

II. UNDERGRADUATE COURSES (COURSE DESCRIPTIONS)

DEPARTMENT OF SOFTWARE ENGINEERING

CMSE100 Introduction to Software Engineering

A series of seminars are held in current topics and areas of specialization in Software Engineering. Speakers are invited from different departments of EMU including Computer Engineering Department or other International Universities, Industry and Consulting firms, to deliver seminars in all aspects of engineering that are not normally covered in the lecture courses.

CMSE201 Fundamentals of Software Engineering

(4, 1) 4

Phases of the software development process. Estimation, system modeling, requirements analysis. Project management, modular software design, object-oriented analysis and design techniques. Design documentation using symbolic representations, UML diagrams. Software testing, quality issues. (Prerequisites: CMPE101)

CMSE 222 Introduction to Computer Organization

(4, 1) 4

Simplification of Boolean functions. Combinatorial logic. Synchronous sequential logic, registers, and counters. Machine language instructions: the MIPS approach. Computer arithmetic. The processing unit: data path and control. (Prerequisites: MATH163)

CMSE321 Software Requirements Analysis & Specification

(4, 1) 4

Functional, non-functional and domain requirements. User and system requirements. Feasibility study. Estimation techniques. Languages and models for representing requirements. Performance, reliability, availability, safety, and security issues. Requirements documentation standards. Requirements management: handling requirements changes. (Prerequisites:CMSE201)

CMSE322 Software Design

(4, 1) 4

Modular software design. Different architectural design styles for software. UML diagrams, Client/server paradigm. Choice of appropriate software and hardware system capabilities. Dealing with timing constraints. Formal software design specification techniques. Configuration management. Software design for distributed systems. Reusability and commercial off-the-shelf software modules. (Prerequisites: CMSE321)

CMSE326 Software Quality Assurance and Testing

(4, 1) 4

Software metrics. Quality planning and quality control. Inspections and formal technical reviews. Black-box and white-box testing, problem analysis and reporting techniques. Verification and validation techniques. Process and product quality assessment. Process measurement. Software quality assurance standards. (Prerequisites: CMSE201)

CMSE346 Computer Networks and Communication**(4, 1) 4**

This course addresses the general principles of computer networks and communication with emphasis on the software aspects of networking. In the study of the multilayered model, it begins with application level and works its way down towards the lower layers. Topics include: Internet 1 and Internet applications, transport protocols, switching and routing, link layer and LANs. Software support for networks. (Prerequisites:CMPE242 ve MATH322)

CMSE353 Security of Software Systems**(4, 1) 4**

Information security requirements, security threats, attacks, and methods providing information protection, discretionary and mandatory access models. Malicious software. Symmetric and asymmetric cryptographic methods, DES, AES, RSA. Authentication, digital signature, certificates, one-time passwords, hash functions. Practical aspects of information security in operating systems, databases, network applications. (Prerequisites: CMSE201)

CMSE 400 Summer Practice**(-, -) 0**

As a part of the fulfillment of the graduation requirements, all students must complete 40 work days of summer training after the second and/or third year, during summer vacations. The summer training should be carried out in accordance with the rules and regulations set by the department. (3rd/4th year standing)

CMSE 405 Graduation Project I/II**(-, -) 1**

4th academic year students in Software Engineering are required to prepare and present a project under the supervision of a faculty member of the Department. Each student has to prepare a separate (individual) project. The purpose of the project is to develop an understanding of independent research by studying a particular Software Engineering topic. It is an extended exercise in the professional application of the skills and experience gained in the undergraduate program. Topics will be chosen in consultation with faculty members. (4th year standing)

CMSE 406 Graduation Project II/II**(-,4) 4**

4th academic year students in Software Engineering are required to prepare and present a project under the supervision of a faculty member of the Department. Each student has to prepare a separate (individual) project. The purpose of the project is to develop an understanding of independent research by studying a particular Software Engineering topic. It is an extended exercise in the professional application of the skills and experience gained in the undergraduate program. Topics will be chosen in consultation with faculty members. (Pre-requisite: CMSE 405)

CMSE412 Formal Specification of Software Systems**(4, 1) 4**

Review of mathematical foundations for formal methods. Formal languages and techniques for software system specification and design. Analysis of software specifications and designs. Verification of consistency with requirements. Reliability validation. Automated program and design transformation.(Prerequisites: CMSE322)

CMSE414 Software Testing**(4, 1) 4**

Testing techniques and principles. Black-box and white-box testing. Testing strategies: Unit testing, boundary testing and integration testing. State based testing, configuration testing, compatibility testing, web site testing. Alpha, beta, and acceptance testing. Test coverage criteria. Testing tools. Developing effective test plans. Problem reporting, tracking, and analysis.(Prerequisites: CMSE322)

CMSE415 Systems Analysis**(4, 1) 4**

Life cycle phases: requirements determination, logical design, physical design, and implementation planning; interpersonal skills, interviewing, presentation skills; group dynamics; risk and feasibility analysis; group-based approaches: project management, joint application development (JAD), and structured walkthroughs; structured versus object oriented methodologies; RAD, prototyping; database design; software package evaluation, global and inter-organizational issues and system integration. (Prerequisites: CMSE323)

CMSE421 Software Construction**(4, 1) 4**

General principles and techniques for disciplined low-level software design. BNF and basic theory of grammars and parsing. Use of parser generators. Basics of language and protocol design. Formal languages. State-transition and table-based software design. Formal methods for software construction. Techniques for handling concurrency and inter-process communication. Techniques for designing numerical software. Tools for model-driven construction. Introduction to Middleware. Hot-spot analysis and performance tuning. (Prerequisites: CMSE201)

CMSE422 Software Project Management**(4, 1) 4**

Project planning, cost estimation and scheduling. Project management tools. Factors influencing productivity and success. Productivity metrics. Analysis of options and risks. Planning for change. Management of expectations. Release and configuration management. Software process standards and process implementation. Software contracts and intellectual property. Approaches to maintenance and long-term software development. Case studies of real industrial projects.(Prerequisites: CMSE323)

CMSE423 Low-Level Design of Software**(4, 1) 4**

Detailed software design and construction in depth. In-depth coverage of design patterns and refactoring. Introduction to formal approaches to design. Analysis of designs based on internal quality criteria. Performance and maintainability improvement. Reverse engineering. Disciplined approaches to design change.(Prerequisites: None)

CMSE439 Human/Computer Interaction**(4, 1) 4**

Human factors in computing. Cognitive modeling, user interfaces. Usability engineering. Task analysis, user-centered design, and prototyping. Design of windows, menus, and commands. Voice and natural language I/O. Multimedia systems. User interface architectures and API's. (This course involves case studies and a term project.(Prerequisites: CMSE201)

CMSE473 Software Process and Management**(4, 1) 4**

Software processes: standards, implementation, and assurance. Project management: requirements management and long-term evolution. Human effort, duration and cost estimation. Planning and tracking projects. Risk analysis, project control, change management. (Prerequisites: CMSE321 ve MATH322)

CMSE491 Selected Topics in Software Engineering I**(4, 1) 4**

This course is to be arranged as seminar course. Students and faculty members participate in studying recent articles published on the research interests of the department. (4'th year standing) (Pre-requisite: none)

CMSE492 Selected Topics in Software Engineering II**(4, 1) 4**

This course is to be arranged as seminar course. Students and faculty members participate in studying recent articles published on the research interests of the department. (4'th year standing) (Pre-requisite: none)

MATH 151 Calculus I**(4, 1) 4**

Limits and continuity. Derivatives. Rules of differentiation. Higher order derivatives. Chain rule. Related rates. Rolle's and the mean value theorem. Critical Points. Asymptotes. Curve sketching. Integrals. Fundamental Theorem. Techniques of integration. Definite integrals. Application to geometry and science. Indeterminate forms. L'Hospital's Rule. Improper integrals. Infinite series. Geometric series. Power series. Taylor series and binomial series. (Pre-requisite: none)

MATH 152 Calculus II**(4, 1) 4**

Vectors in R^3 . Lines and Planes. Functions of several variables. Limit and continuity. Partial differentiation. Chain rule. Tangent plane. Critical Points. Global and local extrema. Lagrange multipliers. Directional derivative. Gradient, Divergence and Curl. Multiple integrals with applications. Triple integrals with applications. Triple integral in cylindrical and spherical coordinates. Line, surface and volume integrals. Independence of path. Green's Theorem. Conservative vector fields. Divergence Theorem. Stokes' Theorem. (Pre-requisite: MATH 151)

MATH 163 Discrete Mathematics**(3, 1) 3**

Set theory, functions and relations; introduction to set theory, functions and relations, inductive proofs and recursive definitions. Combinatorics; basic counting rules, permutations, combinations, allocation problems, selection problems, the pigeonhole principle, the principle of inclusion and exclusion. Generating functions; ordinary generating functions and their applications. Recurrence relations; homogeneous recurrence relations, inhomogeneous recurrence relations, recurrence relations and generating functions, analysis of algorithms. Propositional calculus and boolean algebra; basic boolean functions, digital logic gates, minterm and maxterm expansions, the basic theorems of boolean algebra, simplifying boolean function with karnaugh maps. Graphs and trees; adjacency matrices, incidence matrices, eulerian graphs, hamiltonian graphs, colored graphs, planar graphs, spanning trees, minimal spanning trees, Prim's algorithm, shortest path problems, Dijkstra's algorithms. (Pre-requisite: none)

MATH 241 Linear Algebra and Ordinary Differential Equations**(4, 1) 4**

Linear Algebra; Matrix algebra, special matrices and row operations, Gaussian elimination method, determinants, adjoint and inverse matrices, Cramer's rule, linear vector spaces, linear independence, basis and dimension. First order ordinary differential equations; definitions and general properties of solutions, separable, homogeneous and linear equations, exact equations and integration factors. Higher order equations with constant coefficients; Basic theory and the method of reduction of order, second order homogeneous equations with constant coefficients, nonhomogeneous equations, the method of undetermined coefficients, the method of variation of parameters, the Cauchy-Euler equations. Power series solutions; classification of points, ordinary and singular points, power series solutions about ordinary points, power series solutions about regular singular points, the method of Frobenius. Systems of differential equations; general properties of constant coefficient systems, eigenvalues and eigenvectors, diagonalizable matrices, solutions of linear systems with constant coefficients. Boundary value problems. (Pre-requisite: MATH 152)

MATH 322 Probability and Statistical Methods**(3, 1) 3**

Introduction to probability and statistics. Operations on sets. Counting problems. Conditional probability and total probability formula, Bayes' theorem. Introduction to random variables, density and distribution functions. Expectation, variance and covariance. Basic distributions. Joint density and distribution function. Descriptive statistics. Estimation of parameters, maximum likelihood estimator. Hypothesis testing. (Pre-requisite: MATH 152)

MATH 373 Numerical Analysis for Engineers**(3, 1) 3**

Numerical error. Solution of nonlinear equations, and linear systems of equations. Interpolation and extrapolation. Curve fitting. Numerical differentiation and integration. Numerical solution of ordinary differential equations. (Pre-requisite: MATH 241)

PHYS 101 Physics I**(4, 1) 4**

Measurement and units, Vectors, Motion Along a Straight Line, Motion in Two and Three Dimensions, Force and Motion-I, Force and Motion-II, Kinetic Energy and Work, Potential Energy and Conservation of Energy, Center of Mass, Impulse, and Linear Momentum, Rotation, Rolling, Torque, Angular Momentum, Equilibrium and Elasticity, Gravitation. (Pre-requisite: none)

PHYS 102 Physics II**(4, 1) 4**

Temperature, Heat and First Law of Thermodynamics, Kinetic Theory of Gases, Entropy and the Second Law of Thermodynamics, Coulomb's Law, Electric Fields, Gauss' Law, Electric Potential, Magnetic Fields, Magnetic Fields Due to Currents, Induction and Inductance. (Pre-requisite: none)

ENGL 191 Communication in English – I**(3, 1) 3**

The contents of the GEED192 course do not appear to exclusively focus on English language development. Instead they are becoming tutorials for the Critical Thinking Skills Courses. (Pre-requisite: none)

ENGL 192 Communication in English – II**(3, 1) 3**

The contents of the GEED192 course do not appear to exclusively focus on English language development. Instead they are becoming tutorials for the Critical Thinking Skills Courses. (Pre-requisite: ENGL191)

ENGL 201 Communications Skills**(3, 1) 3**

EFL 201/203/205 is a second year Basic/Mainstream/Advanced Communication Skills course for students at the Faculty of Engineering. The course aims to introduce a range of skills, including effective written and oral communication, research skills and study skills. Throughout the course the students will be involved in project work intended to help them in their immediate and future academic and professional life. This will include library research, technical report writing and an oral presentation. By investigating a topic of their own choice, students will develop their understanding of independent research skills. During the report writing process, students will improve their writing and develop the ability to produce organized, cohesive work. The oral presentation aims to enhance spoken fluency and accuracy and provide training in the components of a good presentation. (Pre-requisite: ENGL192)

IENG 355 Ethics in Engineering**(3, 0) 3**

This course is designed to introduce moral rights and responsibilities of engineers in relation to society, employers, colleagues and clients. Analysis of ethical and value conflict in modern engineering practice. Importance of intellectual property rights and conflicting interests. Ethical aspects in engineering design, manufacturing and operations. Cost benefit-risk analysis, safety and occupational hazard considerations. (Pre-requisite: none)

IENG 420 Engineering Economy**(3, 0) 3**

An introduction to the basics of economic analysis for decisions in engineering design; in manufacturing, in manufacturing equipment, and in industrial projects. Time value of money. Cash-flow analysis. Cost of capital. Return on investment. Elements of cost and cost estimation. Break-even analysis. Decision making among alternatives. Effects of depreciation. Taxes. Replacement analysis. Inflation. Sensitivity analysis. (Pre-requisite: none)

IENG 450 Industrial Management**(3, 0) 3**

The objective of this course is to equip engineers with the necessary modern managerial skills, which are essential to increase productivity in organizations through employee empowerment and effective communication, to develop plans that will put the organization ahead of the international marketing game, to overcome obstacles to personal and professional growth, to attain organizational strategic goals, and to develop action plans for organizational change. (Pre-requisite: none)

HIST 280 History of Turkish Reforms**(2, 0) 2**

A history of the foundation of the Turkish Republic under the light of Kemal Atatürk's principles. A required course for all Turkish students (This course is given in Turkish). (Pre-requisite: none)

TUSL 181 Introduction to Turkish Language**(2, 0) 2**

TURK 100/199 is a Basic Turkish course introducing the Turkish language. It incorporates all four language skills and provides an introduction to basic grammar structures. Students will be encouraged to develop their writing skills through a variety of tasks. The aim of this course is for students to be able to understand and communicate in everyday situations, both in the classroom and in a Turkish-speaking environment. (Pre-requisite: none)

*****An area elective course offered in the corresponding semester for CMPE can be taken as area elective course.**