



LEFKE AVRUPA ÜNİVERSİTESİ  
EUROPEAN UNIVERSITY OF LEFKE

**DEPARTMENT OF  
COMPUTER ENGINEERING**

*PROGRAM INFORMATION*

## PROGRAM INFORMATION

**Program Name and Degree Awarded:** Computer Engineering, Bachelor of Science

**Duration of Studies:** 4 years (8 semesters)

**Total Credits / ECTS :** 152 CREDITS/ 240 ECTS

**Language of Instruction:** English

### **Mission**

Our mission is to provide students with the necessary skills and competencies in engineering, to demonstrate how theoretical knowledge can be applied to existing and new technologies, and to create a learning and research environment that fosters creative, inquisitive, and innovative engineers who approach technological problems from different perspectives while demonstrating social responsibility, environmental awareness, and ethical values.

### **Vision**

Our vision is to train ethically and socially conscious engineers who can creatively design and manage modern computer software, hardware, and information systems. Furthermore, our primary goal is to be recognized nationally and internationally as an educational institution that leads the IT sector in technological terms.

### **Program Objectives**

**EO1:** To be Computer Engineers who are able to build careers in both national and international organisations that are significant to the field, within the areas of hardware and software.

**EO2:** To produce graduates who continue their professional development and progress in job positions in the field of Computer Engineering.

**EO3:** To be Computer Engineers, who become entrepreneurs or reach leadership positions (project managers, team leaders, directors or managers) in the areas of Computer and Information Systems.

**EO4:** To be graduates who can take part in the projects of various fields, within a team or individually.

### **Program Learning Outcomes**

**1. Engineering Knowledge:** Knowledge of mathematics, science, basic engineering, computer computing and subjects specific to the relevant engineering discipline; Ability to use this information in solving complex engineering problems.

**2. Problem Analysis:** The ability to define, formulate and analyze complex engineering problems using basic science, mathematics and engineering knowledge and taking into account the UN Sustainable Development Goals\* relevant to the problem under consideration.

- 3. Engineering Design:** Ability to design creative solutions to complex engineering problems; The ability to design complex systems, processes, devices or products to meet current and future requirements, taking into account realistic constraints and conditions.
- 4. Use of Techniques and Tools:** The ability to select and use appropriate techniques, resources and modern engineering and informatics tools, including estimation and modeling, for the analysis and solution of complex engineering problems, while being aware of their limitations.
- 5. Research and Investigation:** Ability to use research methods to examine complex engineering problems, including researching literature, designing experiments, conducting experiments, collecting data, analyzing and interpreting results.
- 6 a. Global Impact of Engineering Practices:** Information about the effects of engineering practices on society, health and safety, economy, sustainability and environment within the scope of the UN Sustainable Development Goals.
- 6 b. Awareness of the legal consequences of engineering solutions.**
- 7. Ethical Behavior:** Acting in accordance with engineering professional principles\*, knowledge about ethical responsibility; Awareness of acting impartially, without discrimination on any issue, and being inclusive of diversity.
- 8. Individual and Team Work:** Ability to work effectively individually and as a team member or leader in intradisciplinary and multidisciplinary teams (face-to-face, remote or hybrid).
- 9. Oral and Written Communication:** The ability to communicate effectively verbally and in writing on technical issues, taking into account the various differences of the target audience (such as education, language, profession).
- 10 a. Knowledge of business practices** such as project management, risk management and change management.
- 10 b. Awareness about entrepreneurship, innovation; information about sustainable development.**
- 11. Lifelong Learning:** Lifelong learning skill that includes being able to learn independently and continuously, adapting to new and developing technologies, and thinking inquisitively about technological changes.

## **CURRICULUM**

**Course Code – Course Title (Theory, Practice, Lab) Credit – Compulsory/Elective – ECTS**

### **1ST YEAR**

#### **Fall Semester (Total 19 Credits)**

- UFLE01 – Foreign Language Elective I (English) (3,0,0)3 – Elective – 3
- COMN111 – Chemistry (3,0,0)3 – Compulsory – 4
- ENGG117 – Computing Foundations (3,1,0)4 – Compulsory – 6
- COMP119 – Introduction to the Profession (2,0,0)0 – Compulsory – 2
- ENGG111 – Chemistry Laboratory (2,0,0)1 – Compulsory – 2
- ENGG121 – Physics I Laboratory (0,0,2)1 – Compulsory – 2
- ENGG131 – Physics I (3,0,0)3 – Compulsory – 4
- MATH101 – Calculus I (3,2,0)4 – Compulsory – 7

#### **Spring Semester (Total 20 Credits)**

- UHTC01 – History (2,0,0)2 – Compulsory – 2
- UFLE02 – Foreign Language Elective II (English) (3,0,0)3 – Elective – 3
- COMN122 – Physics II (3,0,0)3 – Compulsory – 5
- COMP124 – Computer Programming (3,0,2)4 – Compulsory – 6
- ENGG122 – Physics II Laboratory (0,0,2)1 – Compulsory – 2
- MATH104 – Linear Algebra (3,0,0)3 – Compulsory – 5
- MATH110 – Calculus II (3,2,0)4 – Compulsory – 7

### **2ND YEAR**

#### **Fall Semester (Total 19 Credits)**

- COMP205 – Digital Logic Design (3,0,2)4 – Compulsory – 6
- COMP209 – Discrete Mathematics (3,0,0)3 – Compulsory – 5
- COMP217 – Data Structures (3,0,2)4 – Compulsory – 7
- COMP219 – Electronics for Computer Engineers (3,0,2)4 – Compulsory – 7
- MATH201 – Differential Equations (3,2,0)4 – Compulsory – 5

#### **Spring Semester (Total 18 Credits)**

- COMP214 – Operating Systems (3,0,3)3 – Compulsory – 6
- COMP218 – Fundamentals of Object-Oriented Programming (3,0,2)4 – Compulsory – 6
- COMP228 – Digital System Design (3,0,1)3 – Compulsory – 6
- MATH224 – Engineering Mathematics (3,0,0)3 – Compulsory – 5
- MATH226 – Probability and Statistical Methods (3,0,0)3 – Compulsory – 5
- UHTC02 – Turkish (2,0,0)2 – Compulsory – 2

## **3RD YEAR**

### **Fall Semester (Total 20 Credits)**

- COMP333 – Computer Architecture and Organization (3,1,0)4 – Compulsory – 5
- COMP335 – Analysis of Algorithms (3,0,0)3 – Compulsory – 5
- COMP337 – Database Management Systems (3,0,2)4 – Compulsory – 6
- COMP339 – System Programming (3,0,0)3 – Compulsory – 5
- COMP343 – Signals and Systems (3,1,0)3 – Compulsory – 5
- UFRC01 – University Elective I (3,0,0)3 – Elective – 4

### **Spring Semester (Total 20 Credits)**

- COMP342 – Computer Networks (3,0,0)3 – Compulsory – 5
- COMP362 – Microprocessor Systems (3,0,2)4 – Compulsory – 5
- COMP364 – Principles of Programming Languages (3,1,0)4 – Compulsory – 6
- COMP368 – Software Engineering (3,0,0)3 – Compulsory – 5
- UFRC02 – University Elective II (3,0,0)3 – Elective – 4
- CPEL01 – Technical Elective I (3,0,0)3 – Elective – 5

## **4TH YEAR**

### **Fall Semester (Total 16 Credits)**

- COMP310 – Summer Internship (0,1,0)0 – Compulsory – 1
- COMP400 – Graduation Project I (0,2,0)1 – Compulsory – 4
- CPEL02 – Technical Elective II (3,0,0)3 – Elective – 5
- CPEL03 – Technical Elective III (3,0,0)3 – Elective – 5
- CPEL04 – Technical Elective IV (3,0,0)3 – Elective – 5
- CPEL05 – Technical Elective V (3,0,0)3 – Elective – 5
- ECON413 – Engineering Economics (3,0,0)3 – Compulsory – 5

### **Spring Semester (Total 20 Credits)**

- COMP452 – Graduation Project II (0,9,0)5 – Compulsory – 5
- CPEL06 – Technical Elective VI (3,0,0)3 – Elective – 5
- CPEL07 – Technical Elective VII (3,0,0)3 – Elective – 5
- CPEL08 – Technical Elective VIII (3,0,0)3 – Elective – 5
- CPEL09 – Technical Elective IX (3,0,0)3 – Elective – 5
- ENGG434 – Engineering Ethics (3,0,0)3 – Compulsory – 5

## Technical Elective Courses

- EE431 – Principles of Digital Image Processing
- COMP415 – Artificial Intelligence
- COMP448 – Artificial Neural Networks
- EE419 – Wireless Communication
- COMP464 – Internet Programming
- ECE408 – Digital Signal Processing
- COMP461 – Automata Theory
- COMP465 – Advanced Computer Graphics
- COMP440 – Database Security
- COMP469 – Discrete Event System Simulation

## Laboratory and Equipment Capacity

AS104, AS106, AS108 COMPUTER LABS

## Laboratory Devices & Experiment Kits

1. LT345 MK2 Feedback Logic Tutor Experiment Kit
2. Digital Electronics Experiment Set
3. KL-100 K&H Linear Circuit Trainer Experiment Kit
4. Linear Circuit Laboratory
5. Basic Electricity Experiment
6. Magnetism Element
7. Magnetic Field
8. Ampere's Law Experiment
9. Fleming's Rule Experiment
10. Electromagnetic Induction Experiment
11. Electronic Circuit Fundamentals Experiment
12. Basic Electronic Circuit Experiment
13. Basic Electronic Circuit Experiment (*duplicate item*)
14. Special Electronic Components Experiment
15. Oscillator Experiment
16. Function Generator
17. GW Instek GDS2102 Oscilloscope
18. Core2Duo Computer Set
19. Feedback Electrical Power & Machines Experiment Kit
20. Universal Power Supply
21. Variable Frequency Drive (VFD)
22. Motor Switches
23. Control Pushbuttons
24. Contactor Panel
25. Torque & Speed Control Panel

26. Synchrony Lamps
27. Automatic Control Lamp & Triac Experiment
28. Temperature Control & Photocoupler Experiment
29. Over/Under Voltage Breaker Experiment
30. Triac Liquid & IC Timer Experiment
31. Digital Signal Driver & Zero Voltage Experiment
32. Zero Voltage Switch Experiment
33. IGBT Characteristic Experiment
34. Isolation Transformer
35. Power Supply Units
36. Feedback Nevis Radar Experiment Kit
37. RS232 Interface
38. Motorized Antenna Unit
39. Nevis Microwave Experiment Kit
40. Klystron Power Supply
41. SWR (Standing Wave Ratio) Meter
42. Feedback 8086 Microprocessor Trainer System
43. 8086 Development and Trainer System
44. DC Power Supply
45. GW Instek GPS4303 Power Supply
46. Reduction Gear Tachometer Unit
47. Loading Unit
48. Input Potentiometer
49. Digital Encoder
50. Synchro Transmitter
51. Differential Synchro
52. Output Potentiometer
53. Pre-Amplifier Unit
54. Cable Adapter
55. Attenuator Unit
56. Amplifier Unit
57. Simulated Relay Unit
58. Sample and Hold Unit
59. Modulation/Demodulation (Mod/Demod) Unit
60. PID (Proportional–Integral–Derivative) Unit
61. Analog Control Interface

### **Microprocessor Lab**

- Feedback 8086 Training Sets
- Digilent Cerebot 32MX4 Microcontroller Boards
- Oscilloscopes
- Logic Analyzers
- Power Supplies

## **Career Opportunities**

Graduates of the Computer Engineering Department can pursue careers in a wide range of fields, taking roles such as system analyst, software developer, system programmer, test/quality engineer, database administrator, computer systems engineer, and game developer. In addition to employment opportunities in both the public and private sectors, graduates are also well-qualified to work abroad or pursue academic careers through postgraduate education.

## **Contact Information**

### **Head of Department**

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## **COURSE CATALOGUE DESCRIPTIONS**

### **UFLE01 FOREIGN LANGUAGE ELECTIVE II (ENGLISH)**

This course is intended for academically oriented students and it aims to bridge the gap between general and academic English. The course aims at developing the skills required for academic study, including note-taking, essay writing, as well as teaching strategies for undertaking research and dealing with unfamiliar academic vocabulary. The course also aims at teaching the features of guided writing, reading strategies such as predicting, skimming, and scanning. At the end of this course the students are expected to be able to; develop strategies, to improve the ability to comprehend complex academic texts, to develop strategies to produce more coherent writing and, make clear, appropriate, relevant notes from academic texts, and to adopt various approaches to deal with new or unknown vocabulary by practising effective use of dictionaries, and through making effective vocabulary records.

### **COMN111 CHEMISTRY**

The aim of this course is to describe students how substances interact with one another. Students will be informed on how the atom is made up, how atoms come together to make molecules and how molecules can interact, chemical compounds, chemical bonds, chemical equations and reactions, aqueous solutions, periodic table, gases, the electronic structure of the atom and introduction to thermochemistry.

### **ENGG 117 COMPUTING FOUNDATIONS**

Introduction to general problem-solving concepts, algorithms and its applications. Computer terminology, units, and number systems. Steps in problem-solving. Problem solution, pseudocode, algorithms, flowcharts, data types, and control structures. History of computers and programming. A simple C program layout, syntax and rules. C language basics, native types, identifiers, declarations, variables, expressions, and assignments. Basic console input/output functions. Operators, unary, binary, mathematical, relational, equality and logical, precedence and associativity rules, type conversions and casting. Statements, flow of control. Sequential structure. Selective structure, if-else statement. Repetitive structure, while loop, do-while loop, break/continue statements. Tracing C code.

### **COMP119 INTRODUCTION TO PROFESSION**

Computer and software engineering professions. Curriculums, courses, course contents, course assessments, letter-grading system. Summer internships, graduation projects. Seminars on academic and/or professional activities.

### **ENGG111 CHEMISTRY LAB**

By the end of this course, students will have a general understanding of experimental methods. Students will have the basic knowledge on concepts such as chemistry, quantitative techniques, distillation, density, chromatography, aqueous solutions, volumetric methods, acid base equilibrium and titrations.

### **ENG121 PHYSICS I LAB**

This course is directed to ENG131-Physics I. The aim of the course is providing a medium for students to see the experimental applications of kinematics and dynamics of one dimensional, two dimensional, circular and rotational motion. The course supports students to validate the underlying theory through experiment and observation.

### **ENGG131 PHYSICS I**

This course aims to introduce the fundamental concepts of physics necessary for engineering science and to provide essential background for engineering students. The course provides deep understanding about kinematics and dynamics of one dimensional, two dimensional, circular and rotational motion. Also, the course aims to show the students the engineering applications of the course material.

### **MATH101 CALCULUS I**

Fundamentals of calculus and its applications for engineers. The conceptual and visual representation of limits, continuity, differentiability, and tangent line approximations for functions at a point. Applying the power rule, product rule, quotient rule and chain rule to functions explicitly and implicitly for finding derivatives. Applying the fundamental theorem of calculus to evaluate definite integrals. Performing accurately improper integrals, definite and indefinite integration, integration by parts, substitution, and inverse trigonometric substitution.

### **UHTC01 HISTORY**

The course provides a detailed exposure on the history of the construction of the Turkish Republic under the light of Kemal Atatürk's principles. The aim of the course is to introduce a brief history of Turkish Republic and Cyprus. Social, economic and political aspects and effects of Western Civilization on Turkey and Cyprus. Relations with Middle East.

### **UFLE02 FOREIGN LANGUAGE ELECTIVE II (ENGLISH)**

This course is the continuation of the COM101 English I course. Similar issues are focused on as in the former course with a higher tone of language. This course integrates all four language skills and teaches students how to integrate skills and content in real-world academic contexts. High-interest and intellectually stimulating authentic materials are used to familiarize students with academic content. The course also aims at developing the ability to participate in exchanges of information and opinions in the context of the specific field, and to write instructions, descriptions and explanations about topics in the related field. Extra importance is put on teaching students terminology related to the specific field.

### **COMN122 PHYSICS II**

This course aims to introduce fundamental concepts of physics for engineering science and to provide essential background for engineering students. The course provides deep understanding of thermodynamics, electricity and magnetism. Also, the course aims to show the students the engineering applications of the course material.

## **COMP124 COMPUTER PROGRAMMING**

Structured programming using C. Expressions: constants, data types, type modifiers, const qualifier, operators, order of evaluations, type conversions, type casts. Statements: selection, iteration, jump, label, expression, block. Selective statements: if-else, switch-case, conditional operator, nested forms. Iterative statements: for, while, do-while, infinite loops, comma operator, break, continue, nested forms. Functions: definitions, formal parameters, actual arguments, call-by-value, function prototypes. Scope rules, storage classes. Arrays: declarations, initialization lists, define directive, arrays as function arguments, call-by-reference. Strings: character arrays, null character, string-handling functions. Pointers: pointer variable declarations, array/pointer relationship, pointer arithmetic, array-subscript and pointer-offset notations, pointers as function arguments. Structures: user-defined types, typedef, structures as function arguments, array of structures, pointer to a structure. Unions, bit-fields, enumerations, preprocessing directives, and standard header files.

## **ENGG122 PHYSICS II LAB**

This course is directed with COM122-Physics II. The aim of course is providing a medium for students to see the experimental applications of thermodynamics, electricity and magnetism. The course supports students to validate the underlying theory through experiment and observation.

## **MATH104 LINEAR ALGEBRA**

Systems of linear equations. Elementary row operations, echelon forms, Gaussian elimination. Matrices, power of matrices, determinants, inverses, diagonal matrices. Cofactor expansion via row reduction. Cramer's rule and evaluating determinants. Vector spaces, linear independence, basis, dimension, inner product spaces, Euclidean spaces. Linear transformation systems. Eigenvalues and eigenvectors; and eigenvalue/eigenvector applications.

## **MATH110 CALCULUS II**

Techniques of integration, integration by parts, trigonometric substitution, integration of rational functions, integration of trigonometric integrals. Application of integrals, areas between curves, volume, volumes by slicing, volumes by cylindrical shells, arc length, area of a surface of revolution, moments and centre of mass. Parametric equations, curves defined by parametric equations, calculus with parametric equations, derivation, area and arc length calculations. Polar coordinates, plotting with polar coordinates, derivation and integration with polar coordinates. Sequences, series, integral tests and estimates of sum.

## **COMP205 DIGITAL LOGIC DESIGN**

Number systems; logic gates; Boolean algebra and truth tables; Karnaugh maps; Combinational logic design; Decoders and encoders; Multiplexers; Arithmetic circuits; Synchronous sequential circuits; Flip-flops; Counters and shift registers; Sequential logic design; Memory and programmable logic.

### **COMP209 DISCRETE MATHEMATICS**

The main purpose of this course is to introduce the concepts of discrete math. The subjects include logical forms, logical equivalences, conditional statements, digital logical circuits and number systems, algorithms, sequences and mathematical induction. The emphasis is placed on recursion. This course also covers set theory, counting and probability theory, functions and relations.

### **COMP217 DATA STRUCTURES**

Notion of data and types, representations in computer memory, abstract data type, types of data structures. The stack structure: properties, operations, types of problems solved, array-based implementations, case study: shunting-yard algorithm. The queue structure: properties, operations, types of problems solved, array based implementations, circular queue, case study: waiting lines. The linked list structure: singly, doubly, and circular lists, basic operations and applications, linked stack and linked queue. Recursion: recursive definitions, how to write a recursive C function, working on examples, case study: linear vs binary search. The tree structure: definitions and properties, binary trees, tree traversals, binary search trees, inserting and deleting nodes into/from a binary search tree.

### **COMP219 ELECTRONICS FOR COMPUTER ENGINEERS**

Current, voltages power and energy. Kirchhoff's current law (KCL), Kirchhoff's voltage law (KVL). Resistances and capacitors in series and parallel. Nodal analysis, mesh analysis. Conductors, semiconductors. Basic diode concepts, load-line analysis of diode circuits. Voltage-regulator circuits, rectifier circuits, linear small-signal equivalent circuits for diodes. NPN and PNP bipolar Junction transistors (BJTs). Field Effect transistors: JFETs and MOSFETs. BJT/FET circuit DC and AC biasing. Basic BJT/FET amplifier configurations. Ideal operational amplifiers, inverting amplifiers, non-inverting amplifiers, integrators, differentiators.

### **MATH201 ORDINARY DIFFERENTIAL EQUATIONS**

Definition and classification of differential equations. Solution of first order linear differential equations, initial value problems, homogeneous differential equations, non-homogeneous differential equations, separation of variables, exact differential equations, integrating factors, the method of undetermined coefficient, Bernoulli equations, higher order differential equations, Systems of linear differential equations with constant coefficients, Cauchy Euler equations, Laplace transforms and properties of Laplace Transforms.

### **COMP214 OPERATING SYSTEMS**

The history of the operating systems. The hardware and software components. Application Programming Interface. Computing environments. Process Management, Process operations, Process synchronization. Processor Scheduling Criteria and Algorithms (FIFO, RR, SJF, SRTF, PRIORITY, PREEMPTIVE, NONPREEMPTIVE ALGORITHMS). The Indefinite postponement, Deadlock prevention, detection, avoidance, recovery. The main memory, swapping, fixed partition multiprogramming,

variable partition multiprogramming, paging, segmentation. The virtual memory, page replacement strategies (FIFO,LRU,OPT). Secondary Storage, Disk scheduling (First-Come-First-Served, Shortest-Seek-Time-First, SCAN, C-SCAN, FSCAN, N-Step SCAN,LOOK, C-LOOK). File Systems, Directories.

### **COMP218 FUNDAMENTALS OF OBJECT ORIENTED PROGRAMMING**

Object-oriented programming using C++. C++ console input/output streams. C++ functions: inlining, overloading, default arguments, reference parameters. C++ operators new/delete. C++ vectors. C++ strings. Classes and objects: data abstraction, data members and member functions, encapsulation, hiding data, member access methods: public, private, and protected, accessor/mutator functions, constructors, destructor. Constant and static data members and member functions, friend functions, friend classes. Object composition: copy constructor, member initializer syntax, this pointer, cascaded function calls. Operator overloading: overloading as member, non-member, and friend functions. Inheritance: base and derived classes, protected access, private inheritance, multilevel inheritance, multiple base classes, virtual base class. Polymorphism and virtual functions: static vs dynamic binding, pure virtual functions, abstract classes, virtual destructor.

### **COMP228 DIGITAL SYSTEM DESIGN**

Review of Boolean algebra, truth tables, K-maps, combinational logic; Synchronous sequential circuits; Flip-flops; Counters and shift registers; Sequential logic design; Memory and programmable logic; Registers and counters - design/analysis of counters; Micro operations: arithmetic, logic and shift operation; Parallel register transfer and algorithmic state machines.

### **MATH224 ENGINEERING MATHS**

The concept of numerical error, solution of nonlinear equations with root finding. Solution of linear systems of equations using software packages. Direct and iterative methods for the solution of linear algebraic equations. Polynomial interpolation ( Lagrange and Newton polynomials) and extrapolation. Curve fitting for least squares line and polynomial fitting with data linearization method. Numerical differentiation, numerical integration with quadrature formulas and their error analysis. Numerical solution of ordinary differential equations.

### **MATH226 PROBABILITY AND STATISTIC METHODS**

Introduction to statistic and data analysis, Measures of location, Sample mean, Sample median, Mode value, Probability and sample space, Probability of an event, Additive rules, Bayes rule, Random variables and probability distributions, Discrete probability distributions, Continius probability distributions, Mean, variance and covariance of random variables, Discrete uniform distributions, Binomial distributions, Hypergeometric distributions, Poisson distributions, Normal distribution, Areas under the normal curve, Applications of normal distributions, Gamma and exponential distributions, Chi-squared and lognormal distributions.

### **COMP333 COMPUTER ARCHITECTURE AND ORGANIZATION**

This course will review fundamental structures in modern processors and computer architecture. Topics will include technology trends, computer organization, instruction set design, memory system design and importance of buses within the computer organization. This course also covers introduction to symbolic assembly language programming for MIPS architectures.

### **COMP335 ANALYSIS OF ALGORITHMS**

Understanding the basic concepts of recursion, recursive algorithms, iterative methods, understanding the concepts of iterative and recursive. Calculating the algorithmic complexity, Big (O) notations, worst case, average case and best case examples and comparative graphs of algorithmic complexity. Basic sorting algorithms; bubble sort, quick sort, selection sort, insertion sort with recursive and iterative comparisons. Calculating the algorithmic complexity of sorting methods, backtracking; 8x8 N-queens problem-solving, dynamic programming; Knapsack problem, Dijkstra's algorithm, longest common subsequence problem, matrix chain multiplication problem and expressing them using recursive method.

### **COMP337 DATABASE MANAGEMENT SYSTEMS**

Foundations of a database-management system: view of data, data models, data abstraction, instances and schemas, data-definition and data-manipulation languages. Relational model: tables, tuples, attributes, primary and foreign keys, schema diagrams, relational query languages, relational algebra. Structured Query Language (SQL): built-in types, schema definitions, structure of SQL queries, queries on a single/multiple relation(s), rename operation, string operations, ordering tuples, attribute specification, where-clause predicates, set operations, null values, aggregate functions, aggregation with grouping, having clause, nested subqueries, set membership, set comparison, test for empty relations, test for the absence of duplicates, subqueries in the from clause, with clause, scalar subqueries, modification of the database, join expressions, views, integrity constraints. Entity-Relationship (E-R) model: design process, entity sets, relationship sets, complex attributes, mapping cardinalities, participation constraints, E-R diagrams, reducing E-R diagrams to relational schemas, extended E-R features, E-R design issues, alternative notations.

### **COMP 339 SYSTEMS PROGRAMMING**

This course introduces system programming in the Linux environment with emphasis on C language. Topics include: program arguments, return codes, compiling programs on Linux. Understanding Linux environment and system calls. Basic terminal commands. POSIX processes, orphan and zombie processes, signals, signal handling. Low level IO calls, managing file systems using C and system calls. POSIX threads, mutexes; multithreading constraints and problems, synchronization, critical sections. Interprocess mechanisms; pipes, shared memory, UNIX sockets. Introduction to Internet communication protocols using TCP/IP and UDP/IP sockets. Creation and management of semaphores, using file tokens, the relation with shared memory.

### **COMP343 SIGNALS AND SYSTEMS**

System properties: linearity, time-invariance, causality, stability, convolution for discrete-time signals/systems supported by examples shown using MATLAB. Convolution for continuous-time signals supported by examples shown using MATLAB. Fourier series of continuous and discrete-time signals with MATLAB examples. Signal categorisation, description and properties. Fourier transform of continuous and discrete-time signals. Signal description and properties with supported by examples shown using MATLAB. Basic Fourier transform pairs. System properties: linearity, time-invariance, causality, stability. Linear time-invariant systems. Properties of Fourier representation. Fourier transform rep of signals and systems.

### **UHTC02 TURKISH**

To show the characteristics and rules of operation of Turkish language with examples; to give the students the ability and habit to express their feelings and thoughts accurately and effectively; developing vocabulary through written and oral texts; The aim of this course is to teach the rules of reading texts or the programs they listen to correctly. COM 106 course aims to provide basic Turkish reading, speaking and writing skills for international students.

### **COMP342 COMPUTER NETWORKS**

An understanding of foundations and applications of computer networks, classical network topologies, network performances and network layer services. The reference OSI and TCP/IP models. Ethernet: physical properties and multiple access. Wireless topologies; Bluetooth, Wi-Fi, Wi-MAX and cellular networks. Application of Computer Networks, Types of Networks : PAN, LAN, MAN, WAN, Internet. Switching concepts, bridges and LAN switches. Coding, framing, error detection and fundamental data security. Internetworking with IP (classes of IP addresses; IPV4 and IPV6), Cisco Packet Tracer Tutorial.

### **COMP362 MICROPROCESSOR SYSTEMS**

This course will introduce the fundamentals of microprocessor systems, microcontrollers, hardware interfacing and system design techniques as well as microprocessor architectures. Additionally embedded C/C++ programming, Arduino Nano microcontrollers, analog to digital conversion, I/O methods, pin and port manipulation, pulse-width modulation, UART communication, serial peripheral interface, inter integrated circuit communication, interrupts, timers, counters, EEPROM access, power saving modes, and fuses will be covered.

### **COMP364 PRINCIPLES OF PROGRAMMING LANGUAGES**

The language evaluation, language design, evolution of programming languages, language categories. The names, variables, binding, scope, lifetime, referencing environments, constants, data types, enumeration types, array types, pointer and reference types. The arithmetic expressions, overloaded operators, relational and boolean expressions, type conversions. The selection statements, iterative statements. The subprograms, parameter passing methods, nested subprograms, blocks and scoping. The syntax, semantics, lexical and syntax analysis, syntax parsing, abstract syntax tree, recursive descent parser.

## **COMP368 SOFTWARE ENGINEERING**

Introduce important software properties; security, maintenance, adaptability, robustness. Software process steps; requirement analysis, specification, prototype, design, implementation, testing, validation and verification. Process models; waterfall, evolutionary, incremental, spiral component based. Scheduling and Management, risk management; minimization, avoidance, mitigation, monitoring. Functional and nonfunctional requirements, constraints, Organizational Goals, Project Goals, Stakeholders, Life Cycle Planning, responsibilities. Software architectures; client-server, layered, pipe-filter, implicit invocation, repository, blackboard style. Design patterns; facade, singleton, observer, bridge. Data flow diagram, Sequence Diagram, Use case diagram, scenarios, feasibility, business case analysis, cost estimation.

## **BUSN461 STRATEGIC PLANNING AND MANAGEMENT**

Strategic Planning, setting goals, basic concepts of strategic management, developing a strategic plan, vision, mission, objectives, strategies and action plans, project management, types of project management, risk management, the six step process of risk management, risk management steps and tools, entrepreneurship, innovation, invention, the practice of innovation, entrepreneurial management, change management and leadership, roles and responsibilities for change, leadership style, strategic leadership, strategic leadership failure, global and social effects of engineering practices.

## **ENGG413 ENGINEERING ECONOMICS**

Basic concepts of economy for engineering students. Interest rate, simple and compound interests are discussed. This course also introduces students to the key concept and topic of microeconomics such as opportunity cost, production possibility frontier, demand and supply, elasticity, utility, preferences, production, costs.

## **ENGG434 ENGINEERING ETHICS**

Ethics and professionalism, moral reasoning, moral frameworks, ethical theories, commitment of safety, risks, workplace responsibilities, honesty, equal opportunity: non-discrimination, confidentiality and conflicts of interest, environmental ethics, green engineering, sustainable development, dilemma resolution, professional rights, whistleblowing. Code of ethics: The Institute of Electrical and Electronics Engineers, American Institute of Chemical Engineers, American Society of Civil Engineers, Software Engineering. Basic ethics training. Engineering professional training, job responsibilities and professionalism, labor law and ethics. Case studies on the topics of engineering professional ethics, labor safety, environmental protection. Computers and ethics, data protection, computer failures. Global issues.

## **EE431 DIGITAL IMAGE PROCESSING**

This course introduces the principles of digital image processing applications and their implementations mainly in C++. Topic covers: Image sampling and quantization; interpolation techniques, nearest neighbor interpolation, bilinear interpolation; Histograms, understanding image histogram, contrast stretching, brightness and contrast, gamma, histogram equalization. Filtering in spatial domain, low pass

filter, high pass filter, band pass filter, box filter, edge detection techniques. Color theory, human color vision, digital image color systems: RGB, HSI, HSV, CMYK. Image morphology, thresholding, erosion, dilation, opening and closing operations, and/or/not operations. Information theory, Shannon's entropy, Huffman compression, compression techniques, lossy/lossless compression.

### **COMP415 ARTIFICIAL INTELLIGENCE**

Basic concepts of artificial intelligence; systems think/act rational, systems think/act human like, goal based, utility based, reflex agents. Environment types; static, discrete, accessible, episodic, and deterministic. Problem solving, problem, actions, goals, simple agent problem, multi agent problem. Uninformed search strategies; Breadth First Search, Depth First Search, Uniform Cost, Iterative Deepening. Informed search strategies; Greedy Search, A\* search, hill climbing, annotated simulating, admissible heuristic, complexity, completeness, optimal algorithms, game playing, min max algorithm, alpha beta pruning algorithm. Propositional Logic, truth table, entailment, inference, valid, tautologies. First Order Logic, modus ponens, resolutions, conjunctive form, disjunctive form, horn form. Forward chaining, backward chaining, resolution by refutation, generalized modus ponens.

### **COMP448 ARTIFICIAL NEURAL NETWORKS**

Background on Linear Algebra. History of Neural Networks. Artificial and biological neural networks. Biological Neurons and Artificial Neurons. Models of single neurons. Different neural network models. Mc-Culloch-Pitts neuron, Hebb NET, Single Layer Perceptrons, Adaline, Least mean square algorithm. Learning rates. Activation Functions, Logic Gates, Threshold, Bias, Limitation of Linear models, The XOR problem. Multilayer Perceptrons, Back-propagation algorithm. Binary Classification, Multi-Class Classification. Unsupervised Learning strategies, Kohonen Self-Organising Maps, The SOM algorithm, Learning vector quantization, Hamming NET and Probabilistic Neural Networks.

### **EE419 WIRELESS COMMUNICATION**

This course introduces the characteristics and applications of transmission fundamentals, communication networks, the cellular concept and system design fundamentals frequency reuse, interference and system capacity. Protocols and the TCP/IP protocol suite. Antennas and radio propagation and large-scale path loss. Small-scale fading and multipath propagation. Doppler shift, mobile multipath channel parameters such as coherence bandwidth and coherence time. Diversity techniques and diversity combining. Spread spectrum communication techniques. Multiple access techniques TDMA, FDMA, CDMA, SDMA. Satellite Communications, Wireless LAN technologies.

### **COMP464 INTERNET PROGRAMMING**

The fundamental concepts of client-side web programming, the fundamental concepts of server-side web programming.

## **ECE408 DIGITAL SIGNAL PROCESSING**

Discrete-time signals, the relationship between continuous and discrete-time transforms, and the sampling theorem. System properties. The impulse response of discrete time, linear time-invariant (LTI) systems and the convolution sum. The z-transform and its properties. Design and analysis of LTI systems using the ztransform. Filter structures. Design of FIR and IIR digital filters. Characterization using linear difference equations. Signal analysis using the discrete Fourier transform and the fast Fourier transform (FFT). Analysis and simulation using the MATLAB software package.

## **COMP461 AUTOMATA THEORY**

Sets, relations, functions, graphs, trees, strings, languages. Parse trees. Deterministic Finite state automata (DFA), non-deterministic finite state automata, equivalence of deterministic finite state automata and non-deterministic finite state automata, minimization of finite automata. Mealy and Moore machines. Regular expressions and regular grammars. Conversion of DFA to regular expression, conversion of regular expression to finite automata. Closure property of regular languages. Context-free grammars (CFG) and languages.  $\epsilon$ -productions, derivations and sentential forms. Normal forms of CFG, Chomsky Normal Form, Greibach Normal Form. Pushdown automata, Deterministic Pushdown automata, Non-Deterministic Pushdown Automata, Construction of PDA from CFG. Construction of CFG from PDA.

## **COMP440 DATABASE SECURITY**

Entity relationship model, SQL, query, nested queries, select, from, where, group by, having, order, like, set operation, referential integrity, cascade, primary key, candidate key, super key, foreign key, constraints. Discretionary access control; grant, revoke, privilege, create user roles, permission, inference, prepared statement. Mandatory Access Control, security levels, top secret, secret, classified, unclassified, polyinstantiation, SQL injection, covert channels, Trojan horses, star model. Backup and recovery methods, auditing, inspection, concurrency control, isolation, durability, commit, rollback, transaction log, system failures, check point, power failure, undo, redo, transaction recovery, lost update, uncommitted data, inconsistent analysis.

## **COMP469 DISCRETE EVENT SYSTEM SIMULATION**

The theories of system simulation. The simulation examples, general principals, simulation models, applications, system components, discrete systems, continuous systems. The queuing systems, single channel queues, two channel queues, event scheduling/time-advance algorithm, list processing, data structures. The statistical models in simulation, random numbers, discrete random variables, continuous random variables and random number generation. Techniques for generating random numbers, uniformity, independence, period, time, queueing models and random variate generation, inverse transform technique, empirical continuous distributions, empirical discrete distributions and discrete uniform distributions. Various simulation software tools (GPSS). Verification and validation of simulation models. Output Analysis.

## **COMP400 GRADUATION PROJECT I**

It provides students with the opportunity and time to take the first steps of their design work through literature research.

## **COMP452 GRADUATION PROJECT II**

Through project developed in a specific technology, students gain the ability to access knowledge, engage in continuous learning, and enhance their personal and professional development.

## **COMP310 SUMMER TRAINING**

The subjects that students have learned in the courses are put into practice through hands-on applications at the companies. The objective of this training is to enhance students' practical skills and provide them with valuable exposure to real-world industry practices in the field of computer engineering for 30 working days.