COMPUTER ENGINEERING DEPARTMENT

COURSE CONTENTS

FIRST YEAR

Turkish Language I (2+0) 2

Following the aim of course, to make students have free and scientific thinking ability and a wide world view in order to support the development and enrichment of our language and our national culture under the protection of international culture; in Turkish 101 course, the appearance of languages, world languages in terms of structure and origin, the place of. Turkish language among the world languages, historical development of Turkish language, the structure, dividing world into its origin and supplements and word deriving, description defect, drawing up a petition, preparing curriculum vitae concepts are mentioned, in order to support the aim of course, various fictions, poems and trial fictions are analyzed.

Developing Listening and Speaking Skills (0+4) 2

How to develop basic listening and speaking skills for following up the lectures.

Developing Learning Strategies (1+1) 2

How to learn effectively, how to develop strategies for easy and effective learning. Techniques for improved memory to better studying or test-taking strategies.

Basic Chemistry (2+2) 3

The physical and chemical properties and reactions of organic compounds such as saturated and unsaturated hydrocarbons, alcohols, phenols and carboxylic acids. Also part of the "core course" pools for the BIO, MAT degree programs.

Calculus I (4+0) 4

Analytic geometry in the plane and in the three dimensional space: Cartesian coordinates, vectors and their algebra, scalar product, cross product, lines and conics. Trigonometric functions and their basic properties. Inverse trigonometric functions. Logarithmic and exponential functions. Limits. Continuity. Differentiation and its rules. Function sketching.

Physics I (4+0) 4

Physical quantities; rectilinear motion; motion in two and three dimensions; Newton’s laws of motion; work and energy; momentum; conservation laws; collisions; rotational dynamics; gravitation; periodic motion; fluid motion.

Introduction To Computer Science (2+0) 2

An orientation course to provide information to the students about the department and Computer Engineering discipline in general. The main topics introduced are: fundamentals of computer systems, programming languages and algorithms, computer organization, operating systems, networking, database design and software engineering.

Introduction To Computer Programming (3+2) 4

An introduction to the process of program design and analysis for students who have no prior programming experience. Topics to be covered include basic data types and their operators, expressions and assignment statements, I/O, control structures (selection, loops), classes (including methods and fields), arrays, functions and procedures, files.

Body Education-I/Plastic Arts –I (0+2) 1

Turkish Language II (2+0) 2

Giving the ability of correct use of mother language; some writing studies, which include punctuation marks, spelling rules, essay rules, essay rules, writing types with examples are done for the students who have gotten h-this skill in order to develop that skill in this field.

Developing Reading and Writing Skills (0+4) 2

Basic rules of grammar. Basic rules for reading and writing essays and academical texts.

Developing Critical Thinking (1+1) 2

Research methods in social sciences. How to evaluate and understand academic texts, how to think critically and in an academic way.

Calculus II (4+0) 4

Function sketching. Applications of derivatives and max-min problems. Definite and indefinite (Rieamann) integral, area under a curve, Fundamental theorem of calculus, techniques of integration, areas, surfaces, volumes. Sequences, series, convergence tests, introduction to differential equations: first order differential equations.

Linear Algebra (3+0) 3

Systems of linear equations; Gaussian elimination. Vector spaces, subspaces, linear, independence, dimension, change of basic. Linear transformations. Inner product, orthogonality. Eigenvalues. Diagonalization and canonical forms. Cayley-Hamilton theorem.

Physics II (4+0) 4

Electric charge and electric field; Gauss?s law; electric potential; dielectrics; electric circuits; magnetic field and magnetic forces; sources of magnetic field; electromagnetic induction; electromagnetic waves.

Intermediate Programming (3+2) 4

Programming methodology: specification, design, coding and program correctness. Review of data types (scalar and structured types), procedures and functions, recursion, files (sequential and random access), arrays, character strings and records. Basic data structures and their implementations: linear structures (linked lists, stacks and queues) and nonlinear structures (trees and sets). Exercises in a structured or an object-oriented programming language.

Body Education-II /Plastic Arts –II (0+2) 1

SECOND YEAR

Differential Equations (3+0) 3

First-order differential equations and solution methods. Direction fields, qualitative methods, numerical approximations. Higher-order linear differential equations. Linear ayatems. Nonlinear systems, asymptotic behaviour of solutions. Laplace transform.

Discrete Mathematics (3+0) 3

Introduction to combinatorial problems and techniques. Sets, relations and functions. Graphs, trees, matching, network flows. Counting techniques. Recurrence relations and generating functions. Combinatorial circuits and finite state machines.

Atatürk's Principles and Revolutionary History I (2+0) 0

Bringing up the process of transformation from an empire to a national state, the meaning and importance of the Turkish National Struggle for independence. The Concepts of Revolution, The Reasons that prepare the Turkish Revolution, Ottoman Empire, Demise of Ottoman Empire, Preparation Period of Independence War, Preparation of. Standing Army War and Peace (Lausanne).

Electronic Circuits (2+2) 3

Passive components, basic circuit analysis, first order circuits, transient and steady state analysis, secon order RLC circuits, resonance, amplifier fundamentals, operational amplifiers, introduction to diodes and transistors.

Data Structures (3+2) 4

Review of basic data structures. Trees and heap structures. Hashing. Searching and sorting. Structure, organization and processing of files. Sequential and direct file processing techniques.

Indexed and hash files, creation and update; B-trees and derivatives. Representation of graphs and basic graph operations.

Engineering Drawing (2+2) 3

This course will teach the student to read and understand industrial prints. The course will focus on part prints and the use of geometric dimensions and tolerances. Sample prints from local industries will be discussed in class. Topics will include sketching, multi-view drawing standard abbreviations and symbols.

Introduction to Economics (3+0) 3

An introduction to economics with emphasis on macroeconomics. The first three weeks cover aspects of general economics that everyone should know, including how the market system works, how prices are determined, why shortages and surplusses occur, and, mosting interestingly, why some people earn high incomes and others earn low incomes. Topics include: supply and demand, competition vs. monopoly, inflation, unemployment, recessions, booms, fiscal and monetary policy, budget deficits, international trade, and exchange rates.

Numerical Methods (3+0) 3

IEEE-standard, iterative and direct linear system solution methods, eigendecomposition and model-order reduction, fast Fourier transforms, multigrid, wavelets and other multiresolution methods, matrix sparsification. Nonlinear root finding (Newton's method). Numerical interpolation and extrapolation. Quadrature.

Electronics (2+2) 3

Introduction to basic concepts in electronics. An exploration of the basics in electricity and electronics. Topics include an overview of direct and alternating current, circuit laws, components, troubleshooting and use of test equipment. Teamwork, critical thinking and problem solving are emphasized. Hands-on experience and practical applications are included.

Atatürk’s Principles and Revolutionary History II (2+0) 2

Reorganizing Period, the Period coming with republic (political, social, military and economical, forensic, cultural and all changes) Foreign Policy of Turkish Republic (all the agreements, treaties and pacts, Atatürk principles and supplemental principles that Atatürk adopted the international and global value of Turkish Revolution.

Introduction to Probability and Statistics (3+0) 3

Experiments and events. Probabilty axioms. Counting techniques. Conditional probabilty, independent events, discrete and continuous sample spaces. Random variables and distribution function. Some standart distributions. Sampling and statistics.

Systems Programming (2+2) 3

The course content includes two main parts. First part introduces computer hardware and software, addressing methods, instruction sets and formats and details of assembly language programming. Overview of compilers, interpreters, assemblers, linkers and loaders are given as part of the course. The second part introduces UNIX environment by including shell programming, UNIX system calls and signals, UNIX programming and multithreading. Programming assignments are given on both assembly language and UNIX/Linux environment.

Analysis Of Algorithms (3+0) 3

Algorithm design and analysis techniques; Analysis and design of selected group of algorithms: sorting, searching, string processing and graph algorithms. Computational complexities of algorithms. Divide-and-conquer approach. Recursive algorithms and solving recurrence equations. Dynamic programming and greedy algorithms. Introduction to NP-completeness and example of NP-complete problems.

Engineering Economy (2+0) 2

Financial accounting principles and cost systems, interpretation and use of accounting reports and supplemental information for engineering economic analyses, consideration of cost-volume-profit analyses, use of discounted cash flow techniques, flexible budgeting, transfer pricing, and capital budgeting.

THİRD YEAR

Digital Design (3+2) 4

Number systems, Boolean algebra and functions, logic gates. Analysis and design of combinational circuits. Combinational MSI components. Flip-flops, counters and shift registers. Analysis and design of sequential circuits. State table, state minimization and state assignment. Sequential MSI components. Register transfer and micro-operations. Basic computer organization and design: arithmetic logic, memory and control units. Laboratory experiments and applications of digital logic design.

Operating Systems (3+2) 4

Overview and evolution of operating systems. Multiprogramming and time sharing concepts. Process management issues including processes and threads, CPU scheduling, mutual exclusion, synchronization, deadlocks and starvation. Memory management, swapping, paging, segmentation and virtual memory. File system structures, allocation methods and directory implementation. I/O interfaces and secondary storage structure. Protection and security issues. Introduction to distributed systems, client/server programming. LINUX case studies and programming.

Database Systems (3+2) 4

Logical organization of data: Entity-relationship modeling of data. Relational, network and hierarchical data models. Data description and query languages. SQL, QBE and QUEL. Logical database design and normalization. Physical design and access strategies. Query optimization, security, integrity, reliability and concurrency issues in databases. Distributed databases. Object-oriented databases. Students will design and implement a database management system as a project.

Modelling and Discrete Simulation (3+0) 3

Simulation examples, and languages. Mathematical models, petri nets, model validation, random variate generation. Analysis of simulation data. Case studies.

Computer Organization (3+2) 4

Basic computer organization and design. Instruction formats and addressing modes. Instruction fetch, decode and execution. Arithmetic algorithms and design of arithmetic logic unit. CPU organization. Hardwired and microprogrammed control organization. Memory organization: virtual-memory, caches and their management. Input-Output organization: interfacing processors and peripherals. Pipelining and other techniques for performance improvements. Machine language and assembly language

Software Engineering (3+2) 4

The software life cycle and the phases in software development: feasibility study, estimation, analysis, specification, design, implementation and testing, documentation and maintenance. Tools, techniques, environments and methodologies. Management issues: planning, organization and control. Software quality assurance and software configuration management. An integral part of the course is the involvement of students working in teams in the organization, management and development of a medium size software product.

Formal Languages And Automata Theory (3+0) 3

Classification of automata and formal languages. Finite state machines, regular languages and their limitations. Tape automata. Push-down automata and context-free languages. Normal-form grammars. Context-sensitive languages. Turing machines, halting problem and unsolvability. Recursive functions.

Introduction to Operations Research (3+0) 3

This course provides an introduction to some of the more useful OR models that exploit basic concepts and principles of probability and statistics. Although the course is organized around mathematical models and methods, the focus is on practical solutions to real operational problems; sufficient theory is provided to develop understanding of fundamental results. Topics may vary, being selected from the fields of Markov chains, queueing theory, decision theory, Bayesian networks, reliability and maintenance, activity networks, Markov decision processes, and inventory theory.

Business Law and Ethics (3+0) 3

Topics include elements of legal contracts, proof, inadmissible evidence, discharge, breach, and termination; statutes of fraud and limitations; principal-agent relationships; nature of partnerships and essentials of partnership agreements; formation and organization of corporations; powers and regulations of foreign corporations; Uniform Partnership and Turkish Corporation Acts.

FOURTH YEAR

Information Systems: Analysis And Design (3+0) 3

Information systems: characteristics, components, applications, business and organizational systems, requirement analysis, design, implementation, testing, operation and maintenance, prototyping. Information system technology: CASE tools, database management systems, data communication, networking, distributed business systems, Hardware and software selection.

Compiler Design (3+0) 3

Development of the logical design of a compiler: lexical analyzer, parser, semantic analyzer, code generator, code optimizer, and error recovery routines, interpreters and intermediate code. Analysis of formal algorithms for each component, description of overall compiler construction techniques.

Computer Networks (3+2) 4

Basic concepts of data transmission. Overview of network layers and network architectures. ISO-OSI reference model. Physical layer and data communication issues. Circuit switching, packet switching. Network topology. Data link layer and its protocols, error-detection and correction. Local area networks, Ethernet, bridges and switches. Network layer issues and protocols, routing algorithms, congestion control, Internet Protocol. Transport layer and internet transport protocols (TCP and UDP). Network applications and programming: the socket interface, DNS, SMTP, FTP, and WWW.

Engineering Project I (0+4) 2

A technical project emphasizing engineering design principles on a specific topic in any field of computer science or engineering to be carried out by the senior student under the supervision of a faculty member. Involves design and implementation phases by applying a synthesis of knowledge and skills acquired in different courses during the undergraduate study.

Microprocessors (2+2) 3

Microcomputer hardware organization. Understanding and comparison of microcomputer architectures. Data, address and control buses. Memory system design. Interface units and their usage. Parallel/serial ports, timers, interrupt controllers, DMA services. Input and output peripherals and devices. Assembly language programming. Microprocessor applications. Laboratory experiments and applications of microprocessor based systems.

Engineering Project II (0+4) 2

Continuation of projects given in CSE 497 with emphasis on realization of the design and implementation. The students are required to submit a written report summarizing the accomplishments of the project. Oral presentations and demonstration sessions on the completed projects are required as part of the course requirements.

SEÇMELİ DERSLER

Vlsi Circuit Design (3+0) 3

Size and complexity of integrated circuits (IC), IC design process, trends in very large scale integrated (VLSI) circuit design, IC production process, semiconductor processes, design rules and process parameters, layout techniques and practical considerations, device modeling, circuit simulation, basic integrated circuit building blocks.

Distributed Systems (3+0) 3

Hardware and software concepts of distributed systems. Issues in distributed operating systems: transparency, reliability, performance, scalability, group communication and synchronization. Client/server programming model and remote procedure calls (RPCs). Distributed file and directory systems. Distributed programming tools. Distributed coordination, concurrency control, deadlock detection and election algorithms. Distributed applications.

Advanced Unix Programming (3+0) 3

Programs and processes, process creation, interprocess communication. UNIX File I/O, pipes, file locking. Signals and timers. Critical section and semaphores. Threads and thread synchronization. Semaphores. Client-Server communication, socket and network programming, basics of remote procedure calls (RPCs).

Parallel Processing (3+0) 3

History and basic concepts of parallel computing. Classification of parallel processing systems. Parallel computer architectures. Programming methods and libraries for parallel processing. Design and analysis of fundamental parallel algorithms for sorting, arithmetic and matrix-related applications. Parallel programming assignments of selected applications using the parallel programming tools and libraries covered in the course.

Software Project Management (3+0) 3

Life cycle of software system development, project specification, defining end-product, standard techniques and tools, testing, project planning and re-planning, project organization and structure, people management, project control, configuration management.

Distributed Databases (3+0) 3

Architectural models for distributed DBMS, transparencies, alternative design strategies, distribution design issues, semantic data control, security, integrity, query decomposition and data localization, optimization of distributed queries, centralized and distributed algorithms, transaction management and distributed concurrency control. Distributed reliability protocols, distributed multi-database systems. Current trends.

Management of Information Systems (3+0) 3

Decision making process, planning and control, organizational structure, management concepts, information-based support systems, support systems for planning, control and decision making, strategies for determination of information requirements, organization and management of information resources function, management information systems (MIS), organizational and social implications of MIS.

Information System Security (3+0) 3

Principles and underlying concepts for security policy setting and for management of information security. Fundamental security principles: confidentiality, integrity, availability. Principles of information systems analysis for security; concept of analysis, basic features of information systems, semiotic model. Principles of policy for security. Principles of risk and contingency; risk analysis and risk management. Nature of responsibility and policy in the management of security. Role of cryptography in secure systems. Secure payment systems: SET, digital certificates, trusted third parties. Case studies.

Fundamentals Of Electronic Commerce (3+0) 3

A critical review and analysis of electronic commerce with emphasis on multidisciplinary aspects and team projects. Technology infrastructure for electronic commerce. Internet-based businesses. Economics, business and technical models of the Internet. Internet security. Social, legal, ethical and public policy issues of the Internet. Business plan creation and a prototype for an Internet-based operation.

Internet Programming (3+0) 3

WWW-based applications. Design and implementation of a software architecture for connecting applications, WWW and databases. Client side and server side programming. Personalization. Network programming. Java and Javascript programming. Perl and ASP programming. XML. Current trends in internet programming.

Principles Of Programming LanguageS (3+0) 3

Syntax and semantics of programming languages, grammars, design of programming languages, data types, variables, expressions and statements, procedures, recursion, parameter passing,

dynamic and static memory management. Comparative study of functional, logic and object-oriented programming languages.

Object-Oriented Software Design (3+0) 3

Software quality, object-oriented approach, dynamic objects, genericity and parameterizing classes, assertions, preconditions and postconditions, class invariants and class correctness, exceptions handling, inheritance, polymorphism, deferred classes, multiple inheritance, persistent objects and classes, operations on persistent objects, object oriented databases, object oriented analysis and design, object oriented languages.

Introduction To Cryptography (3+0) 3

Basic concepts of cryptography and cryptanalysis. Classical methods: DES and other algorithms. Public key systems: RSA, El-Gamal and other algorithms. Number theory and complexity fundamentals. Digital signatures. Hash functions. Key distribution problems. Network aspects of cryptography. Secret sharing.

Wireless And Mobile Networks (3+0) 3

Introduction to wireless and mobile networks and network architectures. Cellular networks. Mobility and handoff management. GSM, GPRS, 3G networks. WAP. Cellular network planning. Wireless LANs and Mobile IP. Ad hoc wireless networks. Wireless broadband networks. Satellite networks.

Artificial Intelligence (3+0) 3

Representation of knowledge. Search and heuristic programming. Logic and logic programming. Application areas of artificial intelligence: problem solving, game playing and game trees, puzzles, expert systems, planning, learning, vision, and natural language understanding. Basic LISP or prolog programming.

Computer Graphics (3+0) 3

Hardware and software components of graphic systems. Output and filled-data primitives. 2D and 3D geometric transformations. Two dimensional viewing: Viewing pipeline, clipping, and windowing. There dimensional viewing: Viewing pipeline, viewing parameters, projections, viewing transformations, clipping. Visible surface detection. Introduction to illumination models and surface rendering.

Multimedia Systems (3+0) 3

Multimedia system applications and problems. Fundamentals of multimedia signal processing. Issues in effectively representing, processing, retrieving and compression of multimedia data such as text, graphics, sound and music, image and video.

Machine Learning (3+0) 3

Paradigms and issues of machine learning. Supervised and unsupervised learning. Statistical models. Learning decision trees. Clustering. Feature extraction. Artificial neural networks. Reinforcement learning. Applications of machine learning.

Introduction to Scientific Computing (3+0) 3

This course covers the use of numerical computing techniques for mathematical and scientific problems. Topics include: floating-point representation, approximations and computer arithmetic, error analysis, conditioning and stability, Taylor series, roots of nonlinear equations, Newton's method, curve fitting and interpolation solution to systems of linear equations using techniques such as LU decomposition, Gaussian elimination, Jacobi, Gauss-Seidel Iteration, eigenvalue problems, numerical integration and solutions to differential equations.

Introduction to Robotics(3+0) 3

This course provides an overview of robot mechanisms, dynamics, and intelligent controls. Topics include planar and spatial kinematics, and motion planning; mechanism design for manipulators and mobile robots, multi-rigid-body dynamics, 3D graphic simulation; control design, actuators, and sensors; wireless networking, task modeling, human-machine interface, and embedded software. Weekly laboratories provide experience with servo drives, real-time control, and embedded software. Students will design and fabricate working robotic systems in a group-based term project.

Introduction to Mechatronics (3+0) 3

Introduces technologies involved in mechatronics (Intelligent Electro-Mechanical Systems) and the techniques necessary to apply this technology to mechatronic system design. Topics: electronics A/D, D/A converters, op-amps, filters, power devices; software program design, event-driven programming; hardware and DC Stepper Motors, solenoids, and robust sensing. Lab component of structural assignments and open-ended team project.

Introduction to Neural Networks (3+0) 3

This course explores the organization of synaptic connectivity as the basis of neural computation and learning. Perceptrons and dynamical theories of recurrent networks including amplifiers, attractors, and hybrid computation are covered. Additional topics include backpropagation and Hebbian learning, as well as models of perception, motor control, memory, and neural development.

Seminar In Computer Engineering (3+0) 3

In this course, students are given a topic in one of the major fields in computer science or engineering. They are asked to present and to write a technical report by summarizing the various aspects of the topic.

Special Topics In Computer Engineering I (3+0) 3

Selected topics of current interest in computer science and engineering.

Special Topics In Computer Engineering II (3+0) 3

Selected topics of current interest in computer science and engineering.