving Machine Learning.

Course Title	Principles of Robotics	**Course Code**	1916034
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	Signal and Systems
Co-requisite	–
Text Book(s)	• John J. Craig, Introduction to Robotics: Mechanics and Control. 3rd Edition, Prentice Hall, 2004.
Course Description	Robotics as an application draws from many different fields and allows automation of products as diverse as cars, vacuum cleaners, and factories. This course is a challenging introduction to basic computational concepts used broadly in robotics. Topics include simulation, kinematics, control, optimization, and probabilistic inference. The mathematical basis of each area is emphasized, and concepts are motivated using common robotics applications and programming exercises.

Course Title	Computer Networks	**Course Code**	1914030
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	Operating Systems
Co-requisite	–
Text Book(s)	• James F. Kurose and Keith W. Ross, Computer Networking: A Top-Down Approach, 5th Edition, Addison-Wesley Inc., 2009.
Course Description	Introduction to networks and digital communications with a focus on Internet protocols: Application layer architectures (client/server, peer-to-peer) and protocols (HTTP-web, SMTP-mail, etc), Transport layer operation: (reliable transport, congestion and flow control, UDP, TCP); Network layer operation - (routing, addressing, IPv4 and IPv6), Data Link layer operation (error detection/correction, access control, Ethernet, 802.11), Layer 2/3 protocols (MPLS); selected current topics such as: security, multimedia protocols, quality of Service, mobility, wireless networking, emerging protocols, network management.

Course Title	Internet Engineering	**Course Code**	1912016
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	Computer Networks
Co-requisite	Databases (Principles of Database Design)
Text Book(s)	• M. Fowler, Patterns of Enterprise Application Architecture. Addison-Wesly, 2003.
Course Description	This course is an introduction to programming for the World Wide Web. We'll learn about the relationship between clients and servers, how web pages are constructed, and how the internet works. We'll examine several technologies in depth: 1. HyperText Markup Language (HTML) for authoring web pages 2. Cascading Style Sheets (CSS) for applying stylistic information to web pages 3. JavaScript for creating interactive web pages 4. Asynchronous JavaScript and XML (Ajax) for enhanced web interaction and applications. 5. PHP Hypertext Processor for generating dynamic pages on a web server 6. Structure Query Language (SQL) for interacting with databases

Course Title	Principles of Compiler Design	**Course Code**	1912012
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	Data Structures
Co-requisite	–
Text Book(s)	• Alfred V. Aho, Ravi Sethi, and Jeffrey D. Ullman, Compilers: Principles, Techniques, and Tools. Second Edition, Boston: Addison-Wesly, 2007.
Course Description	This course explores the principles, algorithms, and data structures involved in the design and construction of compilers. Topics include finite-state machines, lexical analysis, context-free grammars and other parsing techniques, symbol tables and an introduction to intermediate code generation.

Course Title	Logic Circuits	**Course Code**	1910011
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	–
Co-requisite	Discrete Mathematics
Text Book(s)	• S. Brown and Z. Vranesic, Fundamentals of Digital Logic with Verilog Design. 3rd Edition, McGraw-Hill, 2009. • C. H. Roth and L. L. Kinney, Fundamentals of Logic Design. 5th Edition, 2005.
Course Description	This course provides the student with a foundation in the fundamentals of digital logic design and computer logic circuits. Both combinational and sequential logic circuits are covered in this course. The emphasis is on the use of Boolean algebra and basic logic gates to build cost effective complex logic circuits. Topics include: Number systems, Binary arithmetic, Codes, Logic gates, Boolean algebra and simplifications, Half adders, Full adders, Decoders, Encoders, Multiplexers, Latches, Flip-Flops, Counters, Shift Registers, Memory circuits, and ALU.

Course Title	Computer Architecture	**Course Code**	1914002
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	Digital Systems I (Logic Circuits)
Co-requisite	–
Text Book(s)	• D. A. Patterson and J. L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, 4th Edition, Morgan Kaufmann Publishers Inc., 2010.
Course Description	Fundamentals of computer design; quantifying cost and performance; instruction set architecture; program behavior and measurement of instruction set use; processor datapaths and control; pipelining, handling pipeline hazards; memory hierarchies and performance; I/O devices, controllers and drivers; I/O and system performance.

Course Title	Designing Digital Computer Systems	Course Code	1914004
Credit Hours	3 (Theoretical)	ECTS Credit Hours	6.9

Pre-requisite	Computer Architecture
Co-requisite	–
Text Book(s)	• S. Palnitkar, Verilog HDL: A Guide to Digital Design and Synthesis. SunSoft Press, 2nd Edition, 2003. • C. Maxfield, The Design Warrior's Guide to FPGAs: Devices, Tools and Flows. Elsevier Publication, 2004.
Course Description	This course covers the systematic design of advanced digital systems using field-programmable gate arrays (FPGAs). The emphasis is on top-down design starting with a software application, and translating it to high-level models using a hardware description language (such as VHDL or Verilog). The course will focus on design for high-performance computing applications using streaming architectures. We will first review in detail the basic building blocks of FPGA programming. Second, we focus on architecture, design methodologies, best design practices, and optimization techniques for performance (frequency, latency, area, power, etc).

Course Title	Electric Circuits	Course Code	11914045
Credit Hours	3 (Theoretical)	ECTS Credit Hours	6.9

Pre-requisite	Differential Equations
Co-requisite	–
Text Book(s)	• W. H. Hayt, J. E. Kemmerly, and S. M. Durbin, Engineering Circuit Analysis, McGraw Hill. 8th Edition, 2012.
Course Description	Fundamental concepts in electrical circuits; circuit analysis and network theorems; linearity and superposition; series/parallel combinations of R, L, and C circuits; sinusoidal forcing; complex frequency and Bode plots; mutual inductance and transformers; two port networks.

Course Title	Digital Electronics and Very Large-scale Integration System (VLSI)	**Course Code**	1910020
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	-
Co-requisite	–
Text Book(s)	• K. W. Martin, Digital Integrated Circuit Design. New York: Oxford University Press, 2000. • Jan M. Rabaey, A. Chandrakasan, and B. Nicolic, Digital Integrated Circuits, A Design Perspective. New Jersey: Prentice Hall, 2003. • N. H. E. Weste and David M. Harris, CMOS VLSI Design: A circuits and System Perspective, Fourth Edition, Boston: Pearson Education, publishing as Addison-Wesley, 2011.
Course Description	The main objective of this course is to provide an intuition of the CMOS manufacturing process, design standards, delay estimation, principles of designing sub-systems with computing and memory modules. The course covers the following subjects: • A review on physics of electrons. • MOSFET transistors and their manufactoring process. • Modeling channel length in MOSFET transistors and their dependency on temperature. • Properties of Logical systems (propagation delay, throughput, fan-in and fan-out, noise tolerance, and power consumption). • Implementing logical functions with CMOS and NMOS. • Pass transistors and transition gates. • Dynamic CMOS • Implementing Sequential circuits with CMOS and NMOS (static registers, dynamic registers, and pulse registers) • Communication modeling (delays and energy consumption) • Reducing static and dynamic power consumption • Memory types (SRAM, DRAM, FLASH, PCM)

Course Title	Fundamentals of Speech & Language Processing	**Course Code**	1110234
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	Engineering Mathematics
Co-requisite	–
Text Book(s)	• Rabiner, Lawrence R. Digital processing of speech signals. Pearson Education India, 1978. • Deller Jr, John R. "Discrete-time processing of speech signals." In Discrete-time processing of speech signals, pp. 908-908. 1993. • Klabunde, Ralf. "Daniel jurafsky/james h. martin, speech and language processing." Zeitschrift für Sprachwissenschaft 21, no. 1 (2002): 134-135. • Siddharthan, Advaith. "Christopher D. Manning and Hinrich Schutze. Foundations of Statistical Natural Language Processing. MIT Press, 2000. ISBN 0-262-13360-1. 620 pp. $64.95/£ 44.95 (cloth)." Natural Language Engineering 8, no. 1 (2002): 91-92.
Course Description	This course aims to provide the students with the fundamentals of speech and natural language processing. Through the course, the students get familiar with the speech differences based on gender, vowels, and frequency domains. Additionally, natural language data cleaning and traditional models are presented to them, preparing them for learning recent models. The course covers the following subjects: • Introduction & Time-frequency analysis • Speech Modelling • speech compression techniques • speech recognition • Regular Expressions, Text Normalization, Edit Distance • N-gram Language Models • Naive Bayes and Sentiment Classification • Logistic Regression

Course Title	Microprocessors Laboratory	**Course Code**	1914011
Credit Hours	1 (Practical)	**ECTS Credit Hours**	4.6

Pre-requisite	Microprocessors and Assembly Language
Co-requisite	–
Text Book(s)	• John Uffenbeck, The 8086/8088 Family: Design, Programming, and Interfacing. 3rd Edition, Prentice Hall, 2001.
Course Description	This course is related to topics regarding to microprocessors and basic concepts of designing and developing them practically.

Course Title	Operating Systems Laboratory	**Course Code**	1912024
Credit Hours	1 (Practical)	**ECTS Credit Hours**	4.6

Pre-requisite	Operating Systems
Co-requisite	–
Text Book(s)	• K. Wall, M. Watson, and M. wWhitis, Linux Programming Unleashed. Sams Publishers Inc., 1999. • M. K. Dallheimer, T. Dawson, L. Kaufman, M. Welsh, Running Linux. O'Reilly, 2002.
Course Description	Testing Operating Systems subjects practically.

Course Title	Computer Workshop	**Course Code**	1912028
Credit Hours	1 (Practical)	**ECTS Credit Hours**	4.6

Pre-requisite	Fundamentals of Computer and Engineering
Co-requisite	–
Text Book(s)	–
Course Description	Familiarity with accessory systems such as card reader, printers, magnetic tape, disc and console, manner of work with terminal, familiarity with compilers and editors, familiarity with computer organization of a center, familiarity with prepared software packages such as database, spreadsheet, lotus, familiarity with the important programs of system such as sort, merge, creation and copy of files etc., familiarity with usage manner of an operating system of microcomputer

Course Title	General Mathematics I (Calculus 1)	**Course Code**	5712094
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	–
Co-requisite	–
Text Book(s)	• James Stewart, Single Variable Calculus: Concepts and Contexts, 4th edition, Cengage Learning, 2009. • George Simmons, Calculus with Analytic Geometry. 2nd Edition, McGraw-Hill Science/Engineering/Math, 1996. • Tom Apostol, Calculus, Vol. 1: One-Variable Calculus, with an Introduction to Linear Algebra, Willey, 2nd Edition, 1991.
Course Description	This is a two course sequence in the differential and integral calculus of functions of one independent variable. Topics include the basic analytic geometry of graphs of functions, and their limits, integrals and derivatives, including the Fundamental Theorem of Calculus. Also, some applications of the integral, like arc length and volumes of solids with rotational symmetry, are discussed. Applications to the physical sciences and engineering will be a focus of this course, as this sequence of courses is designed to meet the needs of students in these disciplines. Tangent lines; limits and continuity; differentiation: definition, basic rules, chain rule, rules for trig, exp and log functions; implicit differentiation; rates of change, max-min, related rates problems; 2nd derivative test; curve sketching; linear approximation and differentials; L'Hospital's rule; integration: definition, anti differentiation, area; simple substitution; volumes of solids by cross sections and shells; work; average value of a function.

Course Title	General Mathematics II (Calculus 2)	**Course Code**	5712096
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	General Mathematics I (Calculus 1)
Co-requisite	–
Text Book(s)	• James Stewart, Multivariable Calculus. Cengage Learning, 7th Edition, 2011. • Tom Apostol, Calculus, Vol. 2: Multi-Variable Calculus and Linear Algebra with Applications to Differential Equations and Probability. Wiley, 1969. • George Simmons, Calculus with Analytic Geometry, 2nd Edition, McGraw-Hill Science/Engineering/Math, 1996.
Course Description	This is the second of a two course sequence in the differential and integral calculus of functions of one independent variable. Topics include the basic and advanced techniques of integration, analytic geometry of graphs of functions, and their limits, integrals and derivatives, including the Fundamental Theorem of Calculus. Also, some applications of the integral, like arc length and volumes of solids with rotational symmetry, are discussed. Applications to the physical sciences and engineering will be a focus of this course, as this sequence of courses is designed to meet the needs of students in these disciplines. Techniques of integration, including integration by parts, simple trig substitutions, partial fractions. Basic numerical integration; improper integrals; arc length; area of surface of revolution. Separable differential equations, Euler's method, exponential growth and decay. Parametric curves and polar coordinates. Review of conic sections. Sequences and series, comparison and ratio tests, Taylor series and polynomials. Vectors in three dimensions, dot product, cross product; lines, vector valued functions of a scalar.

Course Title	Engineering Probability	**Course Code**	1110261
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	General Mathematics II (Calculus 2)
Co-requisite	–
Text Book(s)	• Alberto Leon-Garcia, Probability, Statistics, and Random Processes for Electrical Engineering,. Prentice Hall, 3rd Edition, 2008. • Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, and Keying E. Ye, Probability and Statistics for Engineers and Scientists. Pearson, 9th Edition, 2011.
Course Description	An introduction to probability theory and statistics, with an emphasis on solving problems in computer science and engineering. Probability and statistics is an important foundation for computer science fields such as machine learning, artificial intelligence, computer graphics, randomized algorithms, image processing, and scientific simulations. Topics in probability include discrete and continuous random variables, probability distributions, sums and functions of random variables, the law of large numbers, and the central limit theorem, moments, moment generating function, Markov and Chebyshev inequalities. Topics in statistics include sample mean and variance, estimating distributions, correlation, regression, and hypothesis testing. Beyond the fundamentals, this course will also focus on modern computational methods such as simulation and the bootstrap.

Course Title	Differential Equations	**Course Code**	1110203
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	General Mathematics I (Calculus 1)
Co-requisite	–
Text Book(s)	• Yunus Cengel and William Palm, Differential Equations for Engineers and Scientists. McGraw-Hill Science/Engineering/Math, 1th Edition, 2012.
Course Description	This course includes the study of first order differential equations, higher order linear differential equations, Laplace transforms, numerical methods, boundary value and initial value problems, qualitative analysis of solutions, and applications of differential equations.

Course Title	Engineering Mathematics	**Course Code**	1110001
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	General Mathematics II (Calculus 2) , Differential Equations
Co-requisite	–
Text Book(s)	• E. Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley, 2011. • C. R. Wylie, Advanced Engineering Mathematics, 6th Edition, McGraw-Hill, 1995.
Course Description	This course will provide an overview of the salient math topics most heavily used in the core sophomore-level engineering courses. These include algebraic manipulation of engineering equations, trigonometry, vectors and complex numbers, sinusoidal and harmonic signals, systems of equations and matrices, differentiation, integration and differential equations. All math topics will be presented within the context of an engineering application, and reinforced through extensive examples of their use in the core engineering courses.

Course Title	Discrete Mathematics	**Course Code**	1912027
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	–
Co-requisite	General Mathematics I (Calculus 1) and Fundamentals of Computer and Engineering
Text Book(s)	• R. P. Grimaldi, Discrete and Combinatorial Mathematics: An Applied Introduction. 5th Edition, Addison-Wesley Inc., 2004 • K. H. Rosen, Discrete Mathematics and Its Applications. 6th Edition, McGraw Hill Inc., 2007.
Course Description	**Introduction**: mathematical logic, algebra of expressions, well-structured formula, a review of theory of sets, proving methods. **Relations and functions**: dual relations, compatibility and equivalence relations, relations representation matrix, relations graph, functions, surjective functions, one to one functions, recursive relations, solving recursive functions, generating function. **Algebraic structures**: semi-groups and monoids, grammars and languages, Polish marking, groups, homomorphism, isomorphism, lattices, boolean algebra, Carnot's table, grammar, grammar as an example of monoids **Combinational analysis**: pigeon hole principle, an introduction to combinational algorithms, recursive functions and their application. **Graph theory**: directed graphs, undirected graphs, Eulerian path and Hamiltonian path, optimal paths, algorithm finding of optimal paths, connected graphs, matrix of relation and related theorems, graph applications in activities analysis. **Trees**: minimal surjective trees, mensuration of tree, application of trees, algebraic expressions and representation of their trees.

Course Title	Linear Algebra	Course Code	1115119
Credit Hours	3 (Theoretical)	ECTS Credit Hours	6.9

Pre-requisite	Calculus 2
Co-requisite	–
Text Book(s)	• Carl D. Meyer, Matrix Analysis and Applied Linear Algebra, SIAM, 2000. • Gilbert Strang, Introduction to Linear Algebra, Fifth Edition, Wellesley-Cambridge Press and SIAM, 2016. • S. Roman, Advanced Linear Algebra, Second Edition, Springer Verlag, 2005.
Course Description	• **Gaussian Elimination and Matrices, Gauss–Jordan Method** • **Rectangular Systems and Echelon Forms:** Row Echelon Forms and Rank, Reduced Row Echelon Form, Consistency of Linear Systems, Homogeneous Systems, Non- Homogeneous Systems. • **Matrix Algebra:** Addition and Transposition, Linearity, Matrix Multiplication, Properties of Matrix Multiplication, Matrix Inversion, Inverse of Sums and Sensitivity, Elementary Matrices & Equivalence. • **Vector Spaces:** Spaces & Subspaces, Four Fundamental Subspaces, Linear Independence, Basis & Dimension, Classical Least Square, Linear Transformations, Change of Basis & Similarity, Invariant Subspaces. • **Normed and Inner-Product Spaces:** Normed Spaces, Vector Norms, Matrix Norms, Inner-Product Spaces, Orthogonal Vectors, Gram Schmidt Procedure, Unitary & Orthogonal Matrices, Complementary Subspaces, Range and Null spaces Decomposition. • **Determinants:** Determinants, Additional Properties of Determinants. • **Eigenvalues and Eigenvectors:** Invariant Subspaces, Elementary Properties of Eigensystems, Diagonalization by Similarity Transformations, Function of Diagonalizable Matrices, Systems of Differential Equations, Normal Matrices, Hermitian Matrices, Positive Definite & Semi Definite Matrices, Nilpotent Matrices & Jordan Structures, Jordan Form, Functions of Nondiagonalizable Matrices, Keyley-Hamilton Theorem, Minimum Polynomials. • **Matrix Decompositions and Applications:** LU Decomposition, QR Decomposition, Cholesky Decomposition, Singular Value Decomposition (SVD). • **Perturbation Analysis of Linear System Problem:** Perturbation Analysis, Well/Ill Conditioned Systems, Condition Number & Accuracy of Solution.

Course Title	Numerical Analysis	**Course Code**	1110234
Credit Hours	2 (Theoretical)	**ECTS Credit Hours**	4.6

Pre-requisite	Differential Equations
Co-requisite	–
Text Book(s)	• Faires, J. Douglas, and Richard L. Burden. Numerical methods, 4th. Cengage Learning, 2012. • Sastry, Shankar S. Introductory methods of numerical analysis. PHI Learning Pvt. Ltd., 2012. • Chapra, Steven C., and Raymond P. Canale. "Numerical methods for engineers 5th edition." (2010).
Course Description	In recent years, numerical methods have evolved to use high-speed computer processors to address a variety of computational problems. This course's primary aim is to familiarize the students with the current numerical methods, which are optimized for implementation on CPUs and other processors. The course covers the following subjects: • Error in numerical analysis • Solving Equations • Differenc operator , Interpolation , Extrapolation , Numerical Differentiation • Numerical Ordinary differential equations • Numerical Integration • Matrix • Solving systems of linear equations • Solving systems of nonlinear equations • Regression & Curve Fitting • Linear and Nonlinear Programming

Course Title	English for Specific Purposes	**Course Code**	1910039
Credit Hours	2 (Theoretical)	**ECTS Credit Hours**	4.6

Pre-requisite	General English
Co-requisite	–
Text Book(s)	• TED group scientific lectures • IEEE Spectrum Magazine
Course Description	Introduction to basic concepts and grammar relevant to computer science, used vocabularies in software, hardware, internet, information networks. Familiarity with common messages in operating systems and software installation and programming languages and abbreviation in email and chat and search engines. Texts translation relevant to computer.

Course Title	Research Methods and Presentation	**Course Code**	1912029
Credit Hours	2 (Theoretical)	**ECTS Credit Hours**	4.6

Pre-requisite	English for Specific Purposes
Co-requisite	–
Text Book(s)	–
Course Description	Different types of scientific and technical subjects (letters, reports, pamphlets, manual and etc.), common points in all scientific and technical writings: specifying the objective of writing and its eventual readers, organizing the subjects, abstract of essay together with report, the role of a good introduction, dividing the subjects into parts and chapters, discussion and conclusion, preparing source and reference index, attachments, preparing the pictures and diagrams and tables. Important points in translation of scientific and technical subjects, writing style, marking and its importance, preparing final format of writing by typing machine or computer, foot-article, notes and other lateral subjects, an introduction to research methods, presenting subjects orally, effective use of audio-visual devices, the rules and process of drawing up graduation diploma including the main parts of thesis and details of each part, preparing and presenting a scientific essay (as assignment)

Course Title	Physics I (Heat and Mechanics)	**Course Code**	4210113
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	General Mathematics I (Calculus 1)
Co-requisite	–
Text Book(s)	• D. Halliday, R. Resnick, and J. Walker, Fundamentals of Physics. 9th Edition, Wiley, 2010. here **??**
Course Description	This is the first semester of a two-semester sequence of calculus-based introductory physics. This course uses calculus. Topics include kinematics, dynamics, rotational motion, gravitation, conservation laws of momentum and energy, thermal physics, and periodic motion. Optional topics include fluids and thermodynamics. This course meets requirements for students majoring in engineering, mathematics, computer science, or the sciences.

Course Title	Physics II (Electricity and Magnetism)	**Course Code**	4210115
Credit Hours	3 (Theoretical)	**ECTS Credit Hours**	6.9

Pre-requisite	General Mathematics I (Calculus 1)
Co-requisite	–
Text Book(s)	• D. Halliday, R. Resnick, and J. Walker, Fundamentals of Physics. 9th Edition, Wiley, 2010.
Course Description	This course is a continuation of Physics 1. This course uses calculus. Topics include wave phenomena, electricity, magnetism, an introduction to Maxwell's equations, electromagnetic waves, and optics. This course meets requirements for students majoring in engineering, mathematics, computer science, or the sciences

Course Title	Physics Lab. II (Electiricy and Magnetism)	**Course Code**	4210116
Credit Hours	1 (Practical)	**ECTS Credit Hours**	4.6

Pre-requisite	Physics II (Electricity and Magnetism)
Co-requisite	–
Text Book(s)	• D. Haliday, R. Resnick, and J. Walker, Fundamentals of Physics. 9th Edition, Wiley, 2010.
Course Description	A series of experiments to derive most of the formulas and theories discussed in Physics II (Electricity, Electromagnetic waves, magnetism)