Curriculum		T	P	ECTS
1 st Semester				
MATH151	Calculus I	4	2	7
PHYS101	General Physics I	3	2	6
CMPE109	Fundamentals of Computing	2	1	2,5
CMPE113	Computer Programming I	2	2	4
HIST101	Principles of Atatürk and History of Turkish Revolution I	2	0	2
CHE105	General Chemistry	3	2	5
ENG101	English For Academic Purposes I	4	0	3,5
2 nd Semester				
HIST102	Principles of Atatürk and History of Turkish Revolution II	2	0	2
CMPE134	Fundamentals of Electronic Components	3	2	3,5
CMPE114	Computer Programming II	3	2	5
HIST221	History of Civilization	3	0	3
ENG102	English for Academic Purposes II	4	0	3,5
PHYS102	General Physics II	3	2	6
MATH152	Calculus II	4	2	7
3 rd Semester				
ENG201	English for Academic Purposes III	3	0	3
MATH275	Linear Algebra	4	0	6
EE203	Digital Circuits and Systems	3	2	6
CMPE251	Discrete Computational Structures	3	0	7
CMPE225	Object-Oriented Programming	3	2	8
4 th Semester				
MATH276	Differential Equations	4	0	6
CMPE236	Introduction to Microprocessors and Microcontrollers	3	2	8
CMPE226	Data Structures	3	0	8
IE220	Probability and Statistics	3	0	5
ENG202	English for Academic Purposes IV	3	0	3

5 th Semester

CMPE399	Summer Practice I	0	0	6
ENG301	English for Occupational Purposes I	3	0	3
CMPE331	Computer Architecture and Organization	3	0	7
CMPE341	Database Design and Management	3	2	7
CMPE323	Algorithms	3	0	7
CMPE325	Study of Programming Languages	3	0	6

6 th Semester

SE346	Software Engineering	3	1	6
ENG302	English for Occupational Purposes II	3	0	3
CMPE326	Formal Languages and Automata	3	0	6
	General Elective	3	0	4
CMPE334	Computer Networks	3	2	6
MATH380	Numerical Methods for Engineers	3	1	5

7 th Semester

CMPE499	Summer Practice II	0	0	10
	Area Elective (1)	3	0	5
CMPE493	Project Orientation	2	0	5
	Area Elective (3)	3	0	5
	General Elective	3	0	4
	Area Elective (6)	3	0	5
	General Elective	3	0	4
TURK401	Turkish Language I	2	0	2

8 th Semester

TURK402	Turkish Language II	2	0	2
	Area Elective (2)	3	0	5
CMPE431	Operating Systems	3	2	5
	Area Elective (4)	3	0	5
CMPE494	Senior Project	4	0	8
	Area Elective (5)	3	0	5

(1) ISE413, ENE303, SE463, MATH490, SE457, CMPE466, CMPE467, CMPE473, ISE311, ISE423, ISE422, CMPE343, CMPE376, CMPE413, CMPE424, SE321, ISE414, ISE432, E400, SE340, SE421, SE426, SE440, SE446, SE450, SE453, SE462, SE344, SE360, SE460, SE461, SE470, ISE301, CMPE312, CMPE318, ISE405, ISE424, SE322, ISE353, ISE332, ISE426, SE324, EE448, MATH427, ISE261, CMPE433, SE375, ISE434, CMPE483, SE427, CMPE481, SE345, MECE447, SE573, SE422, EE425, ISE542, CMPE430, ISE552, CMPE363, AET305, AET306, AET315, AET316, AET325, AET326, AET405, AET406, AET415, AET416, SE362, ISE314, ISE308, CMPE432, CMPE434, CMPE435, CMPE437, CMPE461, CMPE462, CMPE463, CMPE464, CMPE465,

(2) ISE413, ENE303, SE463, MATH490, SE457, MATH427, ISE422, EE448, SE461, ISE311, SE344, ISE426, E400, CMPE312, CMPE343, CMPE413, CMPE424, CMPE434, CMPE435, CMPE437, CMPE461, CMPE462, CMPE463, CMPE464, CMPE466, CMPE467, CMPE473, SE324, SE340, SE360, SE440, SE426, SE446, SE450, SE453, SE460, SE462, SE470, ISE332, ISE314, ISE353, ISE405, ISE308, ISE414, ISE423, ISE424, ISE432, AET305, AET306, AET315, AET316, AET325, AET326, AET405, AET406, AET415, AET416, CMPE432, CMPE465, CMPE318, CMPE376, SE421, ISE261, SE362, SE321, SE322, ISE301, CMPE433, SE375, ISE434, AET355, AET345, AET365, AET335, AET375, SE427, CMPE483, CMPE481, SE345, MECE447, SE422, SE573, ISE542, EE425, CMPE430, ISE552, CMPE363,

(3) ISE413, ENE303, SE463, MATH490, SE457, ISE308, ISE332, ISE432, E400, ISE426, ISE423, ISE424, ISE311, CMPE312, CMPE413, CMPE424, CMPE434, CMPE435, CMPE437, CMPE462, CMPE463, CMPE464, CMPE466, CMPE467, CMPE473, SE324, SE340, SE344, SE360, SE426, SE440, SE446, SE450, SE453, SE460, SE461, SE462, SE470, ISE314, ISE353, ISE405, ISE414, ISE422, AET305, AET306, AET315, AET316, AET325, AET326, AET405, AET406, AET415, AET416, CMPE432, CMPE376, CMPE318, CMPE465, CMPE461, ISE261, SE321, SE362, EE448, SE421, CMPE343, ISE301, SE322, MATH427, CMPE433, SE375, ISE434, SE427, CMPE483, CMPE481, SE345, MECE447, SE422, SE573, EE425, ISE542, CMPE430, ISE552, CMPE363,

(4) ISE413, ENE303, SE463, MATH490, SE457, E400, ISE426, SE461, ISE422, EE448, CMPE312, CMPE343, CMPE413, CMPE424, CMPE434, CMPE435, CMPE437, CMPE461, CMPE462, CMPE463, CMPE464, CMPE466, CMPE467, CMPE473, SE324, SE340, SE344, SE360, SE440, SE446, SE450, SE453, SE460, SE462, SE470, ISE311, ISE332, ISE314, ISE353, ISE405, ISE308, ISE414, ISE423, ISE424, ISE432, AET305, AET306, AET315, AET316, AET325, AET326, AET405, AET406, AET415, AET416, CMPE318, CMPE432, CMPE376, CMPE465, ISE261, SE321, SE362, SE421, ISE301, SE426, SE322, MATH427, CMPE433, SE375, ISE434, AET345, SE427, CMPE481, SE345, CMPE483, MECE447, SE422, SE573, ISE542, EE425, CMPE430, ISE552, CMPE363,

(5) IE447, IE445, MECE322, IE322, MATE460, MATE462, MFGE420, MFGE482, SE426, SE446, ISE432, AET305, AET315, AET325, SE375, AET365, AET355, AET335, AET345, IE443, ENE308, ENE312, ENE430, IE314, MECE422, MFGE405, MFGE481, CMPE468, ME488, MATE458, IE446, EE449,

(6) ISE413, ENE303, SE463, MATH490, SE457, SE426, SE324, ISE426, ISE353, EE448, MATH427, CMPE433, SE375, ISE434, SE362, CMPE483, SE345, SE427, CMPE481, MECE447, SE422, SE573, EE425, ISE542, CMPE430, ISE552, CMPE363, AET305, AET306, AET315, AET316, AET325, AET326, AET405, AET406, AET415, AET416, ISE261, ISE314, ISE332, SE322, SE446, SE450, SE453, SE460, SE461, SE462, SE470, ISE301, ISE311, ISE405, ISE308, ISE414, ISE422, ISE423, ISE424, ISE432, E400, CMPE434, CMPE312, CMPE318, CMPE435, CMPE413, CMPE343, CMPE432, CMPE376, CMPE424, CMPE461, CMPE462, CMPE465, CMPE466, SE344, SE360, SE440, CMPE437, CMPE463, CMPE464, CMPE467, CMPE473, SE321, SE340, SE421,

General Electives

ENG395, HUM319, ART228, PR419, HUM412, HUM105, ART225, ART251, ART252, ART291, ART292, FRE201, FRE202, FRE301, FRE302, FRE401, FRE402, GER201, GER202, GER301, GER302, GER401, GER402, HUM201, HUM211, JAP201, JAP202, JAP301, JAP302, RUS201, RUS202, RUS301, RUS302, SPAN201, SPAN202, SPAN301, SPAN302, ART202, MAN409, ART294, PR491, PR492, MAN415, MAN428, ART235, ART293, CHIN201, CHIN202, CHIN301, LAW250, HUM321, HUM312, MLY314, ART265, ART282, ART284, HUM316, HUM320, ECON442, HUM331, HUM212, ART287, KOR201, CMPE487, SPAN402, RUS402, CMPE485, ART285, ART286, RUS401, SPAN401, ART288, ART289, HUM360, ECON325, GET304, GET305, GET306, GET314, GET315, GET316, GET324, GET325, GET326, GET404, GET405, GET406, GET414, GET415, GET416, ART271, ART201, ART221, ART222, ART223, ART224, ART297, HUM291, MAN374, KOR202, ART295, ART262, ART261, ART268, ART298, ART266, ECON318, KOR301, HUM310, ART264, ART267, ART226, HUM202, EE425, ART227, MAN408, MAN313, HUM323, HUM204, MAN414, MAN437, MAN412, MAN328, ART269, ART270, AVM490,

Area Elective Course List

AET 305	Area Elective Course	(0-0)5
AET 306	Area Elective Course	(0-0)6
AET 315	Area Elective Course	(0-0)5
AET 316	Area Elective Course	(0-0)6
AET 325	Area Elective Course	(0-0)5
AET 326	Area Elective Course	(0-0)6
AET 335	Area Elective Course	(0-0)5
AET 345	Area Elective Course	(0-0)5
AET 355	Area Elective Course	(0-0)5
AET 365	Area Elective Course	(0-0)5
AET 375	Area Elective Course	(0-0)7.5
AET 405	Area Elective Course	(0-0)5
AET 406	Area Elective Course	(0-0)6
AET 415	Area Elective Course	(0-0)5
AET 416	Area Elective Course	(0-0)6
CMPE 312	Visual Programming	(2-0)5
CMPE 312	Visual Programming	(2-2)5
CMPE 318	Java Programming	(2-2)5
CMPE 343	Database Systems and Programming	(2-0)5
CMPE 343	Database Systems and Programming	(2-2)5
CMPE 363	Introduction to Machine Learning	(2-2)5
CMPE 376	Computer Games and Simulation	(2-0)5
CMPE 376	Computer Games and Simulation	(2-2)5

CMPE 413	Logic Programming	(3-0)5
CMPE 424	Language Processors	(3-0)5
CMPE 430	Fundamentals of Deep Learning	(2-2)5
CMPE 432	Virtualization	(3-0)5
CMPE 433	Cloud Computing and Virtualization	(3-0)5
CMPE 434	Embeded System Design	(2-0)5
CMPE 434	Embeded System Design	(2-2)5
CMPE 435	Special Topics in Computer Networks	(3-0)5
CMPE 437	VLSI Design	(2-0)5
CMPE 437	VLSI Design	(2-2)5
CMPE 461	Applied Neural Computing	(2-0)5
CMPE 461	Applied Neural Computing	(2-2)5
CMPE 462	Introduction to Artificial Intelligence	(3-0)5
CMPE 463	Digital Signal Processing	(3-0)5
CMPE 464	Digital Image Processing	(3-0)5
CMPE 465	Knowledge Engineering	(3-0)5
CMPE 466	Soft Computing	(3-0)5
CMPE 467	Pattern Recognition	(3-0)5
CMPE 468	Machine Learning for Engineers	(3-0)5
CMPE 473	Computer Graphics	(2-2)5
CMPE 473	Computer Graphics	(2-0)5
CMPE 481	CO_OP Practice I	(3-0)5
CMPE 483	CO_OP Practice II	(3-0)5
E 400	Undergraduate Research Project	(3-0)5
EE 425	Advanced Digital Design with HDL	(2-2)5
EE 448	Pattern Recognition	(0-0)5
EE 448	Pattern Recognition	(3-0)5
EE 449	Pattern Classification and Sensor Applications for Engineers	(3-0)5
ENE 303	Modeling, Analysis and Simulation	(3-1)5
ENE 308	Solar Energy Technology	(3-1)5
ENE 312	Wind Energy Technologies	(3-1)5

ENE 430	Energy Sytems in Buildings	(3-0)5
IE 314	Project Management	(3-0)5
IE 322	Industrial Engineering Practices in Energy Sector	(3-0)5
IE 443	Occupational Health and Safety	(3-0)5
IE 445	Technology Management	(3-0)5
IE 446	Innovative Products Services and Systems	(3-0)5
IE 447	Technology Entrepreneurship	(3-0)5
ISE 261	Business and e-Commerce	(3-0)6
ISE 301	Multimedia Systems	(3-0)5
ISE 308	Introduction to Mobile Application Development	(3-0)5
ISE 311	Internet Programming	(2-2)5
ISE 314	Data Warehousing and Mining	(3-0)5
ISE 314	Data Warehousing and Mining	(3-0)5
ISE 332	IT Infrastructure and Architecture	(3-0)5
ISE 353	Information Systems Development	(3-0)10
ISE 405	Foundations in Information Technology Services	(3-0)5
ISE 413	Web Application Development with .NET	(2-2)5
ISE 414	Investigation of Computer Crime	(3-0)5
ISE 422	E-Government	(3-0)5
ISE 423	Technology Trends in E-Government	(3-0)5
ISE 424	Distance Education and E-Learning	(3-0)5
ISE 426	Computer Security	(3-0)5
ISE 432	Innovation and Entrepreneurship in IT	(3-0)5
ISE 434	Fundamentals of the Internet of Things	(3-0)5
ISE 542	IT Security	(3-0)5
ISE 552	E-Commerce - A Managerial Perspective	(3-0)5
MATE 458	Materials for Catalysis and Fuel Cells	(3-0)5
MATE 460	Biomaterials	(3-0)5
MATE 462	Nanomaterials	(3-0)5
MATH 427	Introduction to Crytopgraphy	(3-0)6
MATH 490	Introduction to Optimization	(3-0)6

ME 488	Production Design and Prototyping	(1-4)5
MECE 322	Multidisciplinary Design in Engineering	(2-2)5
MECE 422	Multidisciplinary Engineering Design	(2-2)5
MECE 447	Path Planning and Navigation	(3-0)5
MFGE 405	Rapid Prototyping	(3-0)5
MFGE 420	Project Management in Manufacturing	(3-0)5
MFGE 481	Nanofabrication	(3-0)5
MFGE 482	Introduction to CAD/CAM	(2-1)5
SE 321	Object-Oriented Analysis and Design	(3-0)7
SE 322	Software Architecture	(3-0)5
SE 324	Software Project Management and Economics	(3-0)5
SE 340	Rapid Application Development	(2-0)5
SE 344	Systems Software Validation and Testing	(2-2)6
SE 345	Software Quality Assurance	(3-0)7
SE 360	System Modeling and Simulation	(3-0)5
SE 362	Open Source Software Development	(2-2)5
SE 375	3D Modeling, Animation and Game Design	(2-2)5
SE 421	Big Data Programming	(2-2)5
SE 422	Introduction to Data Science	(3-0)5
SE 426	Emerging Technologies	(2-2)5
SE 427	Blockchain and Cryptocurrency Technologies	(2-2)5
SE 440	Analysis and Design of User Interfaces	(3-0)5
SE 446	Introduction to Bioinformatics	(3-0)5
SE 450	Software Engineering Ethics	(3-0)5
SE 453	Large Scale Software Development	(3-0)5
SE 457	Secure Software Development	(3-0)5
SE 460	Software Construction	(3-0)5
SE 461	Software Patterns	(3-0)5
SE 462	Formal Methods in Software Engineering	(3-0)5
SE 463	Low-code Application Development	(3-0)5
SE 470	Agile Methods in Software Development	(2-2)5

SE 573 Applied Machine Learning in Data Analytics (3-0)5

Course Descriptions

CHE 105 General Chemistry (3-2)5

Matter and measurement, atoms, molecules and ions, stoichiometry: calculations with chemical formulas and equations, oxidation-reduction reactions, thermochemistry, electronic structure of atoms, periodic properties of the elements, basic concepts of chemical bonding, molecular geometry and bonding theories, gases, intermolecular forces, liquids and solids, chemical kinetics, chemical thermodynamics, electrochemistry.

CMPE 109 Fundamentals of Computing (2-1)2.5

Engineering fundamentals, computer engineering as a profession, career opportunities, professional organizations for computer engineering, ethical issues in computing; hardware components of a computer system; data representation and machine language instructions; coordinating internal activities of a computer using operating systems; networking

CMPE 113 Computer Programming I (2-2)4

Algorithm development, fundamental elements of the C language, selection statements, iteration statements, standard library functions, user-defined functions, parameter passing, application programs in a laboratory environment using the C language.

CMPE 114 Computer Programming II (3-2)5

Pointers, dynamic memory management, parameter passing, arrays, strings, structures, file processing; application programs in a laboratory environment using the C language.

CMPE 134 Fundamentals of Electronic Components (3-2)3.5

Engineering abstraction in simple circuit analysis and models to represent actual circuit components; analysis of electronic circuits; the linearity and superposition theory; Thevenin and Norton equity principles in multi-component circuit analysis; first order RC and RL circuits, digital electronic components, fundamentals of logical calculations

CMPE 225 Object-Oriented Programming (3-2)8

Data types, expressions and statements, functions and scope rules, class definitions, inheritance, polymorphism, name overloading, templates, exception handling; input/output; object oriented principles using the UML and C++ programming language.

CMPE 226 Data Structures (3-0)8

Stacks, recursion, queues; creation and destruction of dynamic variables, serial linked lists, circular lists, doubly linked lists, circular doubly linked lists; sorting and searching algorithms, space and time considerations, binary trees, binary search trees, tree traversal algorithms, binary tree sorting algorithms, hashing.

CMPE 236 Introduction to Microprocessors and Microcontrollers (3-2)8

Introduction to microcontrollers, instruction set, serial port operation, interrupt operation, assembly language programming, program structure and design, tools and techniques for program development, design and interface examples in assembly, design and interface examples.

CMPE 251 Discrete Computational Structures (3-0)7

Basic mathematical objects of computational mathematics: sets, sequences, relations, functions, and partitions; deductive mathematical logic proof techniques; discrete number systems; induction and recursion; graphs and sub-graphs; trees; planarity of graphs; covering problems; path problems; directed graphs; combinatorics.

CMPE 312 Visual Programming (2-0)5

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.

CMPE 312 Visual Programming (2-2)5

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.

CMPE 318 Java Programming (2-2)5

Java technology, object-oriented programming, objects, classes, modularity; encapsulation, polymorphism, elements of Java, exceptions, garbage collector; classes and inheritance; interfaces; the collections framework; the input/output framework; the graphical user interfaces framework; threads.

CMPE 323 Algorithms (3-0)7

Design and analysis of algorithms, 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.

CMPE 325 Study of Programming Languages (3-0)6

Study of programming language concepts: syntax and semantics, types, values, expressions, and statements; program structure; procedures and functions; structured data; abstraction and encapsulation; inheritance; dynamic binding; concepts of programming paradigms by means of functional, procedural, and object-oriented programming languages.

CMPE 326 Formal Languages and Automata (3-0)6

Languages and their representations, finite automata and regular grammars, context-free grammars, concept of abstract machines and language acceptance, deterministic and non-deterministic finite state machines, pushdown automata, Turing machines and introduction to the theory of computation.

CMPE 331 Computer Architecture and Organization (3-0)7

Computer components, Von Neumann architecture, instruction execution, interrupts, bus structure and interconnection of components, memory: internal memory, cache and virtual memory, external memories. CPU: ALU, floating point arithmetic, instruction sets, addressing modes and formats; control unit: hardwired and micro-programmed control units;

CMPE 334 Computer Networks (3-2)6

Basic concepts of computer networking; application layer and well-known applications; transport layer, UDP and TCP services; network layer, IPv4 addresses, forwarding and routing; data link layer, MAC addresses, HUBs and switches; physical layer properties and standards.

CMPE 341 Database Design and Management (3-2)7

Database system concepts, data modeling with ER and EER, the relational data model, file organizations and index structures, relational algebra, structured query language (SQL); database design: functional dependence and table normalization; introduction to database administration; a relational DBMS in a laboratory environment.

CMPE 343 Database Systems and Programming (2-0)5

Concurrent operations on databases; transaction processing and concurrency control; DB recovery, security and authorization; introduction to DB programming, object-oriented DB concepts.

CMPE 343 Database Systems and Programming (2-2)5

Concurrent operations on databases; transaction processing and concurrency control; DB recovery, security and authorization; introduction to DB programming, object-oriented DB concepts.

CMPE 363 Introduction to Machine Learning (2-2)5

Artificial intelligence, machine learning, Supervised and Unsupervised Learning, Binary classification, Multiclass classification, Regression, Clustering, Model Evaluation Metrics and Scoring

CMPE 376 Computer Games and Simulation (2-0)5

History of games and current trends in games, the main concepts on game design and development, evaluating commercial games; main game design issues; creating simulations; using artificial intelligence in games; using physics and mathematics in games; main computer graphics concepts used in games; human computer interaction concepts for developing

CMPE 376 Computer Games and Simulation (2-2)5

History of games and current trends in games, the main concepts on game design and development, evaluating commercial games; main game design issues; creating simulations; using artificial intelligence in games; using physics and mathematics in games; main computer graphics concepts used in games; human computer interaction concepts for developing

CMPE 399 Summer Practice I (0-0)6

A minimum of six weeks of training in the industry involving the observation of the hardware and software components of a computer system in use; a summer practice report is prepared that lists the experiences of the student during the six weeks period.

CMPE 413 Logic Programming (3-0)5

Lisp programming: symbolic expressions, elementary functions, Lambda notation, forms, functions, list structures, Prolog programming: facts, rules, relationships; data structures; backtracking; input/output; built-in predicates.

CMPE 424 Language Processors (3-0)5

Fundamental concepts of compilation and interpretation; single-pass and multiple-pass language translators; lexical analyzer; top-down parsing, and LL(1) grammars; recursive descent method; bottom-up parsing; shift reduce technique; operator precedence grammar, LR(0) and SLR(1) grammars; syntax directed translation; error processing and recovery; s

CMPE 430 Fundamentals of Deep Learning (2-2)5

Artificial intelligence, machine learning, and deep learning, mathematical building blocks of neural networks, binary classification, multiclass classification, regression, deep learning for computer vision.

CMPE 431 Operating Systems (3-2)5

Basic design principles of operating systems, single-user systems, command interpreter, semaphores, deadlock detection, recovery, prevention and avoidance; multi-user OS; resource managers, processor management and algorithms, memory management: partitioning, paging, segmentation and thrashing; device management; interrupt handlers, device drivers

CMPE 432 Virtualization (3-0)5

Types of virtualization, hardware virtualization, hypervisors, server virtualization, desktop virtualization, storage virtualization, application virtualization, OS virtualization requirements and techniques, benefits and costs, security issues.

CMPE 433 Cloud Computing and Virtualization (3-0)5

Cloud description, types of cloud, services, deployment models, types of virtualization, hardware virtualization, hypervisors, OS virtualization, server virtualization, desktop virtualization, storage virtualization, application virtualization, benefits and costs, security issues.

CMPE 434 Embeded System Design (2-0)5

Embedded systems and their applications, metrics of embedded systems, components of embedded systems, realization of embedded systems, PCB technologies, simulation, emulation, rapid prototyping, testing and certification examples of realizations optimized for different applications, analysis of development costs and times, laboratory work on specif

CMPE 434 Embeded System Design (2-2)5

Embedded systems and their applications, metrics of embedded systems, components of embedded systems, realization of embedded systems, PCB technologies, simulation, emulation, rapid prototyping, testing and certification examples of realizations optimized for different applications, analysis of development costs and times, laboratory work on specif

CMPE 435 Special Topics in Computer Networks (3-0)5

Elaborate concepts of TCP/IP computer networks; application details for well-known applications on the Internet. IPv6 addresses; routing principles and routing algorithms; ICMP communication; VPNs; wireless-networking; network security.

CMPE 437 VLSI Design (2-0)5

Basic fabrication sequence of ICs, self aligned silicon gate, NMOS and CMOS technologies; design rules and layout; memories and registers; full custom and semi-custom ICs; standard cells, gate arrays, FPGAs and PLDs. CAD tools for design of ICs; high level design of ICs using VHDL; low power IC design.

CMPE 437 VLSI Design (2-2)5

Basic fabrication sequence of ICs, self aligned silicon gate, NMOS and CMOS technologies; design rules and layout; memories and registers; full custom and semi-custom ICs; standard cells, gate arrays, FPGAs and PLDs. CAD tools for design of ICs; high level design of ICs using VHDL; low power IC design.

CMPE 461 Applied Neural Computing (2-0)5

Introduction to neural networks, perceptron learning rules, backpropagation algorithms, generalization and overtraining, adaptive linear filters, radial basis networks, self organizing networks, learning vector quantization, recurrent networks.

CMPE 461 Applied Neural Computing (2-2)5

Introduction to neural networks, perceptron learning rules, backpropagation algorithms, generalization and overtraining, adaptive linear filters, radial basis networks, self organizing networks, learning vector quantization, recurrent networks.

CMPE 462 Introduction to Artificial Intelligence (3-0)5

Agent Paradigm, Problem Solving by Searching, Informed/Uninformed Search Methods, Genetic Algorithms, Simulated Annealing, Constraint Satisfaction Problems, Adversarial Search, Ant Colony Optimization, Particle Swarm Optimization, Artificial Bee Colony Optimization, Multi-Agent Systems & Intelligent Agents, Multi-Agent Interactions, Philosophical Foundations & Ethics.

CMPE 463 Digital Signal Processing (3-0)5

Discrete-time domain and frequency domain representation of signals and systems; sampling and reconstruction; DFT, FFT, z - transform, filter design techniques; finite word length effects; 2-D filtering; applications of DSP; programming of some DSP processors.

CMPE 464 Digital Image Processing (3-0)5

Introduction to signal and image processing, introduction to digital image processing, sampling, reconstruction, and quantization, digital image representation, image transforms, enhancement, restoration, segmentation and description.

CMPE 465 Knowledge Engineering (3-0)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.

CMPE 466 Soft Computing (3-0)5

Biological and artificial neurons, perceptron and multilayer perceptron; ANN models and learning algorithms; fuzzy sets and fuzzy logic; basic fuzzy mathematics; fuzzy operators; fuzzy systems: fuzzifier, knowledge base, inference engine, and various inference mechanisms such as Sugeno, Mamdani, Larsen etc., composition and defuzzifier.

CMPE 467 Pattern Recognition (3-0)5

Bayes? decision theory, classifiers, discriminant functions and decision surfaces, estimation of parameters, hidden Markov models, nearest neighbor methods; linear discriminant functions; neural networks; decision trees; hierarchical clustering; self organizing feature maps.

CMPE 468 Machine Learning for Engineers (3-0)5

Artificial intelligence, machine learning, supervised and unsupervised learning, binary classification, multiclass classification, regression, clustering, model evaluation.

CMPE 473 Computer Graphics (2-2)5

Hardware and software components of graphic systems; output and filled data primitives; 2D and 3D geometric transformation; 2D and 3D viewing pipelines; visible-surface detection methods.

CMPE 473 Computer Graphics (2-0)5

Hardware and software components of graphic systems; output and filled data primitives; 2D and 3D geometric transformation; 2D and 3D viewing pipelines; visible-surface detection methods.

CMPE 481 CO_OP Practice I (3-0)5

Participating in software/hardware development projects in IT companies who have a COOP agreement; analyzing the methods and techniques utilized in the company; working in analysis, design and development of a project; preparing a report and presentation of his/her experiences.

CMPE 483 CO_OP Practice II (3-0)5

Participating in software/hardware development projects in IT companies who have a COOP agreement; analyzing the methods and techniques utilized in the company; working in analysis, design and development of a project; preparing a report and presentation of his/her experiences.

CMPE 493 Project Orientation (2-0)5

Computing and IS projects, research, project planning and risk management, national and international standards, team working, literature survey, conducting project, project presentation, lifelong learning, ethics, legal issues, innovation and entrepreneurship.

CMPE 494 Senior Project (4-0)8

Project analysis and design, project development, project management, team working, project presentation.

CMPE 499 Summer Practice II (0-0)10

A minimum of six weeks of training in an IT department/company involving the observation of the hardware and software components of a computer system; students are expected to be involved in software/hardware development projects of the IT department/company; a summer practice report is prepared that presents the experiences of the student during

E 400 Undergraduate Research Project (3-0)5

Rigorous scholarly research, research methodologies, review of background knowledge, academic reading.

EE 203 Digital Circuits and Systems (3-2)6

Number systems and codes, Boolean algebra and logic gates, minimization of Boolean functions, combinational circuits, design of combinational circuits using SSI and MSI components, flip-flops, analysis and design of sequential circuits, counters, shift registers, memory elements, programmable logic devices (PLD), design with PLDs. Introduction to

EE 425 Advanced Digital Design with HDL (2-2)5

Behavioural, dataflow and structural modelling of digital circuits with Verilog HDL. Language constructs of

Verilog. Design of finite state machines with data path using Verilog. Introduction to modern CAD tools. Simulation and verification of digital circuits.

EE 448 Pattern Recognition (0-0)5

Introduction to the theory of pattern recognition, Bayesian decision theory, Maximum likelihood estimation, Nonparametric estimation, Linear discriminant functions, Support vector machines, Neural networks, Unsupervised learning and Clustering, Applications such as handwriting recognition, lipreading, geological analysis, medical data processing, d

EE 448 Pattern Recognition (3-0)5

Introduction to the theory of pattern recognition, Bayesian decision theory, Maximum likelihood estimation, Nonparametric estimation, Linear discriminant functions, Support vector machines, Neural networks, Unsupervised learning and Clustering, Applications such as handwriting recognition, lipreading, geological analysis, medical data processing, d

EE 449 Pattern Classification and Sensor Applications for Engineers (3-0)5

Sensors, general information about sensor types and sensor working principles; what is a pattern; pattern classification applications; theory and methods of pattern classification; feature extraction and selection; MATLAB Classification Learner Tool; analysis and performance of classifiers; RFID basics.

ENE 303 Modeling, Analysis and Simulation (3-1)5

Translational mechanical systems, state-variable equations, inputoutput equations, matrix formulation, block diagrams and computer simulation, rotational mechanical systems, electrical systems, Laplace transform solutions of linear models.

ENE 308 Solar Energy Technology (3-1)5

Introduction to solar energy conversions, fundamentals of solar radiation, methods of solar collection and thermal conversion, solar heating systems, solar thermal power, capturing solar energy through biomass.

ENE 312 Wind Energy Technologies (3-1)5

Wind characteristics, wind energy, wind turbines, design of wind turbines, projecting, planning and economy, wave energy and wave energy conversion systems.

ENE 430 Energy Sytems in Buildings (3-0)5

Building structure, heating, ventilation and air conditioning, the calculation of heat loss and insulation surfaces, water, fuel and electricity consumption in buildings, the national andinternational standards and regulations on energy efficiency in buildings.

ENG 101 English For Academic Purposes I (4-0)3.5

English language skills, especially academic skills, such as reading comprehension, vocabulary building and critical analysis of texts; listening and note-taking, class discussions, presentations, writing, research assignments and use of technology.

ENG 102 English for Academic Purposes II (4-0)3.5

Academic skills such as reading comprehension, class discussions, use of academic vocabulary and critical analysis of texts; research assignments and review of the English language structure; skills such as listening and note-taking, analysis of written products, writing, presentation and use of technology.

ENG 201 English for Academic Purposes III (3-0)3

Advanced reading and writing skills, applying critical reading skills and strategies, identifying the organization of a reading text, main ideas of the texts, and the author?s main purpose, summarizing a given text, outlining and writing an argumentative essay.

ENG 202 English for Academic Purposes IV (3-0)3

Preparing and writing research reports and delivering effective oral/written informative and persuasive presentations; gathering information, organizing data, outlining, using appropriate techniques in presentation and delivering for a maximum impact, using visual aids and citation effectively.

ENG 301 English for Occupational Purposes I (3-0)3

Job-related communication skills;the functions such as describing relationships at work,discussing performance reviews and giving feedback,discussing plans and arrangements,using social media for professional communication,discussing on recruitment tests and job interviews,presenting a service or product,writing reviews on websites

ENG 302 English for Occupational Purposes II (3-0)3

More detailed job-related communication skills;describing and organising meetings,developing communicational styles in various cultural settings,handling mistakes and apologizing,getting familiar with marketing styles and advertising,deciding how to adapt and market a product in different countries,

HIST 101 Principles of Atatürk and History of Turkish Revolution I (2-0)2

French Revolution; structure and geopolitic positioning of Ottoman Empire, reasons of its decline; Westernization movements, First and Second Constitutional Monarchy declarations; Libya and Balkan wars; First World War; period before the War of Independence, congresses, National Pact, establishment of Turkish Grand National Assembly.

HIST 102 Principles of Atatürk and History of Turkish Revolution II (2-0)2

War of Independence; Lausanne Treaty; declaration of the Republic; removal of sultanic rule and caliphate; Atatürk`s revolutions; establishment of national economy; Second World War, before and after; Turkish Republic after 1960.

HIST 221 History of Civilization (3-0)3

A chronological order of the rise of civilizations from Sumer until the Scientific Revolution.

IE 220 Probability and Statistics (3-0)5

Introduction to probability and statistics; random variables and probability distributions; expected value; sampling distributions; one and two sample estimation problems; test of hypotheses; simple linear regression.

IE 314 Project Management (3-0)5

Elements and phases of project management; functions (planning, staffing, scheduling, monitoring, and

control) and techniques (CPM, PERT, etc.) of project management; software tools for project management; project cost control and time/resource management; leadership styles, conflict and risk management.

IE 322 Industrial Engineering Practices in Energy Sector (3-0)5

The impact of energy in today?s world; principles of energy planning and utilization; the drives of energy supply and demand; the role of an engineer in energy industries for management, resource planning and utilization; sustainability as a driving force for energy planning; common concepts in energy management; a paradigm of decision making: conventional versus new energy resources including nuclear and renewable energy; economical evaluation of energy investments,

IE 443 Occupational Health and Safety (3-0)5

Basic information on occupational health and safety, principles and legislations, occupational health and safety requirements to be applied in the workplace, occupational accidents, risk assessment and occupational audits; a proactive approach to occupational health and safety.

IE 445 Technology Management (3-0)5

The topics covered
a) identifying the strategic issues in technology management (TM);
b) identifying the issues in organizing TM functions and related human element ;
c) identifying the issues in TM-Activities and Tools
d) being able to identify, formulate and solve TM problems.

IE 446 Innovative Products Services and Systems (3-0)5

Innovation, innovative products, services and systems; innovative organizations, products, services and systems or any topic involving design, development and innovation.

IE 447 Technology Entrepreneurship (3-0)5

Technology Entrepreneurship course aims to enable students to learn variety of basic areas and concepts of entrepreneurship including idea generation, business plan creation, venture financing sources, marketing and go to market strategies and to apply the concepts learned through real life cases and a term project.

ISE 261 Business and e-Commerce (3-0)6

A context for developing e-Commerce applications; types of e-Commerce applications; identifying and describing e-commerce applications; e-commerce feasibility; e-commerce requirement analysis; high-level, detailed and technical design and construction; e-business models; Internet marketing; online monetary transactions; Internet taxation; legal

ISE 301 Multimedia Systems (3-0)5

Multimedia terminology and concepts, multimedia data types (digital image, audio, video); multimedia editing for different multimedia types.

ISE 308 Introduction to Mobile Application Development (3-0)5

Mobile devices, mobile platforms, mobile operating systems, mobile programming, user interface design in mobile devices; data store in mobile platform, map and location-based services, telephony and SMS, sensors.

ISE 311 Internet Programming (2-2)5

Internet programming environments, home page design with HTML and DHTML, JavaScript, client-server model, client side scripts, and server-side scripts, web servers (installation on different OS such as Unix/Linux, and Microsoft, setting up the required components, administration), CGI, SSI, SSL, certification, cookies, and sessions, database integr

ISE 314 Data Warehousing and Mining (3-0)5

Data warehousing fundamentals, planning, design and implementation and administration of data warehouses, data cube computation, OLAP query processing; fundamentals of data mining and relationship with data warehouse and OLAP systems; association rule mining; algorithms for clustering, classification and rule learning.

ISE 314 Data Warehousing and Mining (3-0)5

Data warehousing fundamentals, planning, design and implementation and administration of data warehouses, data cube computation, OLAP query processing; fundamentals of data mining and relationship with data warehouse and OLAP systems; association rule mining; algorithms for clustering, classification and rule learning.

ISE 332 IT Infrastructure and Architecture (3-0)5

IT infrasturucture, IT architecture, IT system model, cloud computing, green IT, big data, datacenters, servers, processor architectures, storages, networking, operating systems, virtualization, security, end user devices, system performance analysis and management, IT service management (ITIL, COBIT).

ISE 353 Information Systems Development (3-0)10

Information systems, strategy and information systems, business information technology, distributed systems, internet and www, e-commerce and business, business intelligence, file organizations and databases, process analysis and modeling, data analysis, systems design, detailed design and implementation, object-oriented approaches, systems

ISE 405 Foundations in Information Technology Services (3-0)5

Service operation and continual service improvement domains of the ITIL standard for IT service management, planning and change management, asset and configuration management, security management, network management, storage management, request management, incident and problem management.

ISE 413 Web Application Development with .NET (2-2)5

C# Programming Language, .NET framework, Entity framework, ASP.NET Core MVC, Object-Oriented Programming, Database CRUD operations, NLayered Architecture, SOLID Principles, Dependency Injection and Model View Controller Design Patterns, User authentication and authorization, Session management

ISE 414 Investigation of Computer Crime (3-0)5

Computer crimes, vulnerability, risk assessment, electronic fraud, viruses and worms, computer crime laws.

ISE 422 E-Government (3-0)5

Introduction to e-government, basic concepts and definitions, the components of e-government, managing e -government projects, infrastructure requirements for e-government, e-organizations, measuring e-government maturity, e-government: a profile of Turkey and world trends; risks: e-government versus

conventional government procedures.

ISE 423 Technology Trends in E-Government (3-0)5

Theoretical background of e-government, the use of e-government: local and global; technical and organizational aspects to realize e-government systems and contemporary sociotechnological methodologies; enterprise architectures, reference models and frameworks: Zachman, TOGAF, MoDAF, and DoDA; interoperability standards: eGIF, EIF, SAGA, and other

ISE 424 Distance Education and E-Learning (3-0)5

Definitions, history, and theories of distance education and e-learning, instructional design, tools and technologies for distance education, multimedia learning, computer-supported collaborative learning, learning management systems, new directions and developments.

ISE 426 Computer Security (3-0)5

Cryptographic tools, user authentication, access control, intrusion detection, malicious software, denial-of-service attacks, firewalls, trusted computing, buffer overflow, software security, Windows security, Linux security.

ISE 432 Innovation and Entrepreneurship in IT (3-0)5

Introduction to entrepreneurship, recognizing opportunities and generating ideas, feasibility analysis, developing an effective business model, industry and competitor analysis, writing a business plan, preparing the proper ethical and legal foundation, assessing a new venture?s financial strength and viability, building a new-venture team, working with disciplinary teams, working with interdisciplinary teams, getting financing or funding.

ISE 434 Fundamentals of the Internet of Things (3-0)5

Basics of IoT, IoT architecture, technologies and tools for IoT environment, IoT programming, IoT communication technologies, cloud for IoT applications and analysis, IoT data analytics, edge and fog computing, security management in IOT.

ISE 542 IT Security (3-0)5

Introduction to IT security, security plans, security policies, security models: TCSEC, common criteria, ISE/IEC 27000, CIBIT, ITIL; security risk assessment and management; security solutions; IT services and security; personnel security; ethics in IT security.

ISE 552 E-Commerce - A Managerial Perspective (3-0)5

Introduction to e-business and e-commerce, electronic marketplaces; technical aspects and infrastructure of e-commerce; e-commerce business models; current state of the art; marketing online, legal environment in e-commerce, fiscal environment in e-commerce; introduction to enabling technologies and standards; workflow systems for e-commerce; curre

MATE 458 Materials for Catalysis and Fuel Cells (3-0)5

Fundamentals of catalysis and catalytic reactors; catalyst synthesis methods; properties of catalytic materials and basics characterization methods; catalyst structure activity relationship fundamentals of electro-catalysis, photo catalysis, different types of fuel cells, and materials used for these applications; existing technology applications; future trends and emerging technologies

MATE 460 Biomaterials (3-0)5

Definition of biomaterial,biocompatibility,host response,synthetic and biological materials,synthetic biomaterial classes,polymers in the body,implant factors,host factors,categories of biomaterial applications,evaluation of biomaterials,historical evaluation of implants,current work in biomaterials, motivation for future directions,current trends.Properties of materials;bulk properties of materials, mechanical properties of materials;comparison of common surface analysis methods;

MATE 462 Nanomaterials (3-0)5

Nanotechnology fundamentals, history, applications and novel materials; synthesis and application of nanomaterials and their application in industry in relation to existing technology applications; future trends and emerging technologies.

MATH 151 Calculus I (4-2)7

Preliminaries, limits and continuity, differentiation, applications of derivatives, L`Hopital's Rule, integration, applications of integrals, integrals and transcendental functions, integration techniques and improper integrals, squences.

MATH 152 Calculus II (4-2)7

Infinite series, vectors in the plane and polar coordinates, vectors and motions in space, multivariable functions and their derivatives, multiple integrals: double integrals, areas, double integrals in polar coordinates, triple integrals in rectangular, cylindrical and spherical coordinates, line integrals, Independence of path,Green's theorem.

MATH 275 Linear Algebra (4-0)6

Linear equations and matrices, real vector spaces, inner product spaces, linear transformations and matrices, determinants, eigenvalues and eigenvectors.

MATH 276 Differential Equations (4-0)6

First-order, higher-order linear ordinary differential equations, series solutions of differential equations, Laplace transforms, linear systems of ordinary differential equations, Fourier analysis and partial differential equations.

MATH 380 Numerical Methods for Engineers (3-1)5

Solution of nonlinear equations, solution of linear systems, eigenvalues and eigenvectors, interpolation and polynomial approximation, least square approximation, numerical differentiation, numerical integration.

MATH 427 Introduction to Crytopgraphy (3-0)6

Basics of cryptography, classical cryptosystems, substitution, review of number theory and algebra, public-key and private-key cryptosystems, RSA cryptosystem, Diffie-Hellman key exchange, El-Gamal cryptosystem, digital signatures, basic cryptographic protocols.

MATH 490 Introduction to Optimization (3-0)6

Fundamentals of optimization, representation of linear constraints, linear programming, Simplex method, duality and sensitivity, basics of unconstrained optimization, optimality conditions for constrained problems.

ME 488 Production Design and Prototyping (1-4)5

Introduction to basic mechanical concepts,mechanical behavior of basic structural elements;introduction to basic materials science and basic manufacturing methods,introduction to mechanical and physical properties of materials;introduction to basic manufacturing processes and casting and material forming; basic design factors(line,figure,color,material,texture,design field,form,value in lighting), ergonomics/anthropometry;meaning in design;design project development by drawing and prototyping.

MECE 322 Multidisciplinary Design in Engineering (2-2)5

An overview of systems engineering (V-Model); engineering design process and methodology; needs assessment; project planning; literature review and patent survey; design criteria and constraints; creativity and idea generation; decision making for idea selection; methods and tools of functional decomposition; product/system architecture; modelling and simulation

MECE 422 Multidisciplinary Engineering Design (2-2)5

Design process and methodology; identification of engineering disciplines, features and importance of multidisciplinary engineering design; systems engineering; need identification and assessment, problem definition; creativity and idea generation; methods and tools of functional/physical/task decomposition; design representation techniques, conceptual modeling of energy, information and material flow in technical systems; idea selection, decision schemes; product architecture

MECE 447 Path Planning and Navigation (3-0)5

Introduction, kinematic models for mobile robots, mobile robot control, robot attitude, robot navigation, path finding, obstacle mapping and its application to robot navigation, application of Kalman filtering.

MFGE 405 Rapid Prototyping (3-0)5

Rapid prototyping technologies, CAD models suitable for automated fabrication, secondary processing, additive manufacturing technologies, stereolithography, fused deposition modeling, laminated object manufacturing, selective laser sintering, direct metal laser sintering, casting processes for rapid prototyping, investment casting, rapid tooling, reverse engineering.

MFGE 420 Project Management in Manufacturing (3-0)5

Project management standards;project,portfolio,program and operation management concepts; managing participation,teamwork, and conflict;need identification and assessment,problem definition; creativity and idea generation;methods and tools of functional/physical/task decomposition;mind mapping;planning methods; cost estimation and budgeting;time management and scheduling;project quality management;resource allocation; project risk management techniques; project execution, monitoringtechniques

MFGE 481 Nanofabrication (3-0)5

Fabrication of metallic nanomaterials, manufacturing of carbon based nanostructures, nanostructured systems from low-dimensional building blocks, characterization techniques and manufacturing methods, proximity effect.

MFGE 482 Introduction to CAD/CAM (2-1)5

Introduction to CAD,overview of geometric modeling techniques (wireframes, boundary representation, constructive solid geometry and hybrid modelers), parametric and variation modeling, parametric modeling of curves and surfaces (Bezier, B-spline and NURBS), introduction to CAM, CNC part programming,machining strategies, cutting tool selection, tool path generation, post-processing.

PHYS 101 General Physics I (3-2)6

Measurement, motion along a straight line, vectors, 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 and linear momentum, rotation, rolling, torque, and angular momentum, equilibrium and elasticity.

PHYS 102 General Physics II (3-2)6

Electric charge, electric fields, Gauss` law, electric potential, capacitance, current and resistance, circuits, magnetic fields, magnetic fields due to currents, induction and inductance.

SE 321 Object-Oriented Analysis and Design (3-0)7

Fundamentals of object-orientation, object-oriented (OO) modeling using UML, Experimentation in OO analysis: identification of use cases and objects, experimentation in OO design: class hierarchies, implementation in OO programming, design pattern (overview), case study to reinforce the underlying concepts.

SE 322 Software Architecture (3-0)5

Introduction to software architecture, architecture business cycle, creating an architecture, introducing a case study, understanding and achieving quality, design, document and reconstruct software architecture, methods in architecture evaluation, quantitative approach to architecture design decision making, software product lines, types of

SE 324 Software Project Management and Economics (3-0)5

Introduction to software project management; overview of project planning; selection of appropriate project approach; activity planning, resource allocation, project tracking and control; contract management; managing people and organizing teams; software quality assurance; configuration management; various tools of software project management;

SE 340 Rapid Application Development (2-0)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 344 Systems Software Validation and Testing (2-2)6

Software testing and its essentials, risk management, verification and validation, static V&V techniques and their comparison, software testing strategy and techniques, software testing tools, configuration management, software measurement and metrics related with testing.

SE 345 Software Quality Assurance (3-0)7

Introduction to software quality and assurance; software quality metrics; construction of software quality assurance; configuration management; software validation and verification; reviews, inspection and audits; software process improvement models; software testing strategies and testing techniques; defect reporting and removal; software

SE 346 Software Engineering (3-1)6

Software project management: metrics, estimation, scheduling, planning; software requirement analysis techniques, software design techniques, software implementation, software quality assurance and testing, software maintenance, software configuration management, risk management in software development projects, recent trends and methods in softwar

SE 360 System Modeling and Simulation (3-0)5

Dynamic simulations, Providing custom-made data types, operators and control structures for simulation, model generators, simulation programming landscape, simulation problems.

SE 362 Open Source Software Development (2-2)5

Introduction to open source software (OSS) projects; history of OSS; unit testing and continuous integration; use of GitHub and other hosting providers; packaging and releasing; different licensing models; some examples of successful open source projects.

SE 375 3D Modeling, Animation and Game Design (2-2)5

Introduction to modeling bases, an overview of the design of the model, selection of the appropriate modeling technique; transforming the model into simulation and animation; overview of simulation and physics engine; control of model and animation with peripherals; overview of peripherals; interactive project construction with the selection of appropriate peripherals; 3D modeling for 3D printers; artificial organ design with 3D printers; industrial product design with 3D printers;

SE 421 Big Data Programming (2-2)5

What is "Big Data"; the dimensions of Big Data; scaling problems; HDFS and the Hadoop ecosystem; the basics of HDFS, MapReduce and Hadoop cluster; writing MapReduce programs to answer questions about data; MapReduce design patterns; basic Spark architecture; common operations; Use Resilient Distributed Datasets (RDD) operations.

SE 422 Introduction to Data Science (3-0)5

Python programming language for data science, data scraping, data manipulation, data visualization, use of vectors and matrices in data science, review of statistical concepts for data science, conditional probability, Bayes?s theorem, normal distribution, prediction, regression, classification and clustering.

SE 426 Emerging Technologies (2-2)5

What is an "Emerging Technology", disruptive technologies; identification of disruptive technologies; the 3D printing revolution; the evolution of technology; the nature o innovation; combination and structure; phenomena, domains and problem-solving; origin of technologies; technological revolution; economic revolution; forecasting.

SE 427 Blockchain and Cryptocurrency Technologies (2-2)5

Introduction.Blockchain Basics.Consensus Algorithms.Cryptography Fundamentals.Blockchain Networks. Blockchain Programming. Blockchain Transactions, Mining, and Wallets. Smart Contracts. Cryptocurrencies. Blockchain Applications. Decentralization. Blockchain Security. Legal Aspects, Finance, and Economy. Future of Blockchain Technologies.

SE 440 Analysis and Design of User Interfaces (3-0)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 446 Introduction to Bioinformatics (3-0)5

DNA and protein sequence alignment, phylogenetic trees, protein structure prediction, motive findin, microarray data analysis, gene/protein networks.

SE 450 Software Engineering Ethics (3-0)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 decis

SE 453 Large Scale Software Development (3-0)5

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 viewpo

SE 457 Secure Software Development (3-0)5

Security Basics. Secure Software Development. DevSecOps. Risk management. Threat modeling. Security of Data, Communication and Application. Security Controls. API Security. Security Scenarios. Secure Coding Practices. OWASP Top 10. Mitre Atta@ck. Security Assessment and Testing. Security Frameworks and Guidelines

SE 460 Software Construction (3-0)5

Software construction fundamentals, software complexity, construction management, construction models, construction planning, software measurement, construction languages, coding, construction testing, reuse, verification and standards in construction, construction quality, integration.

SE 461 Software Patterns (3-0)5

Introduction to design patterns, creational patterns, structural patterns, behavioural patterns, analysis patterns, architectural patterns, testing, refactoring.

SE 462 Formal Methods in Software Engineering (3-0)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 cyc

SE 463 Low-code Application Development (3-0)5

Introduction to low-code development. Low-code platform interfaces and properties. Creating applications using a low-code platform. Preparing a web and mobile UI and screen prototype via a low-code platform. Create scheduled jobs. Publishing applications and testing.

SE 470 Agile Methods in Software Development (2-2)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 573 Applied Machine Learning in Data Analytics (3-0)5

Data statistics; linear discriminant analysis; decision trees; artificial neural networks; Bayesian learning; distance measures; instance-based and reinforcement learning; clustering; regression; support vector

machines.

TURK 401 Turkish Language I (2-0)2

Languages and their classification; history of Turkish language, its spread over the world and its place among other languages; Turkish language in the republic era; orthography; expressions; foreign words, suffixes and prefixes; punctuation; language and verbalism.

TURK 402 Turkish Language II (2-0)2

Written expression and its genres; bibliography; sentence structure and types; misexpression; verbal expressions.