

Üsküdar University

Faculty of Engineering and Natural Sciences

Department of Software Engineering

Compulsory English

Preparatory Class

Course Contents

BİRİNCİ SINIF

I. YARIYIL

SE 101 – Introduction to Software Engineering

3 / ECTS: 4

The course provides the fundamental concepts of software engineering discipline and to provide insight into abstraction, problem solving and systematic view.

MATH 101- Calculus –I

4 / ECTS: 6

Foundations, coordinates and vectors, functions, limits, continuity, derivative, tangent lines, the mean value theorem, graphing, extreme values, optimization problems, linearization and differentials, integration, Riemann sums and definite integrals, the fundamental theorem of calculus, natural logarithm, exponential functions, inverse trigonometric functions, L'Hospital's rule, methods of integration, applications of integrals.

PHYS 101 - Physics-I

4 / ECTS: 6

Physics and measurements. Vectors; motion in one and two dimensions; the laws of motion; circular motion and other applications of Newton's Laws; work and energy; conservation of energy; linear momentum and collisions; rotational motion; angular momentum; equilibrium; gravitation.

CHEM 101-General Chemistry-I

4 / ECTS: 6

Chemical foundations, atoms, molecules and ions, modern atomic theory, chemical compounds and their nomenclature, stoichiometry of chemical reactions, chemical calculations, reactions in solutions, precipitation, acid-base neutralization and oxidation-reduction (redox) reactions, gases, thermochemistry, periodic table and its properties, properties of solutions, chemical reaction kinetics and principles of chemical equilibrium. Laboratory experiments accompany the lectures.

ING 101-English-I

3 / ECTS: 3

Reading texts and exercises. Listening exercises. Translation exercises. Writing essay. Speaking exercises, conversations.

RPSI209 Positive Psychology and Communication Skills

3/ ECTS: 5

This is an approach that enable individuals realize their own resources and values to be happy, peaceful, successful and highly satisfied with their lives. Usage of these resources and values creatively and appropriately allow individual to exert their personal and cultural potential with a conscious choice. In this course, students will evaluate researches and concept studies on different subjects and theoretical approaches (meaningful life, feeling of thankfulness, happiness, hope, optimism, positive emotions, post-traumatic personal growth, endurance, self-perception, strength, time perception). Students will learn how to use methods such as brain mapping, signature strengths, gratitude journal, seven ways increase happiness (learned optimism, thankfulness). Concept of communication. Types of communication and communication process.

RCUL101 – University Culture -I

1 /ECTS:1

The course consists of reports on seminars and conferences organized by the university.

BİRİNCİ SINIF

II. YARIYIL

COME102-Introduction to Algorithms and Programming

3 / ECTS: 4

Basic computer literacy: terminology, system components and operation. Fundamentals of computer programming: sequence, decision, repetition, syntax, compilation, debugging and maintenance, procedures, parameters, arrays, searching, sorting, top-down structured design, and style. Recursion, pointers and dynamic memory allocation; strings and string processing; advanced file processing; programmer-defined types; Introduction to Object Oriented Programming; classes and data abstraction: behaviour/state (data) model, member scope and access, constructors/destructors, object assignment.

COME104-Discrete Mathematics

3 / ECTS: 4

The Foundations: Logic and Proofs, The Foundations: Logic and Proofs, Basic Structures: Sets, Functions, Sequences, and Sums, Basic Structures: Sets, Functions, Sequences, and Sums, The Fundamentals: Algorithms, the Integers, and Matrices, The Fundamentals: Algorithms, the Integers, and Matrices, Induction and Recursion, Counting, Advanced Counting Techniques, Relations, Graphs, Trees, Boolean Algebra, Modeling and Computation

MATH 102-Calculus -II

4 / ECTS: 6

Sequences and series, Taylor and Maclaurin series, lengths of plane curves, polar coordinates and complex numbers, lines, planes and quadric surfaces in space, functions of several variables, limits and continuity, partial derivatives, differentiability, the chain rule, directional derivatives, extreme values, multiple integrals, integrals in polar, cylindrical and spherical coordinates, line integrals and surface integrals.

PHYS 102- Physics -II

4 / ECTS: 6

Topics in Electricity and Magnetism: Electric charges and matter, Coulomb's law, electric fields, electric field calculations, motion of a charged particle in electric field. Gauss's law, electric flux and Gauss's law, applications of Gauss's law. Electric potential and electric potential difference, electric potential energy, electric potential due to point charges and charge distributions. Capacitance and dielectrics, definition and calculations of capacitances, energy stored in capacitors, capacitors with dielectrics. Current and resistance, electric current, resistance, electrical conduction. Direct-current circuits, electromotive force, Kirchhoff's rules, applications. Magnetic fields, definition and properties of Magnetic fields. Magnetic forces on charges and currents, applications of magnetic fields. Sources of magnetic fields, the Biot-Savart Law, Ampere's law. Faraday's law, Lenz's law, induced electric fields, generators and motors. Inductance, mutual and self inductance, RL circuits, energy in magnetic fields.

ENG 102-English-II

3 / ECTS: 3

Reading texts about profession, grammar exercises, word activities, translation activities, listening and speaking exercises.

MAT104-Basic Linear Algebra

3 / ECTS: 5

Matrices, row equivalence, invertibility, systems of linear equations, determinants, Cramer's rule, vector spaces, linear dependence and independence, bases, inner product spaces, Gram-Schmidt orthogonalization process, orthogonal projections, Fourier series, eigenvalues, eigenvectors,

exponential matrix, diagonalization and its applications, linear transformations and their matrices. Examples for each subject of this course are performed in Matlab.

RCUL101 – University Culture -II

1 / ECTS:1

The course consists of reports on seminars and conferences organized by the university.

İKİNCİ SINIF

III. YARIYIL

SE201-Software Requirements Analysis

3 / ECTS: 6

The main topics to be used for system requirements, techniques and practices with documentation in the requirements specification, requirements exploration operations such as prototype production and user interviews, demonstration of the approaches for describing and organizing of software requirements, emphasizing the importance of the requirements work for converting to the software system design, the presentation of the alternative design approaches for developing system testing, specification and design tools, specification appraisal techniques, schematic and graphical approaches, documentation, modeling and design of the software systems using UML.

COME201-Object Oriented Programming I

3 / ECTS: 4

Object-oriented programming principles and techniques using C++, Topics include classes, operator overloading, data abstraction, information hiding, encapsulation, inheritance, polymorphism, file processing, class structure, constructor-destructor techniques, interfaces.

COME205-Data Structures

3 / ECTS: 5

Basic data structures. Stacks and queues. The pointer concept and utilization of dynamic memory. Linked lists. Recursive calls. Tree structures. Algorithms related to basic data structures. Searching, sorting and linking methods which include basic data structures.

COME204-Computer Architecture

3 / ECTS: 4

Computer systems: Microprocessor systems architecture developments. Cache systems: Cache organization, retrieval, and writing mechanisms. Memory management: Memory hierarchy, paging, replacement algorithms, virtual memory systems, Slicer. Serial and parallel I / O methods. Direct memory access (DMA). Shared input / output. Secondary registers: magnetic disk, optical storage, magnetic tape, magnetic recording techniques. Demonstrators CRT: Cathode ray tube and LCD displays CRT controllers, text and graphics memory. Shared-memory multi-processor systems-pipe processor design: multi-processor systems and programming, linking networks. Common nonmemory multiprocessor systems: Message transmission multi-processor systems.

MATH 203-Differential Equations

3 / ECTS: 5

Differential equations and fundamental properties, boundary-value problems, the theorems of existence and unique, separable equations and equations reducible to this form, homogeneous differential equations, if P and Q are linears, exact differential equations, the concept of integrating factors and finding multipliers of differential equations, linear and Bernoulli differential equations, Riccati differential equation, solutions with substitution variable, systems, orthogonal and oblique trajectories, first and high order degrees differential equations Clairaut and Lagrange differential equations, solutions about singular points, envelopes, n.order degrees linear linear differential equations with constant coefficients, the method of undetermined coefficients, the short methods

,variation of parameters , Euler differential equation ,diferential equation with variable coefficients .Laplace transformation; solutions using Laplace transformation.

TURK101-Turkish Language -I

2 / ECTS: 3

Definition of “language”, social role and importance, language-culture relationships, Turkish language and its place and relationships amongst the global languages, the history and development of Turkish language, current position and the hinterland of Turkish language. Phonetics and classification, characteristics of Turkish phonetics and the rules related to phonetics. Spelling rules and applications, punctuations marks and applications, general rules about essay writing, planning of essay writing, words and verbs, adverbs and prepositions with applications.

ATA101-Principles of Atatürk and History of Reforms-I

2 / ECTS: 3

In this course the meaning and the importance of the Turkish Revolution , the conditions which led to the Turkish Revolution , the enviroment and the developments,the National War of Independence under the leadership of Mustafa Kemal Pasha, the founding of the new Turkish State that is totally independent that rests upon national sovereignty, Ataturk as a genius soldier, as a great statesman, as a reformer and as a perfect organiser are presented.

İKİNCİ SINIF

IV. YARIYIL

SE 202-Software Design and Architecture

3 / ECTS: 5

The following are the main topics to be covered in this course: Introduction to the fundamentals of software architecture. Software architecture and quality requirements of a software system. Fundamental principles and guidelines for software architecture design, architectural styles, patterns and frameworks. Methods, techniques and tools for describing software architecture and documenting design rationale. Software architecture design and evaluation processes. Rationale and architectural knowledge management in software architecting. Approaches and tools for designing and evaluating software architectures for the state of the art technologies such as cloud-computing and service-operation and mobile computing. Future challenges and emerging trends in software architecture discipline. The fundamentals of cyber security will be given and the metrics to measure cyber security will be given to the students.

SE204- Software Construction

3 / ECTS: 5

Software construction fundamentals, software complexity, anticipating change, construction management, construction models, construction planning, software construction measurement, construction languages, coding, construction testing, reuse, verification and standards in construction, construction quality, integration. Cyber security and security management methods will be analyzed. Assess the role of good metrics and key performance indicators (KPIs) in security assessment and governance;

COME202-Object Oriented Programming II

3 / ECTS: 4

Introduction to Java programming language and object oriented programming: objects, classes, and program control. Association and composition, data encapsulation, abstract classes, polymorphism, reloading functions, overloading functions, exception handling, threads, Building programs with files, graphics and networking. Internet applications.

MATH204-Statistics**3 / ECTS: 5**

Introduction to Statistics, Descriptive Statistics, Probability, Random Variables and Expectation, Discrete Probability Distributions, Continuous Probability Distributions, Distributions of Sampling Statistics, Parameter Estimation, Hypothesis Testing, Simple Linear Regression and Correlation, Analysis of Variance

TURK102-Turkish Language–II**2 / ECTS: 3**

Components of a sentence, analysis and applications of the sentence, reading and investigating of the literature and philosophy examples from the world and rhetoric applications. Arts of written essay and applications, expression and grammar defaults and their corrections, the rules to prepare scientific articles.

ATA102-Principles of Atatürk and History of Revolutions-II**2 / ECTS: 3**

The struggle of the Turkish Nation to go above the level of the contemporary nations with all its institutions and values, Principles and Revolutions of Ataturk, Ataturk's School of thought, Turkey's national and international politics during Ataturk's leadership, Second World War and Turkey and the transition period to the multi political party era in Turkey.

SE 282 – Summer Practice-I**ECTS:4**

The purpose of the internship, get to know the working environment of the software engineering and universities to apply the information obtained in such a practical working environment.

ÜÇÜNCÜ SINIF**V. YARIYIL****SE201-Software Validation and Testing****3 / ECTS:5**

Introduction to software verification and validation, software testing, basics of software security, software testing tools, black-box unit testing, white-box unit testing and control-flow testing, data-flow testing, website testing, usability testing, genetic algorithms, security testing and code inspections, software test metrics.

COME301-Database Management Systems**3 / ECTS: 5**

Introduction to database management systems, file structure, organization and processing, sequential files, direct files, sort/merge, indexed and hash files, relational data model, logical database design, entity-relationship data model, data description and query languages.

COME307-Operating Systems**3 / ECTS: 4**

Introduction to operating systems concepts, process management, memory management, virtual memory, input-output and device management, file management and file systems, job scheduling, deadlocks, interrupt structures, case studies of operating systems.

SE 3XX – Departmental Elective - I**3 / ECTS: 5****XXXXX- Field Elective I****3 / ECTS: 5****RPRE 104 – Entrepreneurship and Project Culture****2 / ECTS: 3**

The skills and knowledge which students will gain through this course are; 1. To learn scientific, academic and application oriented entrepreneurship, 2. To develop different perspective and manner of approaching corresponding with entrepreneurship, 3. To perceive and learn

entrepreneurship with economical and social aspects, 4. To understand, entrepreneurship and economical entrepreneurship phenomenon as a system at a theoretical and practical level, 5. To be able to evaluate entrepreneurship processes and relations between them systematical and make it practicable, 6. To develop knowledge and skills at basic level about “marketing”, “financing”, “business establishment processes”, “applicable legal legislation” etc. which are closely associated with entrepreneurship and especially economical entrepreneurship. 7. To be able turn an opportunity into an idea and turn an idea into a business idea and evaluate this process, 8. To be able to create marketing, financial and business management plan and evaluate it, 9. To be able to make a feasibility study at a basic level.

XXXXX- Foreign Language Elective

2 / ECTS: 3

ÜÇÜNCÜ SINIF

VI. YARIYIL

SE 304 – Software Project Management

3 / ECTS: 5

Principles of software project management, metrics, cost estimation, software project planning, organizing, resource allocation, directing and controlling, risk management, software configuration management, role of standards, management tools. The course is based on PMBOK 4th Edition. Upon completion of this part, participants will have the ability to:

- Design processes suitable for different types of projects.
- Develop a comprehensive project plan for a significant development effort.
- Apply management techniques to software projects.
- Estimate costs for a project using several different techniques.
- Measure project progress, productivity and other aspects of the software process.
- Perform risk management and adjust project plans.
- Use configuration management tools, and apply change management processes.
- Assess the quality of the software products.
- Procurement management.
- Perform root cause analysis, and work towards continual improvement of process.

Human resource and communication management.

SE 3XX – Departmental Elective II

3 / ECTS: 5

MATH 302 - Numerical Analysis

3 / ECTS: 6

Field and space of real numbers, distance and norms in mathematical spaces, matrices, equations with real coefficients; the matrix inversion problem, eigenvalues and eigenvectors; recurrence relations, mathematical induction, and recursive algorithms; error analysis, evaluation and estimation; iterative methods in computational numeric analysis; finding roots of polynomials; numerical integration and differentiation; solving systems of linear algebraic equations, linear differential equations; the idea and concept of computer algebra systems and symbolic computation; computer handling of polynomials and rational functions; Square-free decomposition of polynomials; the extended Euclidean algorithm; Rational functions and partial fractions.

XXXXXX – Social Elective I

3 / ECTS: 5

XXX 4XX- Field Elective II

3 / ECTS: 5

SE 382 – Summer Practice II

ECTS: 4

The purpose of the internship, get to know the working environment of the software engineering and universities to apply the information obtained in such a practical working environment.

DÖRDÜNCÜ SINIF

VII. YARIYIL

SE 491-Graduation Project

2 / ECTS: 8

It covers developments in the field of software engineering and the content may vary depending on the research interest of student and supervisor.

SE 4XX- Departmental Elective III

3 / ECTS: 5

SE 4XX- Departmental Elective IV

3 / ECTS: 5

COME413-Computer Networks

3/ ECTS: 5

Local and wide area network architectures, protocols, services and applications; Physical data transmission, the elements of reliable and unreliable communications protocols; Transfer of information between machines with similar and different characteristics; How communications services fit in with the hardware and operation system.

XXX 4XX- Field Elective III

3 / ECTS: 5

OHS 402 – Occupational Health and Safety I

2 / ECTS: 2

Occupational health and safety concept, holistic approach to occupational health and safety, culture of risk prevention in the workplace. The importance of safety culture and its place in everyday life, Establishment of safety culture and ensuring its continuity, Basic principles of occupational health and safety, the place of business of the management of occupational health and safety , healthy and safe life.

DÖRDÜNCÜ SINIF

VIII. YARIYIL

SE 492-Graduation Thesis

2 / ECTS: 8

Complete production and test procedure of the project that designed conceptually in SE 491.

SE 4XX- Departmental Elective V

3 / ECTS: 5

SE 4XX- Departmental Elective VI

3 / ECTS: 5

XXX 4XX- Field Elective IV

3 / ECTS: 5

XXXXX- Social Elective II

3 / ECTS: 5

OHS 402 – Occupational Health and Safety II

2 / ECTS: 2

Occupational health and safety concept, holistic approach to occupational health and safety, culture of risk prevention in the workplace. The importance of safety culture and its place in everyday life, Establishment of safety culture and ensuring its continuity, Basic principles of occupational health and safety, the place of business of the management of occupational health and safety , healthy and safe life.

BÖLÜM SEÇMELİ DERSLER

SE 303 - Software Quality Assurance

3 / ECTS: 5

Introduction to software quality and assurance, software quality features, aims of software quality assurance, software quality issues, quality systems, best practices approach, process concept, software process development and improvement models, software quality management, cost of software quality, software testing and application, configuration management, agile methodologies.

SE 305 - Algorithms and Optimization Methods

3 / ECTS: 5

O-Notation. Divide and Conquer algorithms. Dynamic Programming. Backtracking and Branch and Bound. Lower bound theory. Complexity of sorting, and searching algorithms. Graph algorithms. NP-Hard and NP-Complete problems. Basic NPC problems. Proving problems to be NPC. Analysis of some string processing algorithms.

COME309-Web Programming

3 / ECTS: 5

.Net framework, Operational models of the Internet applications. The basic logic of Asp.net, Asp.net application. Asp.net objects. Asp.net objects with central regulation, Web form elements, database concepts, Ado.net and the database, Ado.net and dataset, introduction to the use of Asp.net, XML.

SE 304 - Software Engineering Ethics

3 / ECTS: 5

Corporate responsibility. Engineering responsibilities. Personal rights. Whistle blowing. Conflicts of interest. Professional autonomy. Risk assessment. Sustainable development, and the place and purpose of engineering codes of ethics. Ethics, rules and principles in software engineering and other information systems. Ethical work and ethical decision making in the field.

SE 306 - Large Scale Software Development

The nature and development lifecycle for large-scale software (LLS) projects. Role of the Software Architect. Software Architecture and the Development Process. System Context and Domain Analysis. Component Design and Modeling. Subsystem Design. Transaction and Data Design. Process and Deployment Design. Architecture Techniques. Applying the viewpoints.

COME 304 - Visual Programming

Review of Object-Oriented programming. Visual programming basics such as value types, operator overloading, exception and event handling. Using GUI frameworks. Working with files and data access by using XML.

COME308 – Mobile Programming

3/ ECTS: 5

Mobile Devices and Technologies, file and directory Read / Write operations, XML files, XML Web Services and ADO.NET. Visual Studio 2008, Working with emulators and devices, SQL Server Compact Edition Environment, Graphics Programming, .NET Compact Framework, developing interface for Mobile Applications, Sending SMS and email, developing high performance applications, Testing and debugging, Sample applications.

SE 401 - Human-Computer Interaction

3 / ECTS: 5

This course teaches students to design user interfaces based on the capabilities of computer technology and the needs of human factors. Students design a user interface for a system and implement a prototype from a list of informal requirements. The project is developed over three assignments by a design process based on current human–computer interaction principles.

SE 403 – Computer Games and Simulation

3 / ECTS: 5

In this course, students learn the theoretical aspects of the commonly used artificial intelligence algorithms in computer games and practically implement these algorithms in their own computer

games.

SE 405 - Rapid Application Development

3 / ECTS: 5

Overview of the base language of a Rapid Application Development (RAD) tool; object definitions, methods, properties and inheritance. Form design using visual components. Application development using the libraries of an industry standard RAD tool.

SE 407 - Knowledge Engineering

3 / ECTS: 5

Knowledge representation methods: Rule-based, Graph-based, Logic-based methods, Introduction to Prolog, Knowledge acquisition, Expert Systems, Ontology, Semantic Web, Introduction to Machine Learning. Defining the policies on cyber security, assessing the current security landscape, including the nature of the threat, the general status of common vulnerabilities, and the likely consequences of security failures

SE 409 - System Modeling and Simulation

3 / ECTS: 5

Dynamic Simulations. Providing custom-made data types, operators and control structures for simulation. Model generators. Simulation Programming Landscape. Simulation Problems.

SE 402 - Formal Methods in Software Engineering

3 / ECTS: 5

Introduction to formal methods. Fundamental aspect of formal specifications. Software specification and development with mathematical semantics. Constructing formal specifications for software-intensive systems. Specification languages: Z, Object Z and OCL. Relating specifications and implementations. Role of formal specification in system life cycle. Classification of formal methods. Formal validation and verification.

SE 404 - Agile Methods in Software Development

3 / ECTS: 5

Introduction to Agile Methods. eXtreme Programming (XP), Lean, Scrum, Crystal, Feature-driven Development (FDD), Kanban. Dynamic Systems Development Method (DSDM). Architecture and design issues in agile software methods.

SE 406 - Emerging Technologies

3 / ECTS: 5

What is an "Emerging Technology"? Disruptive Technologies. Identification of Disruptive Technologies. The 3D Printing Revolution. The Evolution of Technology. The Nature of Innovation. Combination and Structure. Phenomena. Domains & Problem-Solving. Origin of Technologies. Technological Revolution. Economic Revolution. Forecasting. Assess the strengths and weaknesses of the certification and accreditation approach to cybersecurity; Evaluate the trends and patterns that will determine the future state of cybersecurity

SE 408 - Analysis and Design of User Interfaces

3 / ECTS: 5

Basics of user interfaces. Use of requirements gathering techniques. Finding out about user, tasks and environment. Conceptual design. Interaction design. Design principles. Interaction styles. Designing GUI. Designing for web. User interface evaluation process.

SE 410 - Software Patterns

3 / ECTS: 5

Introduction to design patterns. Creational patterns. Structural patterns. Behavioural patterns. Analysis patterns. Architectural patterns. Testing. Refactoring.

COME 410 - Systems Programming

3 / ECTS: 5

The objective of this course is to present the Intel Assembly language for system programming and an introduction to the Linux environment with an emphasis on system programming

SE 401 – Compiler Design

3 / ECTS: 5

Lexical analysis: Lexical tokens, regular expressions, finite automata, lexical-analyser generators. Parsing: Context-free grammars, predictive parsing, LR parsing, parser generators. Abstract syntax: Semantic actions, abstract parse trees, visitors. Semantic analysis: Symbol tables, type checking. Activation records: stack frames, frames in the MiniJava compiler. Translation to intermediate code: Intermediate representation trees, translation into trees, declaration. Basic blocks and traces: Canonical trees, taming conditional branches. Instruction selection: Algorithms for instruction selection, CISC machines, instruction selection for MiniJava compiler. Liveness analysis: Solution of dataflow equations, liveness in the MiniJava compiler. Register allocation: Coloring by simplification, coalescing, precolored nodes, graph-coloring implementation, register allocation for trees. Code generation: Putting it all together.