**LECTURE CONTENTS**

**1. YEAR**

**INTRODUCTION TO COMPUTER ENGINEERING 3 0 3 ECTS:5**

Definition of language, importance and features, rise of the language, the world languages and their classification, place among the world languages of Turkish, the historical periods of Turkish language, the extension area of it today, orthographical rules in Turkish.

Text Books: Elektrik ve Bilgisayar Mühendisliği'ne Giriş, C. B. FLEDDERMANN, M. D. BRADSHAW, Çeviren: Erhan AKIN, Nobel Dağıtım, Ankara, 2003.

**ALGORITHMS AND PROGRAMMING I 3 2 4 ECTS:9**

Basics of computer programming. Problem solving techniques, developing algorithms and flowcharts. Basics of structural programming languages. Data types in JAVA, statements, and defining variables. Basic control structures. Conditional statements and loops. Method definitions, calling methods. Arrays, multi-dimensional arrays.

Text Books: Java, Musa Çavuş, Seçkin Yayınları, 2010. Java ile Programlama ve Veri Yapıları, Bülent Çoban, Pusula Yayıncılık, 2010.

**GENERAL PHYSICS I 3 2 4 ECTS:7**

Physics definition, importance, Standards, SI unit system, dimensional analysis, vectors. Motion information (Kinematics): Examples of One-and two-dimensional motion in space, relative velocity. Force Information (Dynamic): Newton's laws and applications, universal gravitation, friction force. Energy: Work, Power, types of mechanical energy, energy of conservative and non-conservative force systems. Impulse, Linear Momentum: Center of mass, interaction in one-and two-dimensional space. Rotational Motion: Equilibrium of rigid bodies, kinematics, dynamics, energy and angular momentum of rotational and circular motion.

Text Books: Physics for Scientist & Engineers with Modern Physics, R. A. SERWAY, Vol. I, Sounders Collage Publishing, 1992. Fundamentals of Physics, H. RESNICK, Vol I, John Wiley & Sons, 1981.

**GENERAL MATHEMATICS 1 3 2 4 ECTS:5**

This course focuses on several topics such as limits, continuity, differential and integral calculus.

Text Books: Temel ve Genel Matematik I-II, Prof. Dr. H. Hilmi HACISALİHOĞLU, Bilim Yayınları, 1996. Matematik Analiz, Prof. Dr. Mustafa BALCI, Balcı Yayınları, 1997. Lineer Cebir, Prof. Dr. H. Hilmi HACISALİHOĞLU, Bilim Yayınları, 1996.

**TURKISH LANGUAGE-1 2 0 2 ECTS:2**

Definition of language, importance and features, rise of the language, the world languages and their classification, place among the world languages of Turkish, the historical periods of Turkish language, the extension area of it today, orthographical rules in Turkish.

Text Books: Üniversiteler İçin Türk Dili, E. MUHARREM, Bayrak Yayınları, İstanbul, 2003. Yükseköğretim Öğrencileri İçin Türk Dili ve Kompozisyon Bilgileri, Z. KORKMAZ, M. AKALIN, A. ERCILASUN, YÖK, Ankara, 1990. Üniversite Türk Dili ve Kompozisyon Dersleri, K. YAVUZ, K. YETİŞ, N. Birinci, Bayrak Yayınları, İstanbul, 2003. Türk Dili Dersleri, B. PAÇACIOĞLU, Cumhuriyet Üniversitesi Yayını No:18, YÖK, Ankara, 1987. Türk Dili ve Anlatım Bilgisi, G. SEZAİ, D.E.Ü. İzmir, 1999. İmlâ Kılavuzu, Türk Dil Kurumu Yayınları, Ankara, 2000.

**FOREIGN LANGUAGE-1** **3 0 3 ECTS:3**

This course is designed to improve university students' skills of reading, writing, listening and speaking effectively in their fields of study and in their academic activities. The aim of the course is to improve the students' communicative competence through creating interesting contexts, showing them authentic materials and authentic situations in and out of class and giving them assignments that lead to increase the usability of the language.

Text Books: Full Steam Ahead, Eds: Vahit ÇAKIR, Nilgün YORGANCI, Gül KESKİL, 3rd Ed., Gündüz Eğitim ve yayıncılık, 2006.

**ALGORITHMS AND PROGRAMMING II** **3 2 4 ECTS:9**

Layout managers, graphical components, the JAVA event model, threads, exception handling, IO streams, a useful subset of Java classes. Swing class to build Java applications and applets, JAVA AWT library. Object oriented design, interfaces, inheritance, and polymorphism.

Text Books: Java Tasarım Şablonları ve Yazılım Mimarileri, Özcan Acar, Pusula Yayıncılık, 2009. Java Programlarma Teknikleri, Bora Güngören, Seçkin Yayıncılık, 2004.

**GENERAL PHYSICS II** **3 2 4 ECTS:5**

Electric Force and Field: Charge and conservation, electrification, insulators and conductors, Coulomb's law, electric fields of discrete and continuous charges. Gauss's Law. Static Charge Potential Energy: Discrete and continuous charges of potential, potential difference, dielectrics, connecting of capacitors and energy. Direct current: Current, power supplies, emf, resistance, energy and power, direct current circuits, structure of measuring tools, use of electricity and security. Magnetic Force and Field: conductors with currents and moving charges interact with the magnetic field, Biot-Savart's law. Electromagnetic Induction: Faraday's law of induction, Lenz's law, self-inductance, magnetic field energy.

Text Books: Physics for Scientist & Engineers with Modern Physics, R. A. SERWAY, Vol. I, Sounders Collage Publishing, 1992. Fundamentals of Physics, H. RESNICK, Vol I, John Wiley & Sons, 1981.

**ELECTRIC CIRCUITS FOR COMPUTER ENGINEERING** **3 0 3 ECTS:5**

This course focuses on several topics such as unit systems, the definition of electricity, conductive and dielectrics, effects of electric current, the definition of current, voltage and resistor, calculating of equivalent resistor the effect of heat on resistor, definition of DC, Kirchhoff laws, introducing of the basic measuring principles and the measuring device, measuring of resistor by Wheatstone bridge, electrical work and power, transforming electric energy into heat energy, voltage dropping on lines and energy losing, equivalent circuit of voltage sources, serial and parallel connecting of voltage sources, Chemical effect of current,

battery and accumulators, maximum power theorem, Thevenin and Norton theorems, Superposition theorem, Capacitor, serial and parallel connecting and behavior of capacitors in DC, Magnetic circuits, Inductances, serial and parallel connecting, and behavior of inductances in DC. Why is AC used?, Producing of AC, quantities definite the grid, rectifiers, average value and effective value, phasor concept, behaviors of RLC elements in AC, solution of electric circuits with graphical way, trigonometric and Phasor diagram methods, behaviors of circuits consisted of RLC elements in AC.

Text Books: Elektroteknik-2 Ders Notları (Fotokopi), Prof. Dr. Şevki HOŞAĞASI. Linear and Nonlinear Circuits, O. L. CHUA, C. A. DOSER, E. S. KUH, Mcgraw-Hill, 1987. Elektrik ve Bilgisayar Mühendisliği'ne Giriş, Çeviren: Erhan AKIN, Nobel Yayın Dağıtım, 2003.

**GENERAL MATHEMATICS II** **3 2 4 ECTS:5**

This course is the continuation of the class: General Mathematics 1. Focuses on multivariable functions and their limits, derivatives and integrals.

Text Books: Temel ve Genel Matematik I-II, Prof. Dr. H. Hilmi HACISALİHOĞLU, Bilim Yayınları, 1996. Matematik Analiz, Prof. Dr. Mustafa BALCI, Balcı Yayınları, 1997. Lineer Cebir, Prof. Dr. H. Hilmi HACISALİHOĞLU, Bilim Yayınları, 1996.

**TURKISH LANGUAGE-2** **2 0 2 ECTS:2**

Word and word groups; the sentence; units and species of it; the characteristics of written expression; the plan, theme, point of view, substance and supporting ideas in the written expression; paragraph and phraseology; official writings; speech impediments and dittography; expressional distortions; lyrical writings (poem); narrative writings (novel, short story, theatre); non-fictional writings (travel writing, memory, diary); investigation writings (interview, biography); thought writings (article, essay, critics); oral expression (panel, discussion).

Text Books: Üniversiteler İçin Türk Dili, E. MUHARREM, Bayrak Yayınları, İstanbul, 2003. Yükseköğretim Öğrencileri İçin Türk Dili ve Kompozisyon Bilgileri, Z. KORKMAZ, M. AKALIN, A. ERCILASUN, YÖK, Ankara, 1990. Üniversite Türk Dili ve Kompozisyon Dersleri, K. YAVUZ, K. YETİŞ, N. Birinci, Bayrak Yayınları, İstanbul, 2003. Türk Dili Dersleri, B. PAÇACIOĞLU, Cumhuriyet Üniversitesi Yayını No:18, YÖK, Ankara, 1987.

**FOREIGN LANGUAGE-2** **3 0 3 ECTS:3**

This course is designed to improve university students' skills of reading, writing, listening and speaking effectively in their fields of study and in their academic activities. The aim of the course is to improve the students' communicative competence through creating interesting contexts, showing them authentic materials and authentic situations in and out of class and giving them assignments that lead to increase the usability of the language.

Text Books: Full Steam Ahead, Eds: Vahit ÇAKIR, Nilgün YORGANCI, Gül KESKİL, 3rd Ed., Gündüz Eğitim ve yayıncılık, 2006

## 2. YEAR

**DIGITAL SYSTEMS** **3 0 3 ECTS:6**

Digital systems, number systems, binary codes, error detecting and error correcting codes.

Boolean algebra, switching algebra, binary operations and Boolean functions. Minimization of Boolean functions. Combinational logic, logic gates, analysis of combinational circuits, circuit design with logical gates. Integrated circuits, design with MSI chipsets, ROM, PLA. Synchronous sequential circuits, memory elements, analysis and design procedures. Registers, counters, RAM. Asynchronous sequential circuits.

Text Books: Sayısal Tasarım, M. Morris Mano, Litaratür Yayıncılıki 2002 Lojik Tasarımın Temelleri Ve Uygulamaları, Şirzat Kahramanlı Muciz Özcan, Dünya Kitapevi, 2002

**DISCRETE COMPUTATIONAL STRUCTURES 3 0 3 ECTS:4**

Discrete Mathematics, computer science of Discrete mathematic, The place and importance in computer and software engineering, proof, Functions, Relations, Sets (venn diagram, complementary sets, Cartesian product, set of powers), Boolean algebra, propositional logic, logical links, truth table, in normal form, validity, logic bridges, Flip-flops, counters, Circuit minimization, algebraic structures, groups, rings and fields, prime numbers and their properties, prime factorization, modular arithmetic, the greatest common divisor and least common multiplier, Euclidean and extended Euclidean theorem, the modular equation solution, the Chinese remainder theorem, Counting the addition and multiplication rules, Pigeonhole principle, permutations and ensemble, binomial and multinomial expansions, Range-exclusion theorem, theoretical applications of Coverage - Exclusion.

Text Books: Ralph P. Grimaldi, Discrete and Combinatorial mathematics, Addison-Wesley, 2006, 2 edition Kenneth H. Rosen, Discrete Mathematics and Its Applications McGraw-Hill. Richard Johnsonbough, Discrete Mathematics 6. Edition, Pearson,Printice-Hall

**SYSTEM THEORY 2 0 2 ECTS:4**

Classification of systems and signals. Basic systems analysis approaches. Systems analysis with Laplace transforms. Block diagrams and stability. Introduction to information systems. System development life cycle, the system concept. Information system analysis and modeling. Feasibility study. Management function. Data and information concepts, identification of information requirements. Systems analysis and modeling tools. The languages used in system modeling. Classification of information systems. Computer-aided software engineering tools. Provision of user interaction. The importance of software maintenance. Studying examples of information systems.

Text Books: *Sinyaller ve sistemler,* Hwei P. Hsu, Nobel Yayın Dağıtım, 2002.

**DATA STRUCTURES 3 2 4 ECTS:8**

Asymptotic notation, performance measurement, memory / time complexity. Recursive algorithms, recursive relations, introduction to algorithm analysis. Multi-dimensional / triangle / sparse matrix representations. Stack and queue data structures, prefix / infix / postfix expressions. Single / dual-connector (loop) lists. Binary tree, binary search tree, recursive and iterative binary tree traversals, generalized lists. Heaps, priority queues, data structures for discrete sets. Graph representations, Breadth first search and depth first search, spanning tree, shortest path problem. Selection, placement, bubbles, counting, quick, merge, heap, radix sorting algorithms and analysis. AVL trees.

Text Books: Veri yapıları ve algoritmalar, Rifat Çölkesen, Papatya Yayıncılık, 2008. Data Structures and Algorithms, Alfred V. AhoJeffrey D. Ullman, John E. Hopcroft, Addison Wesley, 1983

**LINEAR ALGEBRA 2 0 2 ECT:4**

Vector, length and dot product, planes, matrices and linear equations, Gaussian elimination, matrix elimination, the rules of matrix operations, the matrix inverse with the Gauss-Jordan method, factorization, transpose, and permutation matrices, vector spaces and subspaces, null space, row, column and left null space, rank, Ax = b solution, linear independence, bases and dimension, orthogonality, projections, Orthogonal bases and Gram-Schmidt, Determinants, Cofactors, Cramer's rule, eigenvalues and Özelvekt up, diagonalization of matrices, eigenvalues calculation, differential equations applications, symmetric, positive defined and similar matrices, complex vectors and matrices, Hermitian and unitary matrices, Applications.

Text Books: Lineer Cebir, Arif Sabuncuoğlu, Nobel Yayıncılık, 2010. Lineer Cebir, Fethi Çallıalp, Birsen Yayınevi, 2008

**ATATURK'S PRINCIPLES AND HISTORY OF TURKISH REPUBLIC-1 2 0 2 ECTS:2**

The establishment of the Republic of Turkey as a secular and unitary state after the collapse of the Ottoman Empire; the history of Turkish modernization experience in accordance with the establishment of the new state, the instruction of the Turkish Revolution pioneered by Kemal Atatürk and the Kemalist thought, as the meaning and statement of modernity and secularism in Turkey to young generations and let them figure out its significance.

Text Books: Atatürk İlkeleri ve İnkılâp Tarihi I/1, Türk İnkılâbı'nın Hazırlık Dönemi ve Türk İstiklâl Savaşı, Yüksek Öğretim Kurulu Yayınları, Ankara, 1997. Atatürk İlkeleri ve İnkılâp Tarihi I/2, Atatürk İnkılâpları, Yüksek Öğretim Kurulu Yayınları, Ankara, 1997. Atatürk İlkeleri ve İnkılâp Tarihi, Atatürkçülük, Yüksek Öğretim Kurulu Yayınları, Ankara, 1997.

**BUSINESS ENGLISH -1 2 0 2 ECTS:3**

The main aim of the lesson consists in the area which they exercise. They have to know and understand the items and terminologies. The lesson is based on that the reading comprehensions will be developed. For reaching this aim the critical faculty and analyzability of the pupils will be developed.

Text Books: English books about the Department courses.

**COMPUTER ORGANIZATION AND DESIGN 3 0 3 ECTS:6**

Computer abstraction and technology. Computer language. Instruction set architecture (ISA), ISA design principles, RISC and CISC architectures, assembly and machine language, programming of a RISC machine. Computer arithmetic, arithmetic-logic units, floating-point numbers and arithmetic applications. Processor design, datapath and control applications, micro-programmed control, exception detection. Pipeline and hazardous conditions, pipelined processor design, identify of dangerous situations, ramification estimates and exception handling. Memory hierarchy, principles and structure. Cache performance, virtual memory and segmentation. Input-output devices, I / O performance, I / O interfaces.

Text Books: Sayısal Tasarım, M. Morris Mano, Litaratür Yayıncılıki 2002 Bilgisayar Mimarisi, Şirzat Kahramanlı, Nobel Yayıncılık, 2006.

**NUMERICAL METHODS** **3 0 3 ECTS:6**

Mathematical Modeling and Engineering Problem Solving. Numerical Accounts, Management, rounding and truncation errors. Solution of Nonlinear Equations - Off Methods (Graphics, Bisection, Relocation, step increment). Solution of Nonlinear Equations - Public Methods (Simple Iteration, Newton-Raphson, Secant, Floor Roots). Find roots of polynomials - Classic, Müller, Bairstow, Other Methods. Solution of Linear Systems - Gaussian elimination, Gauss Jordan. Special Matrices and Gauss Seidel. Solution of Nonlinear Equations. Finite Difference. Interpolation (Gregory Newton - Langrange and Inverse Interpolation). Numerical Differentiation. Numerical Integration. Curve Fitting. Solution of Ordinary Differential Equations.

Text Books: Yazılım ve Programlama Uygulamalarıyla Mühendisler İçin Sayısal Yöntemler, Raymond P. Canale, Steven C. Chapra, Litaratür Yayıncılık, 2003

**PROBABILITY AND STATISTICS** **3 0 3 ECTS:4**

Definition of probability. Probability actions. Application areas of probability and statistics. Discrete probability, finite probability space, probability measure, conditional probability, Bayes theory. Discrete random variables, binomial, Poisson, geometric distributions. Mean and variance. Integer random variables. Continuous random variables, exponential and normal distribution, probability density functions. Mean and variance calculation, the central limit theory, the compound distributions. Linear regression and correlation. Multiple linear regression. Statistical estimation theory. Chi-square test. Curve fitting. Sampling distributions, sampling nature and vehicle , random approach for sampling, a simple method, flattened sampling, cluster sampling. Data analysis, graphical and numerical operations. Markov chains, queuing.

Text Books: İstatistiğe Giriş, Vasfi Nadir TEKİN, Seçkin Yayıncılık, 2006. İstatistik Yöntemleri, Murat KARAGÖZ. Mühendisler İçin İstatistik, Mehmetçik BAYAZIT, Beyhan OĞUZ, Birsen Yayınevi, 2005. Uygulamalı Temel İstatistik Yöntemler, Özkan ÜNVER, Hamza GAMGAM, Seçkin Yayınevi, 2006.

**DIGITAL SIGNAL PROCESSING** **2 0 2 ECTS:4**

Discrete-time signals and systems. Analog / Digital Digital / analog conversion and stages. The solution of linear constant-coefficient differential equations. Z Transform, definition and region of convergence (ROC). The properties of Z-transform. Solution of inverse Z-transform and linear constant-coefficient differential equations using Z-transform. Stability of discrete-time systems. Structure of discrete-time systems and discrete-time signals in the frequency domain analysis. Discrete Fourier Transform (DFT), the definition and properties. Discrete Fourier Transform (AZFd), the definition and properties. Fast Fourier Transform (FFT), the definition and properties. Digital filter design techniques.

Text Books: Sayısal İşaret İşleme, S. ERTÜRK, Birsen Yayınevi, İstanbul, 2002. Digital Signal Processing, A Computer-Based Approach, S. K. MITRA, McGraw-Hill, 2002. Discrete-Time Signal Processing, A.V. OPPENHEIM, R. W. SCHAFER, Prentice Hall, New Jersey, 1989. *Sayısal İşaret İşleme,* Yazarı, : Monson H. Hayes Çeviren: *Erhan* Akın, Nobel Yayıncılık. 2000

**DIFFERENTIAL EQUATION 2 0 2 ECTS:4**

Infinite series, features and types. The convergence of infinite series and convergence tests. Power series, Taylor and Mac Lourin expansions. Fourier series. Definition and features of the Bessel, Gamma and Beta Special Functions. Complex Functions and conformal (angle Protects) Mapping. Complex Integration and Residue Theorem. First order ordinary differential equations and their applications. Applications of second order differential equations with constant coefficients. Higher order linear differential equations and their applications. Solution of linear differential equations in terms of the power series. Laplace transform and its properties. The inverse Laplace transform and some applications. Partial differential equations and their applications.

**DIGITAL ELECTRONICS LAB. 0 2 1 ECTS:3**

Integrated circuits, basic circuit, properties , identification of logic families , of relevant theoretical knowledge.

**Common test :** the necessary safety precautions when working with electrical circuits , Laboratory instruments recognition, Oscilloscope, measuring instruments, Learning to use the logic analyzer , the measurement and analysis of different signs . Recognition of basic DC and AC circuit elements and measurement and analysis in a simple electrical circuit. **Common test :** the recognition of basic electronic circuit elements, simple electronic circuit applications for understand transistors operation in linear and switching mode., measuring the resulting signals and analysis of them in the oscilloscope. **Integrated Circuit Logic families :** Basic properties of the TTL, MOS, CMOS, HTL, ECL etc. families as a practical extraction and comparison. Families belonging to different applications use the same circuit . **Combinational logic gates and circuits:** Achievement the function equation from a combinational circuit problem, and realization this with SSI integrated gates. Only be carried out with NAND or NOR gates . Given a combinational logic circuit, removing the definition table from a given combinational logic circuit. **Medium Scale Integrated Circuits and Applications :** Combinational circuit design applications With MUX, DEMUX, Encoder, Decoder MSI. **Digital Arithmetic :** With Adder, 4-bit parallel adder, ALU integrated circuits, mathematical operations to be performed in binary. Analysis with logic analyzer. **Flip- Flops and Sequential Circuit Design:** Testing of different types of FF integrated, The design of a sequential circuit problem and realization with integrated circuits and analysis **Counters and Registers :** analysis of the back and forth counter and shift register integrateds, counting, shifting , serial - parallel conversion and related applications and analysis of signals. monitoring the fluctuation count through Decoder and DSPlayer. **Data Conversion:** ADC and DAC integrated circuits examination and analysis of input and output signals. **Timer Circuits:** Clock pulse generating circuit examination and application. With 555 integrated the timing signals obtained.

Text Books: Introduction to Switching Theory and Logical Design, Frederick J. HILL and Gerald R. PETERSON, John Wiley & Sons, USA. Fundamentals of Logic Design, H. CHARLES and Jr. ROTH, West Publishing Company, USA, Digital Design, Morris MANO Prentice Hall, USA. Hüseyin Ekiz, Mantık Devreleri, Sayısal Elektronik, Değişim Yayınları.

**ATATURK'S PRINCIPLES AND HISTORY OF TURKISH REPUBLIC-2 2 0 2 ECTS:2**

This course covers which stages newly established Turkish Republic went through, revolutions fulfilled by Ataturk in the modernization period, Ataturk's principles, home and foreign politics determined by Ataturk for the newly established Turkish Republic, transition

to multi-party political life and developments in the area of politics, society, economy and education by that time.

Text Books: Atatürk İlkeleri ve İnkılâp Tarihi I/1, Türk İnkılâbı'nın Hazırlık Dönemi ve Türk İstiklâl Savaşı, Yüksek Öğretim Kurulu Yayınları, Ankara, 1997. Atatürk İlkeleri ve İnkılâp Tarihi I/2, Atatürk İnkılâpları, Yüksek Öğretim Kurulu Yayınları, Ankara, 1997. Atatürk İlkeleri ve İnkılâp Tarihi, Atatürkçülük, Yüksek Öğretim Kurulu Yayınları, Ankara, 1997.

**BUSINESS ENGLISH -2 2 0 2 ECTS:3**

In this course, students gain the necessary skills of language by the way of reading and interpreting academic passages, listening acedemic tracks, writing essays in academic subjects. In other words, they will have abilities about both comprehension of reading and listening academic texts , using English correctly in written and oral communication and presenting their ideas in an academic format by writing.The writing techniques that are needed for presenting their written term works and reports are given in practice with the world's most widely used formats . In addition, advanced grammar issues which make trouble, are taught to support this course.

Text Books: English in Electrical Engineering and Electronics, H. ERICH Giendinning, Oxford University Press, 1985. English books about the deparment courses.

## 3. YEAR

**MICROPROCESSORS 3 2 4 ECTS:8**

The history of computers , vacuum tubes , transistors, integrated circuits, intel and motorola family. Basis of memory and memory organization, flip-flops, a common way , RAM, ROM, EPROM structures. Microprocessor architecture and operation, 8085 8 -bit microprocessor structure, 8255 integrated circuit. 16-bit microprocessors, 8086-8088 , logical and physical memory, segmented memory structure, protected. addressing modes in 8-bit microprocessors. addressing modes in 16-bit microprocessors, data addressing modes , program memory addressing. Data transfer commands , the installation address commands, array (string) commands. Arithmetic and logic instructions , addition, subtraction, division, multiplication , comparison, and, or, shift, rotate . Sequence comparison , program control instructions , branch instructions , subprograms. Introduction to interrupts , software interrupts, hardware interrupts . 8085 microprocessor software programming examples, the use of the simulator 8085 . 80286 microprocessor software programming examples. 80286 microprocessor software programming examples. The difference between microcontroller and microprocessor , strengths .

Text Books: Mikroişlemciler ve Bilgisayarlar, Doç. Dr. Haluk GÜMÜŞKAYA, Alfa Yayınları, 2002. Micropcessors Architecture, Programming, and Applications with the 8085/8080A, S. GAONKAR, Ramesh, Bell and Howell Company, USA,1984. Mikroişlemciler-Mikrobilgisayarlar ve Assembly Programlama,Turhan ÖZKAN, Beta Yayınları, 1994.

**DATABASE SYSTEMS 3 2 4 ECTS:7**

Definitions and basic concepts: Database, database management systems, database architecture, schemas, and data independence. Data models: Entity-relationship model, hierarchical model, network model, the relational model and object-oriented model. Integrity constraints and relational design: space restrictions, reference restrictions, dependencies

between attributes, normal forms for relationships, the design criteria. Relational languages: relational algebra and relational calculus. SQL standard relational language: data definition, data processing, data base management facilities and major commands. Object-oriented databases, data modelling and language features. Examples: data modeling, database design, database definition and query examples.

Text Books: *Veri Tabanı Sistemleri*, Ünal Yarımağan, Akademi&Türkiye Bilişim Vakfı, 2002 Bilgisayar Veri Tabanı Sistemleri, Oya Kalıpsız, Derin Yayınları, 2001 Veri Tabanı Sistemleri, Yalçın Özkan, Alfa Yayıncılık, 2006

**PROGRAMMING LANGUAGES 3 0 3 ECTS:5**

The development of programming languages. Syntax and semantics concepts. Binding, type checking and scopes. Data types. Expressions and assignment statements. Statement-level control structures. Subprograms and subprogram applications. Abstract data types. Support for object-oriented programming. Concurrency. Functional programming languages, and LISP. Mantısal and PROLOG programming language.

Text Books: Fundamentals of Programming Languages, Ellis Horowitz, W.H. Freeman & Company, 1995

**FORMAL LANGUAGES AND AUTOMATA THEORY 3 0 3 ECTS:4**

Finite Automata (deterministic and non-deterministic automata models, lambda-transitions, Mealy and Moore machines, simplification method). Regular sets and expressions, relationship between finite automata and regular expression. Grammar and Languages (Formal grammar and languages, grammar and language classes and properties. Regular grammar and languages, relationship between finite automata and regular grammar). Context-free grammars and languages. Push-down automata - pushdown automata model, relationship between pushdown automata and context free grammar. Turing Machines. Parsing - Parsing: Parsing types, top-down and bottom-up parsing, LL (k) and LR (k) parsing for context-free languages , using finite automata models for LR (k) parsing.

Text Books: Elements of the Theory of Computation (2nd Edition), Harry R. Lewis, Christos H. Papadimitriou, Prentice Hall, 1998. Introduction to Automata Theory, Languages, and Computation (2nd Edition), John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, IAddison Wesley, 2000. Özdevinirler Kuramı ve Bçimsel Diller, Ünal Yarımağan, Bıcaklar Kitapevi, 2003

**PROFESSIONAL PRACTICE-1 0 2 1 ECTS:1**

Professional Practice-1st lesson is taught by weekly lessons, in accordance with the principles that are set in ‘Practical Working (Training) Instruction "and" Tranining Instruction of Students in Department ". The germane juries, evaulations by listening presentations on their internship and by asking questions. Giving 1st midterm mark according to the working performance around their training area and taking into consideration the paperwork filled out by job-site.The evaulation of the jury , by listening the presentations of students related with their training and by asking questions. According to the assessment made by the jury,giving the 2nd midterm exam.

Text Books: The student will assure the resourses according to the working subjects made in the summer training job.

**OPERATING SYSTEMS** **3 0 3 ECTS:6**

Introduction, What is an operating system, processes, inter-process communication, process scheduler, memory management, virtual memory, page replacement algorithms, the safety mechanism, the protection mechanism, input / output "IQ" principles and programming, hardware and software deadlocks, distributed operating systems, communication in distributed operating systems, synchronization in distributed operating systems, the process and processor in distributed operating systems, distributed file system.

Text Books: Bilgisayar İşletim Sistemleri, Ali Saatçi, Bıcaklar Kitapevi, 2003

**COMPUTER NETWORKS** **3 0 3 ECTS:6**

Computer networks, Digital Communication and general descriptions. Coding techniques, Error detection and correction codes. OSI reference model, layers and functions. Protocols, protocol structure, layer protocols, TCP / IP protocol stack examining. Detailed examination of the Transport, Network and Data link layers and header structures, addressing. Static and adaptive routing algorithms. Frame structures, MAC addressing structures. Computer networking concepts, LAN, MAN, WAN topologies. LAN and WAN technologies. Network Devices, NIC, Repeater, HUB, Bridge, Switch, Router, Gateway examination, the basis information for configuration. WAN technologies. Structured Cabling, Campus, Building and horizontal cabling techniques. Internet addressing, subnets, IP routing, Internet services programs. Network operating systems, DNS, DHCP, FTP, etc. servers and Overview to network management software.

Text Books: Bilgisayar Haberleşmesi ve Ağ Teknolojileri, R. ÇÖLKESEN ve B. ÖRENCİK, 4. baskı, Papatya Yayıncılık, 2003. Computer Networks and Internets, D. E. COMER, 4th ed., Prentice-Hall, 2004. Bilgisayar Ağları, D. ÖREN, Papatya Yayıncılık, 2002. Bilgisayar Ağları, N. BAYKAL, SAS Yayıncılık, 2001.

**ALGORITHM ANALYSIS** **3 0 3 ECTS:5**

Asymptotic growth rate and asymptotic representations. Basis tools for performance comparison and analysis. Recursive thinking, recursive relationships. At worst, average and best-case analysis. Using master theorem. An example for divide and conquer technique: The multiplication of two n-bit number. An overview to sorting and selection: Sorting in linear time (step, counting and sorting), lower bound for sorting, analysis of heap, heap sort, average-case analysis of placement and quick sort, tournament method, finding the k-th smallest element in linear time. Dynamic programming: multiplication of Matrix series, the longest common subsequence.

Text Books: Introduction to The Design & Analysis of Algorithms, Anany Levitin, Addison Wesley, 2003 Introduction to Algorithms, Third Edition, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, The MIT Press, 2009 Algorithms, Sanjoy Dasgupta, Christos H. Papadimitriou, and Umesh Vazirani., McGraw-Hill, 2006

**SOFTWARE ENGINEERING** **2 2 3 ECTS:6**

Software development project plan. Software development project management. Software metrics and estimation techniques. Software implementation and documentation. Software testing. Software configuration and implementing. Software development standards. Software quality assurance. Risk analysis. Software maintenance. Configuration management. Computer-aided software modeling tools.

Text Books: **Yazılım Mühendisliği, Erhan Sarıdoğan, Papatya Yayıncılık, 2004** Yazılım Mühendisliği, Ali Arifoğlu - Ali Doğru, Sas Bilişim, 2001

## 4. YEAR

**COMPUTER SYSTEMS LAB. 0 2 1 ECTS:4**

Theoretical preparation for the tests. Win2003 Operating Systems and Features. Linux Operating Systems and Features. TCP-IP Simulation and Distributed Programming with JAVA. Using Databases in client-server architecture. Basic tests in order to configuring Router and Switch devices. LAN Technologies. VOIP (Voice over IP), Voice transmission over IP. computer network simulations with OPNET. Monitoring and evaluation of network traffic.

Text Books: Öğrencilere verilecek deney föyleri

**INTERNET PROGRAMMING 2 2 3 ECTS:6**

In general, perform applications of basis technologies, protocols, softwares belongs to all layers which are used in computer networks and internet: Data communication fundamentals in hardware layer, data communication Fundamentals in software layer, data communications between different environments, data communication in multi-threaded environment, problems and solutions, basic internet protocol examination and be performed within the network servers. Markup Languages and format plates. HTML, Dynamic HTML. HTTP, forms, and data interchange. Client-side programming. JavaScript. Server objects, browsers, DOM. Internet programming with Java. Server-side programming: Web servers ((Apache, Apache Tomcat, Glassfish). Java Servlets. (JSP) Separable programming and representation: Java Server Pages.

Text Books: H.M. Deitel et.al (2002), Internet & Word Wide Web How To Program, Prentice Hall, New Jersey. H.M. Deitel et.al (2002), Java How to Program, Prentice Hall, New Jersey. Jim Buyens, Microsoft Frontpage, 2002, Microsoft Press. Matthew Pizzi, Zak Ruvalcaba, Thomas Myer, Zachariah Ruvalcaba, Greg Holden (2002), Macromedia Dreamweaver MX Unleashed, Sams.

**COMPUTER ENGINEERING DESIGN 0 2 1 ECTS:5**

Within the framework of a project team, will be obtained skills and experience of design, project manager, design tools, simulation standarts, evaluation of quality concept.

**PROFESSIONAL PRACTICE-2 0 2 1 ECTS:1**

Professional Practice-2nd lesson is taught by weekly lessons, in accordance with the principles that are set in ‘Practical Working (Training) Instruction "and" Tranining Instruction of Students in Department ". The germane juries, evaulations by listening presentations on their internship and by asking questions.Giving 1st midterm mark according to the working performance around their training area and taking into consideration the paperwork filled out by job-site.The evaulation of the jury , by listening the presentations of students related with their training and by asking questions. According to the assessment made by the jury,giving the 2nd midterm exam.

Text Books: The student will assure the resourses according to the working subjects made in the summer training job.

**SIMULATION AND MODELLING** **3 0 3 ECTS:6**

Systems modeling and simulation, matlab m file commands, Simulink, computer-aided modeling, neural networks, fuzzy logic applications, the finite element method, mesh generation. System description and mathematical modeling. Dynamic systems. Stochastic generators. Spatial Distributions. Stochastic data representation. Modeling of time-dependent systems. Markov processes. Event-triggered systems. System optimization. Applications of simulation packages.

Text Books: System Simulation, Geoffrey Gordon Computer Simulation and Modelling. Francis Neelamkovil Simulation using, Promodel. C. Harrell, Biman K. Ghosh, Royce O. Bowden Simulation with GPSS and GPSS V. P.A. Bobillier, B.C. Kahan, A.R. Probst Matematiksel modelleme ve Simulasyon, Öztürk, F. ve Özbek, L. Gazi Kitabevi, Ankara, 2004 Bulanık Mantık ve Modelleme İlkeleri, Zekai Şen, 2001

**GRADUATION PROJECT** **0 2 1 ECTS:4**

Graduation Project studies is taught in consultation with the Project Manager, in accordance with the principles that are set in "Graduation project Instruction" and "Guidelines of Graduation Project in Department". Investigation and development of project work, under the supervision of the manager. Giving the first midterm exam according to performance of student's work. Investigation and development of project work, under the supervision of the manager. Giving the second midterm exam according to performance of student's work. Project works, writing in accordance with spelling rules in a thesis format and preparing for the presentation. Delivery of Graduation Project.

- **TECHNİCAL ELECTİVES COURSES**

**ROBOTIC SYSTEMS** **3 0 3 ECTS:5**

The definition and classification of the robot. Robot characteristics. Robot kinematics. Rotation. Homogeneous transformations. Examples. Inverse kinematic transformations. Working space analysis and trajectory planning. Differential movement and static of the robots. Manipulator dynamics. Lagrange equations. Examples. Control of robots. State equations. Stationary solutions. Linear feedback systems. Linear feedback systems. Single axis PID control. Special topics.

Text Books: Robotik Sistemler Ders Notları, H. ALLİ, F.Ü., 2007. Robot Analysis and Control, H. ASADA and J. J. E. SLOTINE, Wiley-Interscience 1986. Fundamentals of Robotics, R. J. SCHILLING, Prentice Hall, 1990. Industrial Robotics, M. P. GROOVER and at all, McGraw-Hill, 1986.

**DIGITAL COMMUNICATIONS** **3 0 3 ECTS:5**

Pulse modulation, sampling theorem. Pulse amplitude, pulse duration, pulse position modulation, quantization, coding, converters. Delta modulation, linear delta modulation, adaptive delta modulation. Stable digit adaptive delta modulation, adaptive delta modulation with bit memory. Differential pulse code modulation. Baseband digital data transmission, systems, spectrum of baseband signal. Encoding, decoding, the receiver modification and compatible filters. Inter-symbol interference and pulse shaping. Bit error rate in baseband digital data transmission, bit error probability for binary signals. The error probability for Q-level signals. With the error probability the relationship between noise ratio and signal, matched filter. Digital modulation systems, amplitude shift keying, frequency shift keying. Phase shift keying. Differential phase shift keying, quadrature phase shift keying.

Text Books: Sayısal Haberleşme, Ahmet H.KAYRAN, Erdal PANAYIRCI,Ümit AYGÖLÜ,Sistem Yayıncılık, 1996. İletişim Kuramı, Haluk DERİN, Murat AŞKAR, ODTÜ Yayını,1987.

**DIGITAL CONTROL** **3 0 3 ECTS:6**

Continuous and discrete-time control system units. Continuous -time systems that contain zero- cross circuit to be converted to discrete-time systems . Pulse transfer function ( PTF) . PTFE of PID control . Laplace and systems that containing asterisked Laplace transform to be asterisked . s-plane to the z-plane transformation . Stability of discrete-time systems . For the stability of discrete-time systems developed methods . Frequency analysis of discrete-time systems . Transient and steady- state response and performance of discrete-time systems. System gain of characteristic polonure roots of discrete-time systems and the changes for sampling period. With analytical method, design of time-optimal controller of discrete-time systems. Discrete time controller design with root locus diagram. Frequency response of discrete-time systems. Discrete-time controller design with bode diagram. With analytical method, time -optimal controller design of discrete-time systems. State space model of discrete-time systems. State feedback controller design for discrete -time systems.

Text Books: Discrete-Time Control Systems, K. OGATA, Prentice Hall, 1987. Digital Control System Analysis and Design, C. N. PHILIPS and H. T. NEGLE, Prentice Hall, 1984. Computer Controlled Systems, K. J. ASTROM and B. WITTENMARK, Prentice Hall, 1984. Digital Control Systems, P. N. PARASKEVOPOULOS, Prentice Hall, 1996. Digital Signal Processing, V. K. INGLE and J. G. PROAKIS, PWS Publishing Company, 1997.

**INTELLIGENT METHODS** **3 0 3 AKTS:6**

An overview of the structure of basic intelligent system . Data mining . Decision trees. Neural computation , biological neural networks and learning algorithms. Application areas of Artificial Neural Networks (ANN). Classification and regression problems as the learning tasks. Error calculations. Single Layer Sensors. Sensor learning rule. Incremental learning algorithm for sensor, error correcting learning. Delta rule, incremental gradient descent algorithm . Sigmoidal sensors. Multilayer Perceptron. Back-propagation learning algorithm. Exemplary and collective learning . With back-propagation learning, problems will arise . Momentum and learning rate factor. Learning instance. ANN design with using a software ( MATLAB , C + + , etc. ). Sharp and fuzzy sets. Basic set operations. Fuzzy relations and combination. Fuzzy inference. Fuzzy control and fuzzy expert systems. Mathematical similarities between ANN and fuzzy systems . The design of fuzzy systems using a software. Basic structures of Genetic Algorithms ( GAs ). A simple GA structure and application.

Text Books: Neural Networks. A Comprehensive Foundation, S. Haykin, Second Edition, Prentice-Hall, Inc., New Jersey, 1999. Neoro-Fuzzy and Soft Computing, J. S. R. JANG, C. T. SUN, and E. MIZUTANI Prentice Hall,1997. Fusion of Neural Networks, Fuzzy Systems and Genetic Algorithms: Industrial Applications, Lakhmi C. JAIN and N. M. MARTIN, CRC Press, 1998.

**SATELLITE COMMUNICATIONS** **3 0 3 ECTS:6**

Introduction to satellite communications. Structure and types of satellite and antenna. Basic concepts such as LNA, LNC, LNB, transponder footprint. Tv satellites, GPS satellites, private satellites. Satellite orbits, satellite ground stations. Circuit-switched services, packet-switched services. Modulation techniques, code division multiplexing. MPEG Distribution stations.

Diseq-C switch, cable types. Data broadcasting, voice broadcasting. VSAT-mobile communication systems. Software techniques in Satellite systems. Modeling and simulation. Future developments and applications.

Text Books: Uydu ve Hücresel Mobil Haberleşme Sistemleri, Prof. Dr. Ergun BAYRAKÇI, Birsen Yayınevi, 2002. Mobile Satellite Communications, S. OHMORI, H. WAKANA and S. KAWASE, Artec House Publishers, 1997.

**WIRELESS COMMUNICATION 3 0 3 ECTS:6**

Introduction to wireless communication systems. Wireless communication systems and mobile communications. Moving cellular communications, capacity, frequency reuse, transfer techniques. The structure of cellular communication systems , public telephone networks and sub- systems. The radio base station subsystem. Switching Subsystem ( SS ) , OMC subsystem. Cell definitions, cell coverage, selecting groups of cells and frequency reuse. Examining the effects of interference, channel capacity and traffic account , antennas used in cellular communication systems. RF propagation link analysis in moving cellular communication systems. Modeling of numerical RF communication , source coding , vocoders, channel coding, linear block codes, convolutional codes, interleaving, multiple access techniques, Walsh codes, PN codes. RF link structure, asymmetric links , the forward link, the reverse link, traffic channels. Realization of Speech, create a speech, creating Stages in realization of communication, speech transmission, traffic characteristics. Power control and network planning. New generation wireless communication systems and the future of wireless communication systems.

Text Books: **Mobil Haberleşmede Evrensel Sistem, Taner KOÇ, Nuhi BAYIR, BETA Yayınları, 2003. Uydu ve Hücresel Mobil Haberleşme Sistemleri, Prof. Dr. Ergun BAYRAKÇI, Birsen Yayınevi, 2002.** Wireless, Internet Access over GSM and UMTS, M. TAFERNER and E. BONEK, Springer-Verlag, New York, 2002. GSM: Evolution Towards 3rd Generation Systems, Eds: Zonar ZVONAR, Peter JUNG and Karl KAMMERLANDER, Kluwer Academic, 1998.

**ARTIFICIAL INTELLIGENCE 3 0 3 ECTS:6**

Introduction. Intelligent Agents. Problem Solving Methods. Knowledge and Reasoning. To act as logical. Expert Systems. Developed computational methods inspired by nature. Learning from experience. Statistical Learning Methods. Detection and vision. Natural Language Processing.

**INFORMATION SYSTEMS 3 0 3 ECTS:6**

Introduction to Information Systems, software and hardware, organization of data and information, telecommunications, Internet, Intranet and Extranet, Electronic commerce and shopping systems, Information and Decision Support Systems, Special Business Information Systems, systems development, information systems security, privacy and ethical issues.

**DIGITAL IMAGE PROCESSING 3 0 3 ECTS:6**

Introduce of human visual perception system. Sampling and Quantization. Basic gray level transformations. Histogram equalization and customization. Spatial filtering: softening filters. Spatial filtering: Sharpening filters. Derivative-based filters. Introduce the Fourier transform and its basic properties. Low-pass filters in the frequency domain. High-pass filters in the

frequency domain. Basis of morphology. Identify discontinuities. Edge joints and limit-setting. Thresholding and region-based segmentation.

**COMPUTER GRAPHICS 3 0 3 ECTS:6**

Introduction: Imaging devices, hard-copy devices, mutually interactive input devices. Points and lines: representation and transformation of the points. 2- dimensional shifting and homogeneous coordinates. 3- dimensional transformations and projection: Scaling, shearing, shifting, rotation and perspective transformations. Plane curves. Space curves: Cubic curves, Parabolic mixture, Bezier curves, B-spline curves. Surface generating: the representation of curved surfaces, two linear surface, Lofted surface, Linear Coans surface, two-cubic surface patch, Bezier and B-spline surfaces. Raster graphics: line drawing algorithm, Bresenham algorithm, scan conversion, Space filling, sampling errors and removal methods.

**MACHINE LEARNING 3 0 3 ECTS:6**

Introduction. Concept learning and sorting general to the specific. Decision tree learning. Artificial Neural Networks. Evaluation of the hypothesis. Bayesian learning. Computational Learning Methods. Example-based learning. Genetic Algorithms. Reinforcement Learning.

**ARTIFICIAL NEURAL NETWORKS AND FUZZY LOGIC 3 0 3 ECTS:6**

Overview of Control Theory. Mathematical models in control system. Fuzzy Logic. Fuzzy Control. Artificial Neural Networks (ANN). Control with ANN. Fuzzy ANN and Neural Fuzzy Control. Application of fuzzy logic and neural network.

**COMPUTER APPLICATIONS IN MEDICAL IMAGING 3 0 3 ECTS:6**

Image Reconstruction in ComputedTomography, Multidetector computed tomography, Flat Detector Technology, Positron Emission Technology, Magnetic Resonance Imaging, Image Processing in Nuclear Medicine, Noise Reduction in Nuclear Medicine Images, Color Flow Imaging, Clinical Tomography, Medical Image Archiving: PACS and DICOM Standards, Web-based image Transfer, Compression of Medical Images

**SENSOR NETWORKS 3 0 3 ECTS:6**

Vision and hardware technology for Sensor Networks, Sensor Networks Applications, Sensor Networks Software, Programming in Sensor Networks, Wireless Integrated Sensor Networks, environmental monitoring with sensors, data management in Sensor Networks, Sensor Networks Software (TinyOS, tinyvm etc.), New Sensor Networks Programming Model, NesC language. Design and Application Problems; TinyOS and Motes, network architecture and services, Programming Languages and abstraction, Programming Tools and System Development Resources, Evaluation Problems, Modeling and Simulation, control and analysis of hybrid systems, Topology problems; Topology control and ensuring the continuation, Directing, Location detection services and techniques, data manipulation problems; Storage, Indexing and Query, abstract data structures, propagation and diffusion, Inter-network flow control, coordination problems; synchronization and calibration, distributed algorithms for coordination.

**DATA MINING 3 0 3 ECTS:6**

Introduction. Data warehouse and OLAP Technology for data mining. Data preprocessing. Classification: Basic Concepts, Model Evaluation. Classification: Alternative Techniques (Rule-based, nearest neighbor classifiers). Association Analysis: Basic Concepts and Algorithms. Association Analysis: Advanced Concepts. Cluster Analysis: Basic Concepts. Cluster Analysis: Algorithms, Anomaly detection. Regression.

**COMPUTER ARCHITECTURE** **3 0 3 ECTS:6**

Principles of computer design and basic computing concepts. The mechanics of running the program. Superscalar operation. Intel Pentium and Pentium Pro processors. PowerPC processors: 600 Series, 700 Series and 7400 processors. Intel Pentium 4 and G4 motorola comparison: Approach and design philosophy. Intel Pentium 4 and G4 motorola comparison: The back end. 64-bit computing and x86-64. G5 processors: IBM PowerPC 970. Cache memories and performance evaluation. Intel Pentium M, Core Duo and Core2 Duo processors.

**NETWORK SECURITY** **3 0 3 ECTS:6**

What is network and computer security? Security policies. Mechanisms of IP addressing (IPv4, IPv6), summary of the physical and IP address conversion protocol (ARP, RARP). Details of the Internet protocol, Routing of datagrams. The details of the ICMP protocol, IP Datagram Routing Protocols (RIP, OSPF, etc.). Examining of the transport layer protocol. Examining of network configuration protocols (BOOTP, DHCP, etc). DNS protocol, WWW concept. Examining the structure of SMPT, IMAP, POP3, TELNET, FTP, TFTP, NFS, SNMP protocols. Firewall and Gateway structure. Network Devices security. Examination of the VPN network. Attack Detection Systems. Attacks for ARP and TCP protocol, DNS protocol security. Attacks for Network and Service. Coordinated distributed attacks. Information Gathering Techniques, Security Policy.

**MULTIMEDIA COMPUTING** **3 0 3 ECTS:6**

Multimedia informations and applications: What is Multimedia? Multi-media and personal computing. The introduction of emerging applications. The combination of computers, communications and entertainment products: technology trends. The architecture of distributed multimedia systems and publishing: Distributed multimedia systems, the role of standards; synchronization, QoS architecture, framework for multimedia systems. Digital audio presentation and processing: Basic digital audio signal processing, MIDI presentation. Image and video technology: Scan principles and sensors for TV cameras, Color fundamentals and colorful video. Sound and image compression. System and architecture support for continuous media applications: limits on the workstation operating system and new operating systems, service architecture for multimedia systems, multimedia device data model and system support, communications and publishing.

**GRID PROGRAMMING** **3 0 3 ECTS:6**

Introduction to Grid Computing; virtualization of computing resources, Example Grids, OGSA, WSRF, Web Services and Grid. Grid Architecture; Virtual Organizations, Resource sharing, Web Services: Advantages, Disadvantages, Web Services Architectures, Service Oriented Architecture, Web Service Standards: WSDL, SOAP, UDDI, WS-Addressing, Grid Services, Grid Service Factories, OGSA-Open Grid Services Architecture, OGSA-Open Grid Services Infrastructure, GT3. Grid Technologies; Globus, Nexus, Condor, MDS-Metacomputing Directory Service, Business and management of remote files and programs, Resource Management. Grid security infrastructure / ID inspection, Parallel Computing, Peer to Peer Computing, Peer-to-Peer networks, Algorithms, Grid Applications, Semantic Grid.

**DISTRIBUTED SYSTEMS** **3 0 3 ECTS:6**

Introduction to distributed systems : purpose, hardware and software concepts, client-server models. Communication: layer protocols, remote procedure access, the use of remote objects, message-oriented communication, stream-oriented communication. Processes: channels, clients, servers, code migration, software agents. Naming: entities of naming, removing

entities which are not referenced. Synchronization: clock synchronization, logical clocks, global status, selection algorithm, mutual exclusion, distributed transactions. Consistency and replication: introduction, data-centric consistency models, client-centric consistency models, distributed protocols, consistency protocols. Fault tolerance: introduction, process resilience, reliable client- server communications, reliable group communication, distributed validation, recovery. Security: introduction, secure channels, access control, security management. Distributed object-based systems: CORBA, Distributed COM, GLOBE, CORBA and DCOM and GLOBE comparison. Distributed file systems: Sun network file system (SNFS), CODA file system, other distributed file systems. Distributed document-based systems: WWW, Lotus Notes, comparing Lotus Notes and WWW. Distributed coordination-based systems: Introduction to Coordination, TIB/ Rendezvous, Juni, comparing TIB / RENDEZVOUS and Jini.

**NETWORK PROGRAMMING** **3 0 3 ECTS:6**

Client-server interaction, the socket interface unit, client and server examples, naming with DNS, DNS client-server model, server model, server hardware, definition and transmission of electronic mail, file transfer and remote file access, World Wide Web page and browsing, CGI for dynamic web pages, active web pages java for, network management, network security, system placement

**BIOINFORMATICS** **3 0 3 ECTS:6**

Introduction. Basic Concepts. Biological structures, arrays. Protein synthesis and analysis. Sequence alignment. Multiple sequence alignment. Motif representation. Motif search and discovery. Prediction of protein structure. Gene expressions. Gene regulatory networks.

**INFORMATION SECURITY** **3 0 3 ECTS:6**

What is information security? Protection steps. Information security services, confidentiality, integrity, authentication, Accessibility, Responsibility, access control, nonrepudiation. Security attacks, Passive: Listening, Active: Interrupt, changed, produced, security mechanisms. Encryption, Decryption, conventional (symmetric) encryption, classic techniques and modern techniques, an overview of public key encryption issues. Modern Encryption Techniques - LUCIFER, DES, IDEA, BLOWFISH, RC5, RC4, Triple DES. Advanced encryption techniques , the basic structure of the U.S. NIST standard. 128, 192, 256-bit block and key. Key distribution, authentication, and resistance to attack. Public key encryption, the creation of a public and a private key pair for asymmetric encryption and decryption, the RSA algorithm. Public-key encryption in creating Authentication and session key. Symmetric Encryption, Information is encrypted progressively at high speeds. Key distribution, the distribution of the public key, Public Key Authorities, Public Key Certificates. The period of validity of the certificate (X.509), the distribution of private keys , the Needham -Schroeder protocol, Diffie -Hellman Key Exchange. Digital Signatures, Summary Codes, MD4, MD5, SHA-1, RIPEMD -160, HMAC, RSA digital signatures ( RSA encryption ), DSS ( Digital Signature Standard) digital signatures. Services and Protocols, Authentication Services, Kerberos, X.509 authentication (certificate service, e-mail services, PGP ( Pretty Good Privacy ), S/MIME Transport and Network Layer services; SSL and Secure IP ( IPsec). The details of the service and protocols. Operating systems and network security. Information security policies.

**COMPILER DESIGN** **3 0 3 ECTS:6**

Introduction, basic concepts. Programming languages and their properties. Lexical analysis.

Syntax analysis. Symbol tables. Error detection and correction. Mid-level code generation. Code optimization. Data flow analysis. Code generation. Advanced topics

**EMBEDDED SYSTEM DESIGN** **3 0 3 ECTS:6**

Introduction to embedded systems. Hardware fundamentals for software engineering. Advanced hardware basics. Interrupts. Overview of software architecture. Real-time operating systems. Operating systems services. Making design using real-time operating systems. Embedded software development tools. Debugging techniques. Sample systems.

**GAME PROGRAMMING** **3 0 3 ECTS:6**

Computer Graphics, Introduction to game engine, Computer Graphics 2D and 3D applications, Computer Graphics and Modeling, Design of User Interface (GUI), design of game, design of game engine, game boats, Game Artificial Intelligence, Game Artificial Intelligence and multi-user games over the network, prepare scenarios for computer games, game physics, game programming tools and environments.

**ELECTRONIC COMMERCE** **3 0 3 ECTS:6**

Introduction to the concept of electronic commerce and electronic business. Interaction of electronic commerce / business issues with outside other disciplines of the computer. Electronic business models. Internet marketing, security, SET, SSL, electronic signature protocols. Legal, social and ethical approaches to electronic commerce / business topic. E-Commerce and E-Business Applications.

**WIRELESS AND MOBILE NETWORKS** **3 0 3 ECTS:6**

Introduction to wireless networks and mobile communications: wireless transmission. Media Access Control (Medium Access Control) TDD/FDD and channel access (TDMA/CDMA /FDMA/Hybrids), fundamentals of wireless communication (Cell reuse , spectrum, sectoring , etc.), Cellular networks (GSM/IS-95), working of general and advanced mobile networks (umts/ımt-2000/satellites), localization, Handoff , Access management , Satellite networks: Introduction to satellite communications, GEO/MEO/LEO satellite systems, satellite architecture, satellite navigation, transport of satellite channels, Handoff , Protocols Applications. Ad Hoc Networks: Basics of mobile radio networks , architecture and protocols for Ad Hoc problems (Routing / Handoff ), Ad Hoc routing structure, other approaches and applications. Wireless LANs, Broadband Wireless Access, WiMax: Architecture/topology of Wireless LANs and WSL. Mobile IP: IP problems in Wireless (Routing / Handoff), Mobile IP principles, other approaches and their practices. Mobile transport layer, WAP, requirements for multimedia applications over wireless networks, Introduction to Sensor network.

**COMPUTER AIDED DESIGN** **3 0 3 ECTS:6**

Computer Aided Design (CAD) and Manufacturing (CAM). Fundamentals of CAD. Architecture and hardware of CAD. Java 3D. Fundamentals of Geometric Modeling Theory. Introducing and functions of Modeling & CAD (general purpose and special purpose) softwares. Curves and Curved Surfaces (Bezier, B-Splines, NURBS). Solid Modeling (B-rep, CSG, Sweep). General Engineering Applications. Virtual Reality and VRML.

**INTELLECTUAL PROPERTY** **3 0 3 ECTS:6**

Intellectual property rights, Industrial property in the global economy, Industrial property rights in Turkey and the Turkish Patent Institute, Resources and basic principles of international intellectual property law, branding, geographical indication, Introduction to the patent system, national and international patent protection, the Patent Cooperation Treaty

(PCT) and the European patent Convention (EPC), the patent specification preparation, criterias for patentability, patent search and examination reports, patent research systems and patent databases.

**DATA MINING** **3 0 3 ECTS:5**

Introduction, Data warehouse and OLAP technology for data mining, Data preprocessing. Classification: Basic concepts, models, Evaluation. Classification: Alternate techniques (rule based, the nearest neighbor classifiers), Association analyze: basic concepts and algorithms, Association analyze: Advanced concepts, Clustering analyze: basic concepts., Clustering analyze: Algorithms, Anomaly determination, regression.

**ARTIFICIAL INTELLIGENCE** **3 0 3 ECTS:5**

Intelligent Factors, Advanced Search Techniques, Autonomous Planning, Uncertainty Modeling, Markov Decision Processes, Learning, Decision Trees, Statistical Learning Methods, Artificial Neural Networks.

**INTRODUCTION TO EVOLUTIONARY COMPUTING** **3 0 3 ECTS:5**

Computational systems inspired by natural evolution; natural and artificial evolution, evolutionary; chromosome representations; search operators; co-evolution; constraint handling techniques; niching and speciation; genetic programming; classifier systems and theoretical foundations; implementation of selected algorithms.

**OBJECT ORIENTED PROGRAMMING** **3 0 3 ECTS:5**

Object oriented programming concepts, Unified Modeling Language(UML),Class design, Applets, Inheritance, Polymorphisim, Interface and abstract classes, design patterns, frameworks, Application programming interfaces (API).

**MOBILE PROGRAMMING** **3 0 3 ECTS:5**

An Overview of Mobile Technologies ; Mobile Devices ; Mobile OS ; Introduction to Mobile Application Development ; Mobile App Components ; Application Lifecycle ; User Interface Design (Menus, Dialog boxes, etc.) ; ListView ; ViewPager ; ArrayAdapters; Databases on Smartphones and Data Management ; Sensors on Smartphones and Sensor Data Collection ; Broadcast Receivers ; Notifications, User Rights and Permissions ; Location-based Services ; Background Tasks.

**ARTIFICIAL NEURAL NETWORKS** **3 0 3 ECTS:5**

The concept of neural networks, compatible networks and structures, back propagation, Learner control of neural networks, aided learning, uncontrolled learning, application examples.

**CYBER SECURITY** **3 0 3 ECTS:6**

Cyber security attack and defense tools. Critical infrastructures within the scope of cyber security. Cyber attack and defense techniques and applications.

- **SOCIAL ELECTIVES**

**Philosophy of Science** **2 0 2 ECTS:2**

While emphasizing the differences between philosophy and science, the aim of this course is to introduce the basic values, concepts and arguments of the philosophy of science in general and the philosophy of social science in particular as a philosophical field, with a critical perspective and by considering methodological and epistemological pluralism. In addition, it is aimed to understand the nature of science, to distinguish between scientific and non-scientific, to provide learning with scientific methods and these methods, to learn scientific thinking methods and techniques and to gain practice habits.

Text Books: Bilim Felsefesi-Ders Notları, Doğan Özlem,Inkilap Kitabevi, Istanbul, 2003.Çağdaş Sosyal Bilimler Felsefesi-Çok Kültürlü Bir Yaklaşım, Brian Fay, çeviren İsmail Türkmen, Ayrıntı Yayınları, İstanbul, 2005. Veysel Sönmez, 2008, Bilim felsefesi.

**Public Relations** **2 0 2 ECTS:2**

Public relations, marketing management, integrated marketing communication, corporate communication, public relations writing, public relations practices and case studies, public relations and application techniques, public relations management, corporate social responsibility, brand and management, crisis communication and management, communication research, Defining the basic concepts of advertising and media sociology. It is aimed to gain the ability to define problems, to recognize and analyze opportunities, to interpret and evaluate by using the basic knowledge and skills acquired in the field of public relations.

**Business Management** **2 0 2 ECTS:2**

To be able to analyze the concepts and ideas in the field of business with scientific methods, to identify and analyze problems in this way, to offer solutions based on data and research, to be able to follow current and developing trends in business administration with professional English proficiency, It is aimed to gain the skills of planning and managing activities.

Text Books: Hatch, M. J. ve Cunliffe, A. L. (2006). Organization Theory (2nd. Edition), Oxford University Press: Oxford.Hill, C. W. L. (2002). Global Business Today (2nd. Edition), McGrawHill/Irwin: NY.Ireland, R. D., Hoskisson, R. E. ve Hitt, M. A. (2011).

**Web Technologies** **2 0 2 ECTS:2**

HTML language, design with Dreamweaver, image manipulation with Fireworks, animations with Flash, publishing a web page, sample web designs.

**Illumination and Art** **2 0 2 ECTS:2**

Definition of illumination art, traditional pattern sources of Turkish illumination art, usage areas of Turkish illumination art, sources of motifs in Turkish illumination art, drawings of Turkish illumination art, general groups of motifs in illumination art, 10. Simple aunt pattern, one of the motifs in Turkish illumination art.

Text Books: A .Birol, İnci (2010) Türk Tezini Sanatlarında Desen Tasarımı, çizim Tekniği ve çeşitler

**Good Speech and Oratory** **2 0 2 ECTS:2**

Preparation for eloquence, Importance of speaking well, Points to be considered in speaking, Using Turkish correctly, beautifully and effectively, Breathing and voice training, strengthening of expression, Stress and intonation, Stress and its types.

Text Books: Ö.Göçgün (2016), Güzel ve Etkili Konuşma Sanatı, Nisan Kitapevi

**History of Science and Technology** **2 0 2 ECTS:2**

It is aimed to teach some basic concepts on science and technology, technological progress and technological change, science and technology system and national innovation system, invention, discovery and innovation, internal and external dynamics of human creativity, technique, information and innovation.

**Scientific Research Methods** **2 0 2 ECTS:2**

It is aimed that students acquire basic theoretical knowledge about research methods and techniques and transfer this knowledge to practice. Science and basic concepts (fact, knowledge, absolute, true, false, universal knowledge, etc.), basic information on the history of science, the structure of scientific research, scientific methods and different views on these methods, problem, research model, universe and sample, data collection and data collection methods (quantitative and qualitative data collection techniques), data recording, analysis, interpretation and reporting concepts are taught.

**Disaster and Disaster Management** **2 0 2 ECTS:2**

Before, during and after the emergency, it will carry out and support these plans and programs by making emergency planning in the ongoing process in order to prevent an event or accident that threatens the environment, operation, production, property and human life, to reduce the damage, to prepare, to intervene and to heal. To ensure that students are familiar with emergency plans and emergency management as a team member to manage emergencies.

**History of Civilization** **2 0 2 ECTS:2**

The basic events and phenomena that constitute the civilization process from the beginning to the present, which people have transferred from one generation to the next. Ancient Asia Minor and Egyptian civilizations, Ancient Greek and Hellenic civilizations and culture, Roman civilization, Medieval, Renaissance and reforms, Age of Enlightenment, American and French revolutions, Industrial revolution, XIX. The currents that emerged in the century and XX. the most important events of the century. I and II. World Wars and later developments.

**Tennis** **2 0 2 ECTS:2**

Examining School, Club and Family relations, basic tennis techniques, competition rules, field tools and equipment, Provincial, National and International Tennis Competition Organizations in the tennis branch.

**Management Sociology** **2 0 2 ECTS:2**

Scope of management sociology. Management theories and history. Management relations. Management in organizations. Management types. Organizational Culture, Organizational Types and Organizational Analysis Techniques.

**Physical Education** **2 0 2 ECTS:2**

Basic concepts in physical education and sports, the place, function, aims, philosophy of physical education and sports in education and training, its relationship with other sciences, the future of professional fields in physical education and sports, its place and function in Turkish Education and Sports institutions. Concept of training, basic and auxiliary principles of training, fatigue, recovery, training sections, talent selection in sports. History of Football, Volleyball and Basketball, game rules, knowledge and skills about basic techniques and tactics. General Gymnastics, definition, basic postures, formations, use of space, rhythmic bounces, jumps, turns, transitions and connections, movements with and without equipment, pyramids, rule information. Demonstration marches, order, rhythm, jump rope, gym stick, pin floor mat exercises, rule information and teaching skills.

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