University of Mohaghegh Ardabili

Ardabil

Faculty of Electrical and Computer Engineering

Course Description

Computer Engineering

Bachelor Degree

Remarks:

According to the Academic Instruction of University, in the academic system, each theoretical credit is presented in 16 or 17 hours, each practical credit in 32 or 34 hours, and each of the workshop credit in 48 hours.

There are some different type of the courses passing by a bachelor/master/Phd student at this university, as listed below:

1. Basic
2. Major
3. Specialized
4. Elective
5. General
6. Workshop
7. Internship
8. Project
9. Optional
10. Pre-university

Each one of these types contain some courses to be passed, according to the educational regulations passed by the Ministry of Science, Research and Technology or Ministry of Health & Medical Education of Iran.

The grading system in this university is from 0 to 20. The minimum passing grade for a course leading to an Associate's Degree or a Bachelor's Degree is 10, for a course leading to a Master's Degree and Medical Sciences is 12 and for a course leading to a PhD Degree is 14.

Note : This document has been prepared at **Mahdi Darvish's** request.

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Title of the Course: Foreign language 1

Number of Credits: 3

Type of the Course: General | Theoretical

Training hours: 51 h Theoretical & h Practical

Course Objectives:

Students undertaking this course will develop their skills in reading, writing, and speaking English in an intensive study situation. They will read selected English literary texts (or extracts from them), learn skills for understanding these texts, and develop written and spoken responses to them. The selected texts will be appropriate for both students whose first language is not English and for native speakers of English. Students will develop transferable skills in critical thinking, research, the evaluation of secondary sources, and the planning and drafting of academic essays.

Title of the Course: Persian

Number of Credits: 3

Type of the Course: General | Theoretical

Training hours: 51 h Theoretical & h Practical

Course Objectives:

Familiarity with Persian language and reading literary texts, poetry and prose in Iranian Persian literature.

Title of the Course: General Mathematics 1

Number of Credits: 3

Type of the Course: Basic | Theoretical

Training hours: 51 h Theoretical & h Practical

Course Objectives:

Basic concepts of Calculus and Geometry will be taught to the students in this course which provides necessary background for technical courses.

Syllabus of Courses:

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; trigonometric functions derivative and their inverse functions; Rolle's theorem; mean theorem; Taylor expansion; geometrical and physical applications of derivative; curves and acceleration in polar coordinates; application of derivative in approximation of equations roots; definition of integral of continuous functions and piecewise continuous; basic theorems of differential & integral arithmetic; primitive function; approximate methods of integral estimate; application of integral in computation of area, length of curve, moment, center of gravity and labor ….(in Cartesian and polar coordinates); logarithm and exponential function and their derivative; hyperbolic functions; integration methods such as change of variable, component and decomposition of fractions; transform of special variables of sequence and numerical series and relevant theorems; power series and Taylor theorem with remainder.

TextBooks:

R.L. Finney, G.B. Thomas, Calculus and Analytic Geometry, Geometry, 9th Edition, Addison Wesley, 1996

Title of the Course: Physics 1

Number of Credits: 3

Type of the Course: Basic | Theoretical

Training hours: 51 h Theoretical & h Practical

Course Objectives:

Presents the applications and theory of basic physics principles. This course emphasizes problem-solving, laboratory investigation and applications. Topics include unit conversion and analysis, vectors, translational and rotational kinematics, translational and rotational dynamics, heat and temperature and harmonic motion and waves.

TextBooks:

Fundamentals of Physics, David Halliday, Jearl Walker, Robert Resnick, 10th edition

Title of the Course: Basics of Computer and Programming

Number of Credits: 3

Type of the Course: Major | Theoretical

Training hours: 51 h Theoretical & h Practical

Course Objectives:

This course teaches students the basic concepts of programming using a high-level programming language such as Pascal. Techniques for developing and implementing algorithms in a high-level programming language are discussed.

Syllabus of Courses:

- Basic computer concepts. The role of computer in today's world and giving practical examples - Introduction of the main components of the computer and its environment (hardware - software) - Numerical systems in the computer - Display of numerical and non-numerical data - Familiarity with machine language (using a hypothetical language with About 10 instructions) - Algorithm concept - Principles of algorithm design (sequence, selection and iteration) and problem solving - Expression of algorithm to pseudocode - Familiarity with a structured programming language - Constants, variables, computational and logical expressions, types of instructions; Types of conditional operation loops, vectors. Matrices: sub-programs (functions and procedures), input and output instructions, common algorithms such as search and sorting methods. Familiarity with advanced program design principles.

Title of the Course: Physical Education 1

Number of Credits: 1

Type of the Course: General | Practical

Training hours: h Theoretical & **34** h Practical

Course Objectives:

Physical education course is a general unit that aims to improve students 'physical fitness and the specialized field is not taught in this unit and the factors that should be strengthened to improve students' physical fitness are: speed, strength, endurance: musculoskeletal, agility and flexibility.

Title of the Course: Thematic interpretation of Nahj al-Balaghah

Number of Credits: 2

Type of the Course: General | Theoretical

Training hours: 34 h Theoretical & h Practical

Course Objectives:

Familiarity with the book Nahj al-Balaghah

Title of the Course: Discrete Structures

Number of Credits: 3

Type of the Course: Major | Theoretical

Pre-requisite : General Mathematics 1

Training hours: 51 h Theoretical & h Practical

Course Objectives:

The purpose of this course is to acquaint students with the concepts, structures, and techniques of discrete mathematics that are widely used in computer science and engineering. Develop basic skills including understanding and constructing precise mathematical proofs, creative thinking in problem solving, familiarity with basic results in logic, combinations, number theory, graph theory and computational theory. Provide the mathematical prerequisites needed for many of the other courses offered in the various computer engineering majors.

Syllabus of Courses:

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 function. 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. Trees: minimal surjective trees, menstruation of tree, application of trees, algebraic expressions and representation of their trees, application of graphs in activities analysis and projects control, Combinational analysis: pigeon hole principle, an introduction to combinational algorithms, recursive functions and their application. Algebraic structures: semi-groups and monoids, grammars and languages, Polish marking, groups, homomorphism, isomorphism, lattices, Boolean Algebra, grammar as an example of monoids, machines with finite states, their algebraic and graphic representation, Turing machine, Markov's algorithm, an introduction to theory of computability. Writing and implementing some programs for this course is a must.

TextBooks:

Discrete Mathematical Structures with Applications to Computer Science, J.P. Tremblay Mc Graw Hill, 1988

Title of the Course: Advanced Programming

Number of Credits: 3

Type of the Course: Major | Theoretical | Practical

Training hours: 51 h Theoretical & h Practical

Course Objectives:

The purpose of this course is to study the principles and methods necessary to produce a computer program with good quality specifications. In this regard, after covering the top-down design method to solve the problem, students will be introduced to the concepts and techniques of object-oriented programming as a tool for managing complexity in medium and large-scale applications. Program performance, testing, and debugging are focused throughout the course. An object-oriented programming language (such as Java) is used to teach these principles and methods, and students are introduced to the concepts and techniques of object-oriented programming and module-based object design, advanced concepts such as graphical user interface design. , Multidisciplinary programming (parallel) and distributed programs on the network are also covered in this course.

Syllabus of Courses:

In depth Java programming, Introduction of UI design QT. Complementary issues of Java programming, Memory management, in depth understanding of Java codes, Coding relation with operating system, file management, IO streams, clear implementing basic data structures like link lists, Generic programming, Implementation of inheritance and its related issues in Java. Multithreading essentials, exception handling, object oriented programming principles, Debugging and testing of programs, Function calling conventions, Dynamic memory coding.

TextBooks:

1- Java : how to program / P.J. Deitel, H.M. Deitel. 9th ed, 2013.

Title of the Course: General Mathematics 2

Number of Credits: 3

Type of the Course: Basic | Theoretical

Pre-requisite : General Mathematics 1

Training hours: 51 h Theoretical & h Practical

Course Objectives:

Basic concepts of Calculus and Geometry will be taught to the students in this course which provides necessary background for technical courses, continuing "General Math. I "discussions.

Syllabus of Courses:

Parametric equations; space coordinates; vector and space; numerical product; matrix 3x3 of three-indeterminate linear equations system; operation on lines; matrix reverse; solving equations system; linear independence; base in R2; R3 linear transform and its matrix; determinate 3x3 and characteristic value and vector; vector product; second order line and plane equations; two vector functions and its derivative; speed and acceleration; bending; normal vector to a curve; multivariable function; directional and partial derivative; tangent plane and normal line to a curve; multivariable function; directional and partial derivative; tangent plane and projecting line of gradient; chain of rule for partial derivative; exact differential; second kind and third kind integrals and their application in geometrical and physical problems; transform of integration arrangement (without accurate affirmation); cylindrical and spherical coordinates; vector field; curvilinear integral; surface integral; divergence; curl; Laplacian; potential of green space and divergence and stochastic.

TextBooks:

R.L. Finney, G.B. Thomas, Calculus and Analytic Geometry, Geometry, 9thEdition, Addison Wesley, 1996

Title of the Course: Physics 2

Number of Credits: 3

Type of the Course: Basic | Theoretical

Pre-requisite : Physics 1

Training hours: 51 h Theoretical & h Practical

Syllabus of Courses:

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.

TextBooks:

D. Holliday, R. Resnick and J. Walker, Fundamentals of Physics, 6th edition, John Wiley, 2000

Title of the Course: Computer Workshop

Number of Credits: 1

Type of the Course: Major | Practical

Pre-requisite : Fundamentals of Computer and Programming

Training hours: h Theoretical & **34** h Practical

Course Objectives:

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 JCL language, 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

Title of the Course: Differential Equations

Number of Credits: 3

Type of the Course: Basic | Theoretical

Pre-requisite : General Mathematics 1

Training hours: 51 h Theoretical & h Practical

Course Objectives:

In this course, first and second levels of linear differential equations and some nonlinear differential equations will be introduced, in addition, students will learn about some numerical and analytical ways to solve Mathematical Problems.

Syllabus of Courses:

Nature of differential equations and their solution, family of graphs and vertical routes, physical patterns, separable equation, first order linear differential equation, homogeneous equation, 2nd order linear equation, homogenous equation with fixed constants, method of indefinite constants, method of changing parameters, application of 2nd order equations in physics and mechanics, solution of differential equation with series, Bessel and Gamma functions, Legendre polynomial, an introduction to differential equations set, Laplace transform and its application in solving differential equations

TextBooks:

1. E. Kreyszig, Advanced Engineering Mathematics, 1999
2. P. Blanchard, R.L. Devaney, and Co. Hall, Differential Equations, 1st Edition, Brooks/ColePub, 1998

Title of the Course: Islamic Thoughts 1

Number of Credits: 2

Type of the Course: General | Theoretical

Training hours: 32 h Theoretical & h Practical

Course Objectives:

Explain the necessity of Muslim students to pay attention to religion and religious categories, deepen and expand information and strengthen students' theism and faith in the field of theology and resurrection.

Title of the Course: Physics Lab 2

Number of Credits: 1

Type of the Course: Basic | Practical

Pre-requisite : Physics 2

Training hours: h Theoretical & **34** h Practical

Course Objectives:

The purpose of this course is to learn electrical and electronic measuring devices and to perform basic tests of electrical circuits.

TextBooks:

1. D. Halliday and R. Resnick, Fundamentals of Physics, 10th Edition, John Wiley Sons, 2014.
2. R. A. Seerway, and C. Vuille, College Physics, 10th Edition, Cengage Leranting, 2015.
3. H. D. Young, R. A. Freedman and L. Ford, University Physics, 14th Edition, Person Education Limited, 2016.

Title of the Course: Engineering Probability & Statistics

Number of Credits: 3

Type of the Course: Basic | Theoretical

Pre-requisite : General Mathematics 1

Training hours: 51 h Theoretical & h Practical

Course Objectives:

By learning this course, students will be able to use basic rules of Probability Theory for real modeling of information problems.

Syllabus of Courses:

An introduction to theory of sets, samples and their table display together with average, exponent, middle and variance of conversion and composition, probabilities and the relevant theorems, random variables, intermediate and average and variance of distributions, Poison's two-phrase distributions, geometric difference, normal distribution, distribution of several random variable, random sampling and random numbers, sampling from small society, estimation of statistical parameters, assurance intervals, test 2 presumptive test of decision-making, analysis and variance, regression, correlation, nonparametric methods test, fitting straight line on data.

TextBooks:

1. Walpole and Mayers, Probability and Statistics for Engineering and Scientists, 6th edition, Prentice Hall. 1998
2. R.V. Hogg and T. Elliot, Probability and Statistical Inference, 4th edition, Mac Millan, 1993

Title of the Course: Engineering Mathematics

Number of Credits: 3

Type of the Course: Major | Theoretical

Pre-requisite : General Mathematics 2

Training hours: 51 h Theoretical & h Practical

Course Objectives:

This course provides mathematical techniques in the more advanced areas of mathematics that are of most relevance to engineering disciplines.

Syllabus of Courses:

The principal topics covered will include vector calculus, Fourier transforms, fast Fourier transforms and Laplace transformations. Applications of these techniques for the solution of boundary value and initial value problems will be given. The problems treated and solved in this course are typical of those seen in applications and include problems of heat conduction, mechanical vibrations and wave propagation.

Title of the Course: Data Structure

Number of Credits: 3

Type of the Course: Major | Theoretical

Pre-requisite : Discrete Structures & Advanced Programming

Training hours: 51 h Theoretical & h Practical

Course Objectives:

Familiarity with Information Structures, Effects of Structures in Produced Applications, Selecting Optimized Inside-Memory Structures, Organizing Memory based on requirements.

Syllabus of Courses:

Arrays, vectors, matrices, private matrices, arrays display, stacks, queues and rows, bond lists: graphic, cyclical, double bond, multi-bond, method of display and application of bond lists, trees and their menstruation, method of representation and application of trees: decision making trees, search trees, tree of the game and etc., graphs and their representation, dynamic memory allocation and the relevant issues, searching and sorting and combining algorithms

TextBooks:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Introduction to Algorithms, Third Edition, The MIT Press, Cambridge, Massachusetts 2009
2. A.V. Aho, J.E. Hopcroft, J.D. Ullman, Data Structures and Algorithms, Addison Wesley, 1983
3. D.E. Knuth, The Art of Computer Programming, Volume I: Fundamental Algorithms, 3rd Edition, Addison Wesley, 1997

Title of the Course: Logic Circuits

Number of Credits: 3

Type of the Course: Major | Theoretical

Pre-requisite : Discrete Structures

Training hours: 51 h Theoretical & h Practical

Course Objectives:

The purpose of this course is to get acquainted with the principles and components of logic circuits and how these circuits work, to acquire skills in designing circuits and digital systems and skills in analyzing digital circuits in terms of their operation and speed of operation.

Syllabus of Courses:

Logic level models, including Boolean algebra, finite state machines, arithmetic circuits, and hardware description languages. Logic gates, memory, including CMOS gates, flip-flops, arrays, and programmable logic. 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.

TextBooks:

Victor P. Nelson, H. Troy Nagle, Bill D. Carroll and David Irwin, Digital Logic Circuit Analysis and Design, Prentice Hall Inc., 1996

Title of the Course: Systems Analysis and Design

Number of Credits: 3

Type of the Course: Major | Theoretical

Training hours: 51 h Theoretical & h Practical

Course Objectives:

Just as solving a mathematical problem requires first identifying its complexities and dimensions, designing appropriate strategies to solve the problem and then proceeding to solve it, such as building computer systems for a set of people (which in many cases may be More complex mathematical problems) also need to be analyzed and designed before implementation. In this course, students are introduced to analysis and design skills such as requirements analysis, feasibility analysis, modeling, process analysis, architectural design, and UI / UX. In addition to these skills, this course will include computer systems management and production planning skills such as production methods, process automation, and project management concepts in such projects.

TextBooks:

1- L.D. Bentley, K.C. Dittman, and J.L. Whitten. Systems analysis and design methods. Irwin/McGraw Hill, 2007.
2- K.S. Rubin. Essential Scrum: A practical guide to the most popular Agile process. Addison-Wesley, 2012.
3- M. Fowler, C. Kobryn, and K. Scott. UML distilled: A brief guide to the standard object modeling language. Addison-Wesley Professional, 2004.

Title of the Course: History of Imamate

Number of Credits: 2

Type of the Course: General | Theoretical

Training hours: 34 h Theoretical & h Practical

Course Objectives:

Familiarity with the issue of Imamate, its place in Islam and the manners and traditions of the leaders in different time requirements.

Title of the Course: Technical English Language

Number of Credits: 2

Type of the Course: Major | Theoretical

Training hours: 34 h Theoretical & h Practical

Course Objectives:

This subject 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.

TextBooks:

1- Keith Boeckner, P. Charlers Brown, Computing, Oxford, 2001 2. An English for Academic Purposes Programme, Mac Millan (China) Ltd.

Title of the Course: Theory of formal languages and Automata

Number of Credits: 3

Type of the Course: Major | Theoretical

Training hours: 51 h Theoretical & h Practical

Course Objectives:

The course introduces some fundamental concepts in automata theory and formal languages including grammar, finite automaton, regular expression, formal language, pushdown automaton, and Turing machine.

Title of the Course: Electrical circuits

Number of Credits: 3

Type of the Course: Major | Theoretical

Training hours: 51 h Theoretical & h Practical

Course Objectives:

To develop the fundamental tools of linear circuit analysis which will be useful to all engineers. To learn the "alphabet" of circuits, including wires, resistors, capacitors, inductors, voltage and current sources, and operational amplifiers. To prepare students for more advanced courses in circuit analysis.

Syllabus of Courses:

Circuit variables and circuit elements. Some circuit simplification techniques. Techniques of circuit analysis. The operational amplifiers. The natural and step response of RL and RC circuits. Natural and step responses of RLC circuits. Sinusoidal steady-state analysis. Introduction to the Laplace Transform. The Laplace Transform in circuit analysis.

Title of the Course: Software Engineering

Number of Credits: 3

Type of the Course: Specialized | Theoretical

Training hours: 51 h Theoretical & h Practical

Course Objectives:

The purpose of this course is to address the engineering points that must be observed in all stages of software production. In this course, students are introduced to the activities and tools needed to produce a software product.

Syllabus of Courses:

Importance and objectives of software engineering; planning; stages and design stages controlling; principles of needs analysis; methods of needs analysis; principles of software design; study of several known methods of design such as data structure, data flow, functional, aimed and immediate analysis, outstanding points of programming languages in viewpoint of software engineering, software accuracy and confidentiality, software maintenance, performance of a practical project.

TextBooks:

1-Software Engineering, A Practical Approach, Roger S. Pressman, R. S. Pressman, 1987

Title of the Course: Database

Number of Credits: 3

Type of the Course: Specialized | Theoretical

Training hours: 51 h Theoretical & h Practical

Course Objectives:

It includes representing information with the relational database model, manipulating data with an interactive query language (SQL) and database programming, database development including internet applications, and database security, integrity and privacy issues.

Title of the Course: Signals and Systems

Number of Credits: 3

Type of the Course: Major | Theoretical

Pre-requisite : Engineering Mathematics & Engineering Probability & Statistics

Training hours: 51 h Theoretical & h Practical

Course Objectives:

Primary definitions of systems and signal, various kinds of systems, introduction to modeling of various physical systems, analysis of linear and time independent (continuous and discrete) systems, impulse response, convolution integral, Fourier analysis, energy density, spectrum and power sampling theorem, system analysis by Laplace transform, signal flow graphs, system analysis in state space (continuous and discrete), Z transform, discrete systems analysis by the Z transform.

TextBooks:

1- A.V. Oppenheim, A.S. Willsky, S.H. Nawab, Signals and Systems, 2nd Edition, Prentice-Hall, 1997.

Title of the Course: Sports 1

Number of Credits: 1

Type of the Course: General | Practical

Training hours: h Theoretical & **34** h Practical

Course Objectives:

This course is designed for the prospective coach, physical education and/or recreation professional.

Title of the Course: Practical Islamic mysticism

Number of Credits: 2

Type of the Course: General | Theoretical

Training hours: 34 h Theoretical & h Practical

Course Objectives:

Familiarity with the principles, methods and basic issues of Islamic mysticism and its stages of conduct with an approach to the school of Ahl al-Bayt.

Title of the Course: Database Lab

Number of Credits: 1

Type of the Course: Elective | Practical

Pre-requisite : Principles of Database Design

Training hours: h Theoretical & **34** h Practical

Course Objectives:

The aim of the course is to cover the fundamentals of databases as seen from the perspective of application writers. The course covers schema design techniques, SQL, data warehouses and some aspects of the NoSQL movement. Also students will explain the client/server model, and describe the key components used to implement internet database environments and perform basic database administration tasks.

Title of the Course: Principles of Compiler Design

Number of Credits: 3

Type of the Course: Specialized | Theoretical

Pre-requisite : Information Storage and Retrieval

Training hours: 51 h Theoretical & h Practical

Course Objectives:

Designing and building compilers is one of the basic concepts of computer science. Although there is little variety in the way compilers are made, a wide variety of languages and machines can be used to make interpreters and translators. In this lesson, the subject of building compilers is introduced by describing the main components of a compiler, their tasks and their relationship. After an introductory introduction to the components of a compiler and the types of grammars, the various stages of translation, such as lexical, syntactic and semantic analysis, and code generation and payment, are described. Students who successfully pass this course will have a good insight into the following: Familiarity with compiler components and various techniques for their implementation, understanding the implementation of programming language commands, gaining skills in producing optimal programs and fixing programming errors, familiarity And the use of automated tools in compiler production.

Syllabus of Courses:

An introduction to the design and implementation of programming language translators. Theoretical aspects of language design and translation is discussed and practically demonstrated by developing a working compiler.

TextBooks:

A. Aho, M. Lam, R. Sethi, and J. Ullman, Compilers: Principles, Techniques, and Tools (2nd Edition), Prentice Hall, 2006.

Title of the Course: Operating Systems

Number of Credits: 3

Type of the Course: Major | Theoretical

Training hours: 51 h Theoretical & h Practical

Course Objectives:

The purpose of this course is to get acquainted with the structure and organization of operating systems. In this course, students deal with the internal organization of operating systems, interrupts, system calls, in-processor support facilities, new issues arising due to multi-core processors, process synchronization, deadlock, famine, file system management, scheduling, interaction with IO, memory management, operating system protection, security will be familiar with it.

TextBooks:

1- A. Silberschatz, P.B. Galvin, G. Gagne, Operating System Concepts, 9th Edition, Wiley, 2013.
2- W. Stallings, Operating Systems: Internal and Design Principles, 9th Edition, Pearson, 2015.
3- A.S. Tanenbaum, Modern Operating Systems, 4th Edition, Pearson, 2014.

Title of the Course: Algorithms Design

Number of Credits: 3

Type of the Course: Major | Theoretical

Pre-requisite : Data Structure

Training hours: 51 h Theoretical & h Practical

Course Objectives:

The main purpose of this course is to teach the basic concepts and common methods of analysis and design of algorithms. In this lesson, students learn how to analyze a given problem and find some possible algorithms to solve it. Then analyze and compare those algorithms in terms of computational complexity and identify the best ones based on the characteristics of the input samples. In this lesson, basic algorithms for solving some common problems will be introduced.

Syllabus of Courses:

Review of essential points of Data Structures, problem solving methods (for each methods some problems and special algorithm for the problem shall be represented and being analyzed), introducing to complexity, divide & conquer method (problems to be analyzed: max and min of an array, multiplication of two n-bit number, Strassen method about matrix multiplication, round robin algorithm, sorting with Quicksort algorithm), dynamic programming method (matrix multiplication, traveling sales man problem, polygon triangulation),greedy algorithms(scheduling problem, Huffman Code, making change),methods based one xhaustive search, alpha-beta pruning (puzzle, tic-tac-tac), revelation of methods for problems, graph algorithms(searching methods of graph, Dijkstra algorithms, minimum spanning tree, Floyd algorithm, topological sorting and…), maximum flow networks and other problems.

TextBooks:

1- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Introduction to Algorithms, Third Edition, The MIT Press, Cambridge, Massachusetts 2009.

2- R.E. Neapolitan and K.Naimipour, Foundations of Algorithms using C++ Pseudo Codes,2nd Edition, Johns and Bartlett Publishers, 1998.

Title of the Course: Computer Architecture

Number of Credits: 3

Type of the Course: Major | Theoretical

Pre-requisite : Logic Circuits & Machine Language and System Programming

Training hours: 51 h Theoretical & h Practical

Course Objectives:

An introduction to computer configuration, introducing different generations of computer, register transfer and micro-operations, register transfer language, inter-register transfer, computational micro-operations, sliding micro-operations, control functions.

Syllabus of Courses:

Basic computer organization and its design, instruction codes, computer instructions, scheduling and controlling, designing a sample computer such as PDP/8 and its micro-operations, methods of numbers representation, representation by fixed point, representation by floating point, other binary codes, errors revealing codes, organization of central processor including systems with several processor registers and bass system and systems using stack, study of several computers such as PDP/11, IBM 370. Designing computational processors, comparison and subtraction of binary numbers without sign, algorithm of multiplication and division with fixed and floating point. -Input and output organization, memory organization, auxiliary memories, memory of microcomputer, hierarchy of memory, associative memory, dummy memory, cache memory, memory management hardware.

TextBooks:

1- Computer System Architecture, M. Morris Mano, Prentice Hall, 1982 2- Computer Architecture, C.C.Foster, Van Nostrand Reinhold Company, 1985

Title of the Course: Computer Design of Digital Systems

Number of Credits: 3

Type of the Course: Specialized | Theoretical

Training hours: 51 h Theoretical & h Practical

Course Objectives:

Students in the Digital Systems Design course will implement and test digital circuits ranging in complexity from basic logic gates to state machines that perform useful functions like calculations, counting, timing, and a host of other applications.

Title of the Course: Logic Circuit and Computer Architecture Lab

Number of Credits: 1

Type of the Course: Major | Practical

Training hours: h Theoretical & **34** h Practical

Course Objectives:

This course covers the basics of digital logic circuits and design. Through the basic understanding of Boolean algebra and number systems it introduces the student to the fundamentals of combinational logic design and then to sequential circuits (both synchronous and asynchronous). Memory systems are also covered. Also in this class you will design a processor that implements an instruction set of your own design. It will provide you the chance to grapple first-hand with the issues of processor design.

Title of the Course: Social and political rights in Islam and Iran

Number of Credits: 2

Type of the Course: General | Theoretical

Training hours: 34 h Theoretical & h Practical

Course Objectives:

Familiarity with the characteristics of the Islamic legal system and the basic principles and types of civil and political rights and freedoms of man in Islam. After passing these units, the student should: be familiar with the concept of rights and its types; Get acquainted with the basics of Islamic law and the relationship between right and duty; Get acquainted with civil rights, right to life, right to security, etc. and explain them; The student can explain the relationship between the rights of the individual and society; Must recognize his political and social rights;

Title of the Course: Operating Systems Lab

Number of Credits: 1

Type of the Course: Specialized | Practical

Pre-requisite : Operating Systems

Training hours: h Theoretical & **34** h Practical

Course Objectives:

In this laboratory, which is taken simultaneously with the operating systems course, the aim is to test and scientifically test the concepts in which the course is presented. The first part of this lab is mainly focused on working with the Linux operating system, and in the second part, programming in this operating system and interaction with its core.

Title of the Course: Computer Networks

Number of Credits: 3

Type of the Course: Major | Theoretical

Training hours: 51 h Theoretical & h Practical

Course Objectives:

Basics and Principles of Computer Networks and Data Transition Systems will be introduced in this course.

Syllabus of Courses:

Structure of networks, network architectures, reference model of ISO, networks of ARPA, SNA, DECNET and general. Network topology, connectivity analysis, delay analysis, design of network with local access. Design of physical layer, fundamentals of theory for data transfer, transfer telephone systems and multiplexing, survey on terminal, transfer errors. Data relation layer, primary protocols for data relation, sliding window protocol, protocols analysis. Primary layer of network, point-point networks, routing algorithms, density. Secondary layer, satellite and radio networks, broadcasting satellite packages, radio packages.

TextBooks:

1. Computer Networking: a top-down approach / James F. Kurose, Keith W. Ross.6th ed, 2013. 2. Computer networks / Andrew S. Tanenbaum, David J. Wetherall. 5th ed, 2011.

Title of the Course: Artificial intelligence and expert systems

Number of Credits: 3

Type of the Course: Major | Theoretical

Training hours: 51 h Theoretical & h Practical

Course Objectives:

This course presents a study of artificial intelligence and expert systems. Topics include PROLOG programming, search methods, knowledge acquisition, knowledge representation including belief networks, knowledge validation, neural networks, expert system development including uncertainty management methods such as statistical, symbolic, and fuzzy logic, expert system shell, survey of current expert systems, and future trends.

TextBooks:

1- Stuart Russell and Peter Norvig. Artificial Intelligence: A Modern Approach. 3rd Edition, 2009.

Title of the Course: Microprocessor and assembly

Number of Credits: 3

Type of the Course: Major | Theoretical

Training hours: 51 h Theoretical & h Practical

Course Objectives:

In this course, students with a microprocessor architecture (by choosing an architecture such as ARM,) software, hardware and microcontroller components (by choosing a microcontroller from the AVR family, ARM and the like), programming in assembly language and higher levels, How the CPU connects and communicates with memory and peripherals. In this course, students will also learn how to use subprocessors and microcontrollers to build embedded systems, the Internet of Things, and the like.

TextBooks:

1- M. A. Mazidi, S. Naimi, S. Naimi, The AVR Microcontroller and Embedded Systems using Assembly and C, 1st Edition, Prentice Hall, 2010.
2- M. A. Mazidi, D. Causey, R. D. McKinlay, PIC Microcontroller and Embedded Systems using Assembly and C for PIC18, Prentice Hall, 2008.

Title of the Course: Programming Language Desing and Implementation

Number of Credits: 3

Type of the Course: Specialized | Theoretical

Pre-requisite : Data Structure

Training hours: 51 h Theoretical & h Practical

Course Objectives:

This course introduces students to the concepts and components of programming languages and allows them to design and implement a new programming language. Also, understanding the concepts of programming languages helps students to learn new languages more easily. Learning the capabilities of each category of languages along with important examples from each category is also one of the objectives of this course.

Syllabus of Courses:

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.

TextBooks:

1- J. C. Mitchell, Concepts in Programming Languages, Cambridge University Press, 2002.
2- R. W. Sebesta, Concepts of Programming Languages, 11th Edition, Pearson, 2015.
3- B. C. Pierce, Types and Programming Languages, MIT Press, 2002.

Title of the Course: Internship

Number of Credits: 1

Type of the Course: Specialized | Practical

Training hours: h Theoretical & **240** h Practical

Course Objectives:

Students must practically get involved in industry and market by working totally 240 hours in an appropriate and defined company in either governmental or private sectors as an intern.

Title of the Course: Islamic Revolution of Iran

Number of Credits: 2

Type of the Course: General | Theoretical

Training hours: 34 h Theoretical & h Practical

Course Objectives:

Theoretical acquaintance with the causes and factors of the Islamic Revolution and analytical study of cultural, social and political developments of the Islamic Revolution and subsequent issues.

Title of the Course: Family and Population Knowledge

Number of Credits: 2

Type of the Course: General | Theoretical

Training hours: 34 h Theoretical & h Practical

Course Objectives:

Familiarity of students with the basics of family knowledge and how to form, consolidate, and excel it and demographic characteristics and their role in improving the quality of life

Title of the Course: Microprocessor and assembly laboratory

Number of Credits: 1

Type of the Course: Major | Practical

Pre-requisite : Microprocessor and assembly

Training hours: h Theoretical & **34** h Practical

Course Objectives:

With the success of the director of this laboratory, students should be practically familiar with the issues raised in the following topic in the design and implementation of systems based on microprocessors and microcontrollers. In order to target the activities of this laboratory and create interest and enthusiasm in the student, it is recommended that the final project be defined from the beginning and in the first sessions of the laboratory and its specifications are such that the experiments that the student performs during each session of the laboratory Get acquainted with a part of the final project of the laboratory.

Title of the Course: Internet Engineering

Number of Credits: 3

Type of the Course: Specialized | Theoretical

Pre-requisite : Computer Networks

Training hours: 51 h Theoretical & h Practical

Course Objectives:

This course provides an introduction to fundamental concepts of the Internet and web technologies including their architecture, protocols and applications. The main topics of the course include: Introduction to Internet history and Internet services, networking basics, overview of TCP/IP (addressing, routing and transport protocols), network programming, web programming, web services, web servers and Internet security.

TextBooks:

Internet & World Wide Web How to Program, 4th edition, Harvey M. Deitel and Paul J. Deitel, , Prentice Hall , 2008.

Title of the Course: Basics of data mining

Number of Credits: 3

Type of the Course: Specialized | Theoretical

Pre-requisite : Principles of Database Design & Data Structure

Training hours: 51 h Theoretical & h Practical

Course Objectives:

This course is an introductory course on data mining. It introduces the basic concepts, principles, methods, implementation techniques, and applications of data mining, with a focus on two major data mining functions: (1) pattern discovery and (2) cluster analysis.

Title of the Course: Database system implementation

Number of Credits: 3

Type of the Course: Specialized | Theoretical

Training hours: 51 h Theoretical & h Practical

Course Objectives:

Implementing components of relational database systems (DBMS): record storage, indexing structures, query evaluation, joins algorithms, query optimization. Understanding and administering a DBMS: security, concurrency control and crash recovery. Tuning DBMS for performance. Recent advances in data management : text-based information retrieval, web search, cloud computing, column store systems. This class focuses on data management from a database administrator's, or implementer's, perspective.

Title of the Course: Software Engineering Lab

Number of Credits: 1

Type of the Course: Elective | Practical

Pre-requisite : Software Engineering 1

Training hours: h Theoretical & **34** h Practical

Course Objectives:

Practicing materials of the course, “Software Engineering”

Title of the Course: Fundamentals of Organization and Management

Number of Credits: 3

Type of the Course: Elective | Theoretical

Training hours: 51 h Theoretical & h Practical

Course Objectives:

An introductory course in management theory and practice. Topics include: fundamentals of management; making things happen; meeting the competition; organizing people, projects, and processes; and, motivating and leading. Emphasis is given to the development of management, organizational structures, organizational dynamics, the impact of environmental forces, and the use of analytical tools in the performance of the management function.

Syllabus of Courses:

By the end of the course, you should be able to: 1. Access the existing literature related to management and organizations. 2. Distinguish among management, leadership, and organization. 3. Discuss what managers do and what it takes to be a manager. 4. Apply many of the theories and concepts related to management and leadership and distinguish between the two. 5. Examine your own behavior and beliefs about management and organizations and contrast them with the theories and observations of others. 6. Be an informed and engaged participant in discussions related to organizational transformation. 7. Contemplate a personal philosophy of management. 8. Show improvement in your written, oral, and interpersonal skills. 9. Exhibit critical and creative thinking skills. 10. Illustrate the characteristics of ethical decision makers. 11. Explain the significance of global awareness of business. 12. Explain why organizational innovation is important. 13. Be able to participate effectively in class discussions. 14. Explain the concept of motivation as it relates to management, leadership, and organization. 15. Identify three barriers to change within organizations and explain how to overcome them. 16. Illustrate the characteristics and costs of useful information. 17. Identify the basics of organizational strategy. 18. Explain the steps and limits to rational decision making. 19. Explain the significance of organizational cultures.

Title of the Course: Research and presentation methods

Number of Credits: 2

Type of the Course: Major | Theoretical | Practical

Training hours: 34 h Theoretical & h Practical

Course Objectives:

In this course, students learn systematic research methods and techniques and skills of presenting scientific and technical materials. By choosing a subject, students must go through various stages of compilation and submit a written presentation for it, and in doing so, use information networks and computer publishing tools. In this course, students will learn the importance and role of rhetoric in mass communication and will be able to strengthen their sense of self-confidence by presenting oral material. Students learn different styles of expression and eloquence and gain the ability to analyze, critique and evaluate different types of oral communication. Students must provide several lecture sessions in the classroom.

Title of the Course: Management Information Systems

Number of Credits: 3

Type of the Course: Specialized | Theoretical

Training hours: 51 h Theoretical & h Practical

Course Objectives:

This course will introduce students to the concepts of computer-based information systems in an organization. Students will examine the impact of information technology on an organization’s decision-making as well as ethical issues facing managers. Information technology fundamentals are explored (networking and communications; database management systems, data warehousing, systems development) as well security, control frameworks and auditing computer-based systems.

Syllabus of Courses:

information systems, organizations and strategies, social, ethical and legal issues, information systems infrastructure, business process mapping and database design, e-commerce, systems security, systems development and emerging issues.

TextBooks:

1 - Laudon- K.c., Laudon. J. P. ,Essentials of mangement Information System, Prentice Hall 1997. 2 - Obrien. J.A. Introduction to Information System, Irwin, 1997. 3 - Raymond Mc leod, JR., “ Management Information Systems” Prentice Hall, 1998. 4- Seppe. Casserrori , “Introduction to Integrated Geographic Information Management. C and H. 1993, London.

Title of the Course: Information Retrieval and Web Search

Number of Credits: 3

Type of the Course: Specialized | Theoretical

Pre-requisite : Algorithms Design

Training hours: 51 h Theoretical & h Practical

Course Objectives:

This module aims to give students an understanding of the fundamental techniques for hypermedia architectures, design and usability, document management and retrieval, metadata management, and searching the web.

TextBooks:

Introduction to Information Retrieval by C. Manning, P. Raghavan, and H. Schütze. Cambridge University Press, 2008

Title of the Course: Computer Networking Lab

Number of Credits: 1

Type of the Course: Major | Practical

Pre-requisite : Computer Networks

Training hours: h Theoretical & **34** h Practical

Course Objectives:

The objective of this lab course is to get practical knowledge of working principles of various communication protocols. Analyse structure and formats of TCP/IP layer protocols using network tools such as Wireshark and network simulators.

TextBooks:

1- J. F. Kurose, Keith W. Ross, Computer Networking: A Top-Down Approach, 7th Edition, Pearson, 2016

Title of the Course: Project

Number of Credits: 3

Type of the Course: Specialized | Practical

Training hours: h Theoretical & **102** h Practical

Course Objectives:

With the consent of the research committee of the public relations department and under the supervision of one of the professors appointed by the department, the student selects a topic with the consent of his / her supervisor and compiles his / her dissertation in one of the research methods or practical project. Graduation of the student will depend on the successful defense of the dissertation. The evaluation of the dissertation and the project is the responsibility of the supervisor and the representative of the department (consulting professor) and if necessary, the student will defend his dissertation orally.

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