

Code	COMP101
Name	Art of Computing
Hour per week	5 (3+2)
Credit	4
ECTS	6
Level/Year	Undergraduate/1
Semester	Fall, Spring
Type	Compulsory
Prerequisites	-
Content	The course aims to teach the essentials of computing to students who have little or no background in programming. The students will learn how to write basic computer programs using SNAP and Java. Through a course project the course also aims to develop design skills of the students.

Code	COMP104
Name	Exploring Computer Engineering
Hour per week	5 (3+2)
Credit	4
ECTS	6
Level/Year	Undergraduate / 1
Semester	Spring
Type	Compulsory
Prerequisites	
Content	The main concepts of object oriented programming as well as complementary topics that are used extensively in modern computer programming will be given throughout the course. The main components of object oriented programming will be investigated in Java programming language. Also, various topics like exception handling, basic data structures, GUI design, and multithreading will be explained. Finally, some critical software engineering concepts like software code management and documentation will be discussed briefly.

Code	COMP112
Name	Object Oriented Programming
Hour per week	5 (3+2)
Credit	4
ECTS	6
Level/Year	Undergraduate / 1
Semester	Spring
Type	Compulsory
Prerequisites	COMP 101
Content	The main concepts of object oriented programming as well as complementary topics that are used extensively in modern computer programming will be given throughout the course. The main components of object oriented programming will be investigated in Java programming language. Also, various topics like exception handling, basic data structures, GUI design, and multithreading will be explained. Finally, some critical software engineering concepts like software code management and documentation will be discussed briefly.

Code	COMP202
Name	Software Engineering
Hour per week	3 (3+0)
Credit	3
ECTS	7
Level/Year	Undergraduate / 2
Semester	Spring
Type	Compulsory
Prerequisites	
Content	In this course, the introductory concepts of software engineering will be given. The software life cycle and various phases of software development such as feasibility study and analysis, software specification and design, implementation and testing, and documentation and maintenance will be discussed. Some tools, techniques, environments, and methodologies regarding these issues will be given and explained. Lastly, some project management related issues like project planning, organization, control, and professional ethics will be discussed as part of the general context of software engineering.

Code	COMP203
Name	Data Structures and Algorithms
Hour per week	5 (3+2)
Credit	4
ECTS	7
Level/Year	Undergraduate / 2
Semester	Fall
Type	Compulsory
Prerequisites	COMP 112
Content	The purpose of this course is to provide the students with solid foundations in the basic concepts of programming: data structures and algorithms. The main objective of the course is to teach the students how to select and design data structures and algorithms that are appropriate for problems that they might encounter. This course is also about comparing algorithms and studying their correctness and computational complexity. This course offers the students a mixture of theoretical knowledge and practical experience using Java.

Code	COMP204
Name	Database Management Systems
Hour per week	3 (3+0)
Credit	3
ECTS	6
Level/Year	Undergraduate / 2
Semester	Spring
Type	Compulsory
Prerequisites	COMP 101
Content	This course provides a comprehensive overview of design and implementation of relational databases with web access for database-driven Web applications. The students will also learn about database management systems (such as Oracle), database administration, and database querying with SQL.

Code	COMP205
Name	Mobile Programming
Hour per week	5 (3+2)
Credit	4
ECTS	7
Level/Year	Undergraduate / 2
Semester	Fall
Type	Compulsory
Prerequisites	COMP101
Content	The main concepts of mobile programming as well as complementary topics that are used extensively in modern computer programming will be given throughout the course. Also, various topics like GUI design, and multithreading will be explained. Finally, some critical software engineering concepts like software code management and documentation will be discussed briefly.

Code	COMP301
Name	Analysis of Algorithms
Hour per week	5 (3+2)
Credit	4
ECTS	6
Level/Year	Undergraduate / 3
Semester	Fall
Type	Compulsory
Prerequisites	COMP 203
Content	The purpose of this course is to provide the students with a good understanding of the mathematical concepts needed to study the performance of computer programs. The mathematics needed to support scientific studies that can serve as the basis for predicting algorithm performance and comparing different algorithms on the basis of performance will be given. The material covered in this course draws from classical mathematical topics, including discrete mathematics, elementary real analysis, and combinatorics, as well as from classical computer science topics, including algorithms and data structures.

Code	COMP302
Name	System Programming
Hour per week	5 (3+2)
Credit	4
ECTS	5
Level/Year	Undergraduate / 3
Semester	Spring
Type	Compulsory
Prerequisites	COMP 112
Content	The course aims to teach the essentials of system programming for Unix and Linux. The students will learn how to write basic shell scripts, Python scripts and will get a hands on experience and knowledge on the structure of Unix/Linux operating systems.

Code	COMP303
Name	Operating Systems
Hour per week	3 (3+0)
Credit	3
ECTS	6
Level/Year	Undergraduate / 3
Semester	Fall
Type	Compulsory
Prerequisites	COMP 203
Content	This course provides a comprehensive overview of process management, file systems. It will also cover the efficient use of operating system (OS) and OS design.

Code	COMP304
Name	Embedded Systems Programming
Hour per week	5 (3+2)
Credit	4
ECTS	6
Level/Year	Undergraduate / 3
Semester	Spring
Type	Compulsory
Prerequisites	COMP 305
Content	The course aims to teach the essentials of embedded systems and how the computer interacts with its environment. Students will analyze the working principles of computers and develop embedded systems on microprocessors using assembly and C programming languages.

Code	COMP305
Name	Computer Organization
Hour per week	5 (3+2)
Credit	3
ECTS	6
Level/Year	Undergraduate / 3
Semester	Fall
Type	Compulsory
Prerequisites	EE 203
Content	This course provides a comprehensive presentation of the organization and architecture of modern-day computers, emphasizing both fundamental principles and the critical role of performance in driving computer design. The topics include number system, computer arithmetic, computer evolution and performance, memory, storage, input/output, details of a processor, multi-cores, multiprocessors and clusters.

Code	COMP306
Name	Formal Languages and Automata Theory
Hour per week	5 (3+2)
Credit	4
ECTS	6
Level/Year	Undergraduate / 3
Semester	Spring
Type	Compulsory
Prerequisites	MATH 206
Content	The main concept of the theory of computation will be given throughout the class. Key mathematical language classes like Regular languages and context-free languages will be explained. Also, the Church-Turing thesis and Turing machines which constitute the heart of the Theory of Computation will be explained as well as related topics as Decidability and Reducibility. Finally, a brief introduction to time complexity analysis of algorithms and main mathematical problem classes like class P and class NP will be provided.

Code	COMP308
Name	Computer Networks
Hour per week	3 (3+0)
Credit	3
ECTS	6
Level/Year	Undergraduate / 3
Semester	Spring
Type	Compulsory
Prerequisites	
Content	This course provides a comprehensive overview of computer networks and mobile communications technologies. The topics include computer networks, Internet, TCP/IP, transport layer protocols, routing layer protocols, medium access control protocols, wireless channel models, cellular networks and wireless local area networks. After completing the course, students will get a basic understanding about the computer networks and mobile communications, and related problem solving discipline using mathematics / engineering principles.

Code	COMP351
Name	Summer Training I
Hour per week	0
Credit	0
ECTS	2
Level/Year	Undergraduate / 3
Semester	Fall
Type	Compulsory
Prerequisites	
Content	The purpose of this course is to enable students to apply academic knowledge to real-world problems and to gain real working environment experience.

Code	COMP401
Name	Bioinformatics
Hour per week	3 (3+0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 4
Semester	Fall/Spring
Type	Elective
Prerequisites	
Content	This course introduces students to the fundamental theories and practices of bioinformatics and computational biology. The students will get an understanding and practice on the types of biological data, biological databases as well as computational problems and algorithms related to biological data analysis.

Code	COMP402
Name	Wireless and Mobile Networks
Hour per week	3 (3+0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 4
Semester	Fall/Spring
Type	Elective
Prerequisites	COMP 308
Content	This course covers wireless and mobile networking concepts and protocols with real-world examples. This course aims to provide students with a basic understanding about the wireless and mobile networks and related problem solving discipline using mathematics / engineering principles.

Code	COMP403
Name	Network Security and Cryptography
Hour per week	3 (3+0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 4
Semester	Fall/Spring
Type	Elective
Prerequisites	COMP 308
Content	This is an introductory course where fundamental concepts in cryptography and network security are explained. After completing the course, students will get basic understanding about encryption, decryption, stream ciphers, block ciphers, public-key cryptography, digital signatures, hash functions, message authentication codes and key distribution protocols.

Code	COMP404
Name	Data Mining
Hour per week	3 (3+0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 4
Semester	Fall/Spring
Type	Elective
Prerequisites	
Content	This course provides an introduction to data mining. It covers fundamental pattern discovery techniques such as frequent itemset and association rule detection, efficient data structures and algorithms that have good scaling properties and fundamental classification and clustering algorithms. Through a course project, the students will program a data mining software and apply the concepts to a real problem.

Code	COMP405
Name	Image Processing
Hour per week	3 (3+0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 4
Semester	Fall/Spring
Type	Elective
Prerequisites	
Content	The main concepts of image processing, various methods of processing image information and methods of manipulating images for different objectives will be given throughout this course. The concept of image as a signal and how to utilize signal theory for image processing purposes using related mathematical operations and tools will be explained. Related topics such as color, noise, image components will be explained. Lastly, more complex concepts such as image compression and morphing will be explained with some well-known examples.

Code	COMP406
Name	Computer Graphics
Hour per week	3 (3+0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 4
Semester	Fall/Spring
Type	Elective
Prerequisites	
Content	This course provides a comprehensive introduction to computer graphics modeling, animation, and rendering. In this course, the basic image processing, geometric transformations, geometric modeling of curves and surfaces, animation, 3-D viewing, visibility algorithms, shading, and ray tracing topics will be covered. Also, GPU programming will be briefly explained.

Code	COMP407
Name	Machine Learning
Hour per week	3 (3+0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 4
Semester	Fall/Spring
Type	Elective
Prerequisites	
Content	This course provides an introduction to machine learning. Students will learn the concepts behind the algorithms by exploring the fundamental theoretical principles without going deeply into the mathematics and gain practical experience by applying the techniques on selected problems.

Code	COMP408
Name	High Performance Computing Systems
Hour per week	3 (3+0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 4
Semester	Fall/Spring
Type	Elective
Prerequisites	
Content	This course will provide students with an in-depth analysis of the current issues in HPC systems including parallel computing, new processor architectures, power-aware computing and communication, advanced topics on petascale computing and optical systems. In addition, parallel models of computation such as dataflow, and demand-driven computation will also be studied.

Code	COMP409
Name	Design Patterns
Hour per week	3 (3+0)
Credit	3
ECTS	5
Level/Year	Undergraduate / 4
Semester	Fall/Spring
Type	Elective
Prerequisites	
Content	This course is an introduction to software design patterns. Each pattern represents a best practice solution to a software problem in some context. The course will cover the rationale and benefits of object-oriented software design patterns. Several example problems will be studied to investigate the development of good design patterns. Specific patterns, such as Strategy, Observer, Decorator, Factory, Singleton, and Adapter will be discussed. Programming projects in the Java language will provide experience in the use of these patterns.

Code	COMP451
Name	Summer Training II
Hour per week	0
Credit	0
ECTS	4
Level/Year	Undergraduate / 4
Semester	Fall
Type	Compulsory
Prerequisites	
Content	The objective of this course is to give students the opportunity to apply their academic knowledge to real world problems and to experience real working environments. The students will also let students to make better career plans by observing these working environments.

Code	COMP491
Name	Capstone Project I
Hour per week	0
Credit	8
ECTS	8
Level/Year	Undergraduate / 4
Semester	Fall
Type	Compulsory
Prerequisites	
Content	This is the first one of the two capstone projects required by the students for graduation. Students work on individual design projects and, guided by their adviser, they learn the required theory needed for the completion of their projects and apply it through implementation and testing. Each design project includes the project specification, design, implementation and finally testing steps, and graded on successful completion and deployment as well as on documentation and final oral presentations.

Code	COMP492
Name	Capstone Project II
Hour per week	0
Credit	8
ECTS	8
Level/Year	Undergraduate / 4
Semester	Spring
Type	Compulsory
Prerequisites	
Content	This is the second and last installment of the student's graduation project. The student is expected to complete his work that is started in Capstone 1 course and make a successful demonstration in the end of the term. The student is also expected to demonstrate the technical skills he acquired during the computer engineering study program as well as independent learning skills by showing a working computer hardware/software system that he developed.