Remarks:

*-In Shahrekord University, for an academic semester, each theoretical and practical point includes **16** hours of class attendance and **32** hours of workshop/Laboratory, respectively.*

Fundamentals of Computer Programming (Theoretical credits: 3)

Introducing organization and main parts of computer, machine language and assembly, numeric and non-numeric data representation, algorithms and sub-algorithms and flowchart, basic concepts such as frequency, selection, repetition and branching, familiarity with a structured language and programming including: constants and variables, computational and logical phrases, different types of instructions, different types of conditional operations loops, vectors and matrices, subprograms, input and output instructions, common algorithms such as methods of search and arrangement, practical examples of programming in C++ Programming.

Advanced Programming (Theoretical credits: 3)

Students will learn the advanced concepts and techniques such as OOP in Programming using C++ language. In depth C++ programming. Memory management, in-depth understanding of C++ codes, coding relation with operating system, file management, IO streams, implementation of inheritance and its related issues in C++, operator overloading, exception handling, object oriented programming principles, multi thread programming.

Advanced Programming 2 (Theoretical credits: 3)

Introduction to Java programming, control structure, method, recursion, class, string and characters, object oriented programming, multithreading, exception handling, data structures, graphical user component, file & streams. Introduction to swing, JavaFX, event handling, binding, Network programming for client and server, web service, Java database connectivity with JDBC.

Discrete Mathematics (Theoretical credits: 3)

An introduction to the foundations of discrete structures as they apply to computer science, focusing on providing a solid theoretical foundation for further work. Topics include sets, ordered structures, graph and trees, functions, proof techniques, number systems, logic, Boolean algebra, etc.

Microprocessors and Assembly Language (Theoretical credits: 3)

An introduction of the Assembly Language. The student will work with binary and hexadecimal numbering systems, computer architecture and assembly language instruction sets. The student will write assembly language programs. In addition, this course has an emphasis on microprocessor AVR atmega32 and programming in C language for this processor. The student will design and implement embedded applications for dedicated hardware platforms. Topics include CPU concepts (registers, address bus, data bus, internal versus external RAM, program counter, stack pointer, interrupts), input/output mechanisms, machine data types, timers and interrupt handling.

Data Structures (Theoretical credits: 3)

A study of the development and use of Abstract Data Types for storing and retrieving data. Data structures considered include lists, strings, tables, stacks, trees, and graphs. Pointers, templates, and classes are used for implementing data structures. Other topics include searching and sorting algorithms and recursion.

Technical English (Theoretical credits: 2)

This course aims at raising students' specific language ability in reading and writing academic texts of their own major disciplines. The subject will use reading texts from chapters of books or journal articles recommended by teachers of different majors for reading comprehension. These texts will also be used for analysis to enable students to develop an awareness of the genre in that particular discipline.

Electrical Circuits (Theoretical credits: 3)

Coulomb's, Ohm's, and Kirchhoff's laws; electrostatics and electromagnetics; resistance, capacitance, inductance; series and parallel circuits, independent and dependent voltage and current sources; energy, power; Superposition, Norton Theorems; DC and AC; initial, steady state and transient conditions; frequency selective circuits and resonance; poly-phase circuits and transformers.

Engineering Mathematics (Theoretical credits: 3)

This subject is one of the cornerstones of mathematics. Complex differentiability, Cauchy-Riemann differential equations, contour integration, residue calculus, harmonic functions, matrix factorizations, and geometric properties of complex mappings. This course covers the following topics: elementary operations with complex numbers, derivatives, integrals, Cauchy's Theorem and consequences such as the integral formula, power series, residue theorem, applications to real integrals and series.

Design of Algorithms (Theoretical credits: 3)

Review essential points of Data Structures, problem solving methods (for each method some problems and special algorithms for the problem shall be represented and being analyzed), introducing to complexity, divide & conquer method, dynamic programming method, greedy algorithms, graph algorithms.

Computer Architecture (Theoretical credits: 3)

Logic gates, combinational circuits, sequential circuits, memory and bus system, control unit, CPU, exception processing, traps and interrupts, input-output and communication, reduced instruction set computers, use of simulators (Logisim) for analysis and design of computer circuits, and traps/interrupts, exploiting memory hierarchy.

Operating Systems with laboratory (Theoretical credits: 3, Practical credit: 1)

A study of operating system concepts and how those concepts are used in the design and implementation of modern operating systems. Topics include process management, processor scheduling, memory management, virtual memory, I/O, file systems, deadlocks, and concurrency, OS migration.

The Theory of Formal Languages and Automata (Theoretical credits: 3)

This course provides a challenging introduction to some of the central ideas of theoretical computer science. Beginning in antiquity, the course will progress through finite automata, circuits and decision trees, Turing machines and computability.

Microprocessor Lab (Practical credit: 1)

This course has an emphasis on microprocessor AVR atmega32 and programming in C language for this processor.

Design of Programming Languages (Theoretical credits: 3)

The projects focus either on various aspects of programming languages (for example, simple parsers, translators, symbolic computation, and implementation of abstract data types) or on exercising the particular strengths of a given language. Students work individually or in small groups on several programming projects. Students design, implement, and test their solutions. Each project typically uses a different language, such as: Ada, C++, Java, Smalltalk, Python, LISP, Scheme, Standard ML, Haskell, and Prolog. At least one project language will support object-oriented programming and at least one will be a non-imperative language. Students will: (1) learn the fundamental principles of modern computer programming languages; (2) learn the commonalities and differences among the different languages; (3) learn about a variety of different programming languages and about their relative strengths and weaknesses; and (4) gain experience designing and writing programs in a selected set of languages.

Artificial Intelligence and Expert Systems (Theoretical credits: 3)

Introducing artificial intelligence, searching methods, basic methods for solving problems, Estimation methods, introducing the games, knowledge representation by use of first order logic, knowledge

representation by use of the other orders logic, structured representation of knowledge, advanced systems for solving problems, heuristic functions, the issue of understanding and learning, implementation of artificial intelligence systems including: languages and machines, science, architecture and industries, new research results, existing problems and an outlook to the future, expert systems, major characteristics of expert systems, inference techniques, rule-based expert systems. In this course one of the languages for understanding artificial intelligence such as LISP and/or PROLOG should be used.

Compiler Design (Theoretical credits: 3)

This course introduces the students to the principles of compiler writing. It focuses on lexical analysis, parsing, and simple code generation. The students are expected to write a complete compiler for a very simple high-level programming language.

Design and Analysis of Systems (Theoretical credits: 3)

Modeling, Design, and Testing. An introduction to object-oriented software development process and design. Topics include: iterative development, interpretation of requirements and use case documents into code; application of design notation in UML, use of commonly-used design patterns, agile development, analysis classes, design concepts, architectural design, component-level design, user interface design, software testing strategies, process and project metrics, quality management, risk management.

Software Engineering (Theoretical credits: 3)

Analysis, Design, Project Management. Applying a development design process to produce high quality software. Topics include: identifying user requirements; performing problem analysis to produce process oriented documentation; using UML notation to create design models and diagrams; investigating and applying design patterns, project management; configuration management. Completing software projects applying development processes using an object-oriented language.

Database with laboratory (Theoretical credits: 3, Practical credit: 1)

Database systems architecture. Storage structures and access techniques. Relational model, relational algebra and calculus, normalization of relations, hierarchical and network models, introduction to Microsoft SQL Server.

Internet Engineering (Theoretical credits: 3)

This course contains some web technologies including: P2P connections, Multimedia Networking, HTML and CSS, JavaScript, JQuery, ASP.Net Programming, Ajax.

Computer Workshop (Practical credit: 1)

Students getting familiar with how computer works and different parts of computer machine, moreover, different OS and basic system commands.

Logic Circuits (Theoretical credits: 3)

Boolean algebra and truth tables; combinational logics: AND, OR, NOT, XOR gates; sequential circuits: flip-flops, counters, memory circuits; logic circuit analysis, synthesis, and optimization; A/D and D/A interfaces; ROM and RAM.

Digital Circuits and Computer Architecture Laboratory (Practical credit: 1)

Practical experiments related to the courses entitled “Computer Architecture” and "Logic Circuits".

Computer Aided Digital System Design (Theoretical credits: 3)

introduction to Verilog HDL, gate-level modeling, data flow modeling, behavioral modeling, timing simulation, switch-level modeling, strength-level modeling.

Computer Networks with laboratory (Theoretical credits: 3, Practical credit: 1)

Considers a wide range of concepts used in the design and implementation of modern network systems. Course content will be organized according to the TCP/IP and the OSI model. Among topics that will be included are hardware components, protocol suites (especially TCP/IP), network topologies, IEEE 802.3 networks, bridging, and routing.

Advanced Database (Theoretical credits: 3)

This course includes advances topics of Databases such as: introduction to transactions, concurrency, backing up and restoring, XML documents, XQuery, MapReduce model, NoSQL databases (MongoDB, CouchDB)

Signal and Systems (Theoretical credits: 3)

Signals and Systems is an introduction to analog and digital signal processing, a topic that forms an integral part of engineering systems in many diverse areas, including seismic data processing, communications, speech processing, image processing, defense electronics, consumer electronics, and consumer products. The course presents and integrates the basic concepts for both continuous-time and discrete-time signals and systems. Signal and system representations are developed for both time and frequency domains. These representations are related through the Fourier transform and its generalizations, which are explored in detail. Filtering and filter design, modulation, and sampling for both analog and digital systems, as well as exposition and demonstration of the basic concepts of feedback systems for both analog and digital systems, are discussed and illustrated.

Network Security (Theoretical credits: 3)

Introduction to electronic warfare, vulnerabilities in network and solution for them, warms, Trojan horses, proxies, firewall, VPN, sniffing, spoofing, session hijacking, URL rewriting, password cracking, dictionary attacks, security accounts manager, LAN manager, denial of service, buffer overflow, symmetric and asymmetric encryption algorithms.

Data Transmission (Theoretical credits: 3)

This course introduces students to evolution trend of computer networks. It also helps students in understanding the procedure of transmitting data over the network and how to resolve the conflicting issues arising in the course of transmission. This course provides with practical knowledge and hands-on experience in transmitting data over the network. Topics to be covered include Introduction to digital and analogue representation; channels: noise, bandwidth, capacity, telecommunication history; circuit switching and packet switching; multiplexing: FDM.TDM, statistical multiplexing; virtual circuits and datagrams; Aloha, CSMA, CSMA-CD, token passing, CDMA, wireless LANs and simple performance analysis; errors, coding and redundancy; hamming theory and codes; CRCs, selective retransmission and flow control.

Wireless Network Fundamental (Theoretical credits: 3)

The objective of this course is to give an introduction to the fundamentals of the wireless communications systems, the wireless network architectures, protocols, and applications. Topics of study include an overview of wireless communications and mobile computing systems, signal propagation characteristics of wireless channels, wireless channel modelling, frequency reuse/cellular/microcellular concepts, spread-spectrum modulation for wireless systems, multiple access techniques, and wireless networking standards (e.g., 2.5G, 3G, IEEE 802.11, IEEE 802.15, IEEE 802.16/WiMAX).

Research and Technical Presentation (Theoretical credits: 2)

Students learn how to find and study scientific articles, how to write an essay and academic presentation.

Real time Systems (Theoretical credits: 3)

To introduce students to the fundamental problems, concepts, and approaches in the design and analysis of real-time systems. To study issues related to the design and analysis of systems with real-time constraints. The problem of ensuring such constraints is ultimately a scheduling problem, so much attention is devoted to such problems.

Training (Practical credits: 1)

Participatory computer experience working for company or not for profit organization in the area or inside research in university. The choice of organization and type of work is to be determined by the student but must be approved in advance by a Computer Engineering faculty member who will coordinate the student's internship.

B.S. Thesis (Practical credits: 3)

Students must submit an essay in the final year of their undergraduate studies.

Entrepreneurship:

This course is designed to help students evaluate the business skills and commitment necessary to successfully operate an entrepreneurial venture and review the challenges and rewards of entrepreneurship.

Students will learn about themselves, their decisions, and their goals to determine how entrepreneurship can play a role in their lives. Students will also be introduced to entrepreneurship from an economic perspective and the concepts of environmentally sustainable practices and social entrepreneurship.

Calculus I (Theoretical credits: 3)

Cartesian coordinates; polar coordinates; complex numbers; addition, product, root & geometrical representation of complex numbers; polar representation of complex numbers; function; functions algebra; limit and relevant theorems; infinite limit and limit in infinite; left-hand and right-hand limit; connectivity; derivative; derivation formula; inverse function and its derivative; Rolle's theorem; mean theorem; Taylor expansion; geometrical and physical applications of derivative; definition of integral of continuous functions and piecewise continuous; primitive function; application of integral in computation of area; logarithm and exponential function and their derivative; hyperbolic functions; integration methods such as change of variable; Power series and Taylor theorem and recursive functions.

Calculus II (Theoretical credits: 3)

Analytic geometry in Euclidean plane and Euclidean space, Vector-Valued functions, elementary theory of curves and surfaces, multivariable functions (limit and continuity, partial derivative), polar, spherical and cylindrical coordinates, multiple integration, green and stokes theorems, elementary account of differential forms.

Differential Equations (Theoretical credits: 3)

Nature of differential equations and their solution, family of graphs and vertical routes, physical patterns, separable equation, first order linear differential equation, homogeneous equation, second order linear equation, homogenous equation with fixed constants, method of indefinite constants, method of changing parameters, application of second order equations in physics and mechanics, solution of differential equation with series, Legendre polynomial, an introduction to differential equations set, Laplace transform and its application in solving differential equations.

Engineering Probability and Statistics (Theoretical credits: 3)

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. Topics in statistics include sample mean and variance, estimating distributions, correlation, regression, and hypothesis testing.

Physics. I (Theoretical credits: 3)

Measurement, Motion in two and three dimensions, forces and Newton's laws and its application, momentum, systems of particles, rotational kinetics, rotational dynamics, angular momentum, work and kinetic energy, potential energy, conservation of energy, gravitation, temperature, molecular properties of gasses, first law of thermodynamics, entropy and second law of thermodynamics.

Physics. II with laboratory (Theoretical credits: 3, Practical credit: 1)

Electric charge and Coulomb's law, the electric field, Gauss' law, electric potential energy and potential, the electric properties of materials, capacitance and capacitors, DC circuits, the magnetic field and magnetic field of a current, Faraday's law in induction, magnetic properties of materials, inductance, AC circuits, Ampere's law.

General English Language (Theoretical credits: 3)

The aim of this course is that students learn about the basic of English language.

General Persian Language (Theoretical credits: 3)

Familiarizing to Persian literature and Persian poets.

Islamic Related Courses (Total of Theoretical credits: 14)

Names of Courses (Islamic Thought I, Islamic Thought II, Islamic Life style, The History of Islamic Culture & Civilization, Islamic Revolution of Iran, Thematic Commentary of the Quran, Family and Population Knowledge). General topics considering ethics and religion.

Physical Education I & Physical Education II (Each Practical credit: 1)

Learning sports.