COURSES IN FOREIGN LANGUAGES for ERASMUS INCOMING STUDENTS

at Sofia University

Faculty of Mathematics and Informatics

Faculty coordinator: Assoc. Prof. Maya Stoyanova, stoyanova@fmi.uni-sofia.bg

Course code according to the curriculum	Course title in English	Language of instruction	Course offered to BA/MA/PhD	Course duration (winter/ summer semester/ full year)	Credits	Number of hours			Lecturer/s	E-mail/s
						Lectures	Exercises/ Seminars	Practical work		
MI M 0101 17 / A541E	ALGEBRA 2	English	BA	Winter	5	45	15	0	Prof. Azniv Kasparian, PhD	kasparia@fmi.uni-sofia.bg
The course is an introduction to Galois theory. After studying separable field extensions it introduces the Galois group and traces out its interrelations with the structure of the corresponding field extension. It discusses the Galois correspondence between the subgroups of the Galois group and their associated fixed fields with a specific emphasis on the bijective correspondence between the finite solvable Galois groups and the finite radical extensions of a given field. Few of the intended applications are the Abel-Ruffini's Theorem on the insolvability of polynomial equations of degree at least 5 by radicals, some counterexamples to classic compass and straightedge constructions, the correspondence between the unratified coverings of a topological space and the subgroups of its fundamental group, as well as the correspondence between the finite ramified extensions of Riemann surfaces and the finite extensions of their function fields.										

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MI M 2421 16 / A641E	GROEBNER BASES	English	MA	Winter	5	45	0	15	Prof. Azniv Kasparian, PhD	kasparia@fmi.uni-sofia.bg

The course studies the Groebner bases. It discusses the monomial orderings, the division of polynomials of several variables, and affine algebraic varieties. As a first application of Groebner bases, the proof of Hilbert's Basis Theorem is derived from Dickson's Lemma. The course focuses on the reduced Groebner bases and Buchberger's algorithm for their construction. Applications to elimination and extension on affine varieties are under consideration. Hilbert's Nullstellensatz is used for building the correspondence between the polynomial ideals and the affine varieties. Thus, algorithmic computations in quotients of the polynomial rings are related to the regular and rational functions on affine varieties. Applications to robotics and automatic geometric theorem proving are intended. Eventually, the course includes also the projective varieties.

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MI M 0101 16 / A731E	**APPLIED ALGEBRAIC GEOMETRY**	**English**	**BA/MA**	**Winter**	**5**	**45**	**0**	**15**	**Prof. Azniv Kasparian, PhD**	**kasparia@fmi.uni-sofia.bg**

The course is an introduction to arithmetic algebraic geometry with an application to coding theory. It starts with function fields of one variable, Galois actions on their constant fields, discrete valuations and places. By the time when the geometry comes in, there is a fair amount of abstract algebraic knowledge, to assess the correspondence between algebraic curves and their function fields. After the basics for smooth algebraic curves, their regular and rational maps, the course proceeds with Riemann-Roch Theorem. It is proved from adelic viewpoint. The usual differential forms are also introduced, discussed and related to the duals of the adelic spaces, called Weil differentials. A milestone of the subject is Hasse-Weil Theorem and the Hasse-Weil bound on the number of the rational points of a curve over a finite field. Their proofs, combining a variety of ideas and techniques, deserve to be a goal itself. The aforementioned theoretic considerations are applied for constructing dual algebrogeometric codes. A special attention will be paid to decoding algorithms for codes of residuums, which are based on the properties of the linear systems of divisors. The course is recommended to students with interdisciplinary mathematical interests. The simultaneous invitation to algebraic geometry and Galois Theory is hoped to enhance both, the geometric intuition and the rigorous thinking.

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MI M 0101 17 / D651E	**DIFFERENTIAL GEOMETRY**	**English**	**BA**	**Winter**	**5**	**45**	**15**	**0**	**Assoc. Prof. Ivan Minchev, PhD**	**minchev@fmi.uni-sofia.bg**

The course provides the necessary foundational material for students interested in any of the diverse areas of mathematics and physics that require the concepts of differentiable manifolds and linear connections.

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MI M 0101 16 / I863E	**DISCRETE MATHEMATICS AND MATHEMATICAL LOGIC**	**English**	**BA/MA**	**Winter**	**7.5**	**45**	**45**	**0**	**Prof. Tinko Tinchev, PhD**	**tinko@fmi.uni-sofia.bg**

The course gives the foundations of the theoretical computer science. We introduce certain basic notions such as sets, relations, functions, partially ordered sets, equivalence relation. We examine the language of mathematical logic, propositional and predicate calculus, the notion of a structure, of a theory and logical interference. We study different kinds of discrete structures. We introduce basic combinatorial principles and the foundations of the theory of finite graphs, together with some basic algorithms such as dept first search, breath first search and some optimizing problems for graphs. We give an introduction to the class of the discrete functions and prove a sufficient criterion for the completeness of a class of Boolean functions. The next topic is the theory of the finite automata, grammars and formal languages. We prove that the regular languages are the languages accepted by finite automata, and that the languages generated by a context-free grammar are those, accepted by push-down automata The course gives the preliminary knowledge, needed for the courses: Design and analysis of algorithms, Artificial intelligence, Computability and complexity, Semantics of programming languages.

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MI M 0101 16 / V101E	**MATHEMATICAL LOGIC**	**English**	**BA/MA**	**Winter**	**6**	**45**	**30**	**0**	**Assoc. Prof. Hristo Ganchev, PhD**	**ganchev@fmi.uni-sofia.bg**

The course is an introduction to the field of Mathematical Logic. Its aim is to introduce the students to the first-order predicate calculus. We shall study in detail the notions theorem, proof and axiomatic system. We will prove Gödel's Completeness theorem from which we will derive some basic results in the field of Model theory.

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MI M 5221 16 / V103E	**MODAL LOGIC**	**English**	**MA**	**Winter**	**5**	**60**	**0**	**0**	**Prof. Dimitar Vakarelov, Dr. Habil**	**dvak@fmi.uni-sofia.bg**

The course "Modal logic" starts with an exposition of intuitionistic and classical propositional logic including axiomatization and completeness theorems. It contains standard material for modal logic: modal languages, Kripke semantics, modal definability and indefinability, Sahlqvist definability theorem, decidability by the method of filtration, axiomatization and completeness via canonical models, extended modal languages. The course is intended for students specializing mathematical logic with applications in computer science and Artificial Intelligence.

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MI M 5221 16 / V732E	**APPLIED MODAL LOGIC**	**English**	**MA**	**Summer**	**6**	**75**	**0**	**0**	**Prof. Dimitar Vakarelov, Dr. Habil**	**dvak@fmi.uni-sofia.bg**

The course "Applied modal logic" is a continuation of the course "Modal logic". It applies the methods studied in the preceding course to some modal logics arising from some applied areas. It includes: Propositional Dynamic Logic (PDL), Logics of knowledge and believe, Arrow logic, Modal logics for information systems, Modal logics for space relations.

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MI M 5221	**LOGICS OF SPACE AND**	**English**	**MA**	**Summer**	**6**	**75**	**0**	**0**	**Prof. Dimitar**	**dvak@fmi.un**

16 / V606E	**TIME: REGION-BASED APPROACH**								**Vakarelov, Dr. Habil**	**i-sofia.bg**

In this course we develop theories of space and time based on some spatial relations between regions of space. This approach, known also as Region-based theory of space (RBTS), goes back to Whitehead where the base primitive notion is the notion of spatial region and some relations between regions as "contact". An algebraic equivalent of this theory is the notion of contact algebra. We consider several models of contact algebras: topological, proximal and relational and representation theorems of contact algebras in the corresponding models. In the second part of the course we introduce the notion of dynamic contact algebra which incorporates the notion of time and formalizes regions changing in time. The theory is point free in double sense: neither spatial points nor time points (moments of time) are taken as primitives – they are definable in the theory by the notion of "dynamic region" and some spatio-temporal relations between dynamic regions: "spatial contact", "time contact" and "precedence". The main result of part two is a representation theorem for dynamic contact algebra in certain concrete models of changing regions called "snapshot models".

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MI M 0101 16 / V601E	**COMPUTABILITY AND COMPLEXITY**	**English**	**BA/MA**	**Winter**	**6**	**45**	**30**	**0**	**Asst. Prof. Stefan Vatev, PhD**	**stefanv@fmi.uni-sofia.bg**

The course is an introduction to the theory of computability. The considered computational model is based on unlimited register machines. We present the connections between partial computable and partial recursive functions. We consider certain important computable and computably enumerable problems and describe methods for establishing incomputability The foundations of the theory of computational complexity are presented. We discuss properties of the complexity classes P and NP. We examine certain NP-complete problems and give a proof of Cook's theorem.

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MI M 2321 16 / R791E	**VARIATIONAL METHODS AND APPLICATIONS**	**English**	**MA**	**Summer**	**6**	**45**	**0**	**30**	**Assoc. Prof. M. Karatop-raklieva, PhD**	**ivmarkar@fmi.uni-sofia.bg**

Variational methods are among the techniques for solving the Dirichlet problem for the Poisson equation in the theory of partial differential equations. Having essential applications in investigation of problems of modern mathematics, classical mechanics, fluid mechanics, optics and electromagnetics, those methods have become recently a powerful research tool in such fields as: quantum mechanics, optimization and control, image processing and data analysis, mathematical finance and economics. The course content consists of the following topics: the classical theory of minimization of a quadratic functional in a Hilbert space, an introduction to the differential calculus in a reflexive Banach space and the theory of critical points for a lower semi continuous functional. The examples of application of the theory include: the Brachistochrone problem, Plateau's problem, linear and semi linear elliptic boundary value problems, the nonlinear p-Laplacian and others.

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MI M 0101 16 / E781E	**ORTHOGONAL POLYNOMIALS AND SPECIAL FUNCTIONS**	**English**	**BA/MA**	**Winter**	**5**	**30**	**0**	**30**	**Assoc. Prof. M. Karatop-raklieva, PhD**	**ivmarkar@fmi.uni-sofia.bg**

The course provides an introduction to the study of orthogonal polynomials and special functions. They are related to important problems in approximation theory of functions, the theory of differential and difference equations, whilst having essential applications to recent problems in quantum mechanics, mathematical statistics, computer graphics, digital signal processing. The course will include the topics: Gamma function, the hypergeometric functions and confluent hypergeometric functions - series expansions, analytical and geometrical properties, differential equations, applications in summation and function representations; sequences of orthogonal polynomials and their weight functions; study of the classical orthogonal polynomials and their applications in quantum mechanics, computer graphics and digital signal processing.

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MI A 0101 16 / C702E	**RANDOM PROCESSES**	**English**	**BA**	**Summer**	**5**	**30**	**30**	**0**	**Prof. M. Bojkova, PhD**	**bojkova@fmi.uni-sofia.bg**

The special topics considered are: Markov chains in discrete time; Brownian motion, Random walks, Birth and death processes, Poisson processes, Martingales in discrete time, Ito integral, Ito formulae, Model of financial market.

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MI A 0101 16 / C832E	**BRANCHING PROCESSES**	**English**	**BA/MA**	**Winter**	**5**	**30**	**30**	**0**	**Prof. M. Bojkova, PhD**	**bojkova@fmi.uni-sofia.bg**

Branching processes (BP) are models of many real world phenomena and processes in biology, physics, chemistry, economics, demography and informatics. The asymptotic properties, as well as the moments and limit theorems for proper functional of the following classical models of BP are studied: Galton-Watson BP, Bellman-Harris BP, Markovian BP, multi-type and controlled BP. Computer simulations and demonstrations for statistical inferences are also provided.

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MI A 5222 17 / P612E	**BIOSTATISTICS**	**English**	**MA**	**Winter**	**5**	**30**	**30**	**0**	**Assist. Prof. D. Grigorova, PhD**	**dgrigorova@fmi.uni-sofia.bg**

This course aims to introduce the specifics of medical and biological data and the relevant methods for analyzing such data. The topics included are introducing the types of data and types of bio-statistical research, basic statistical methods such as t-tests and tests of association between two variables, methods of analysis of variance, linear, logistic and log-linear regression. Also included are basic methods for planning, randomization and analysis of clinical trials and epidemiological studies.

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according to the curriculum	title in English	e of instructi on		(winter/ summer semester/ full year)					Lecturer/s	E-mail/s
MI A 5222 17 / P712E	**ACTUARIAL MATHEMATICS**	**English**	**MA**	**Winter**	**5**	**30**	**0**	**30**	**Prof. M. Bojkova, PhD**	**bojkova@fmi.uni-sofia.bg**
The topics included are typical actuarial probability distributions, compound Poisson process, premium assessment problem, individual and collective risk premium, reinsurance and ruin probabilities, prognosis of the reserves, and optimization of loading. Actuarial principles are illustrated with examples from practice of pensions, life insurance, general insurance, living benefits.										

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MI A 5222 17 / P812E	**MATHEMATICAL STATISTISC 2**	**English**	**MA**	**Winter**	**5**	**30**	**0**	**30**	**Assoc. Prof. D. Donchev, PhD**	**doncho@fmi.uni-sofia.bg**
The problems considered include sufficient statistics, completeness and efficiency, exponential family, Bayesian approach, Fisher information, information and sufficiency, Wishard distribution, robust and nonparametric methods.										

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MI A 5222 16 / P912E	**PROBABILITY 2**	**English**	**MA**	**Winter**	**5**	**30**	**30**	**0**	**Prof. M. Bojkova, PhD**	**bojkova@fmi.uni-sofia.bg**
Special attention is given to the following important topics: relation between Probability theory and Measure theory, Independence, Conditional Expectation, Martingales in discrete time and Girsanov's theorems, Jordan-Hahn, Lebesgue and Radon-Nikodym theorems, classical results from										

probability theory, infinitely-divisible distributions.

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MI A 2321 16 / Z712E	**FINITE ELEMENT METHOD – ALGORITHMIC FOUNDATIONS**	**English**	**MA**	**Winter**	**5**	**30**	**0**	**30**	**Prof. Stefka Dimova, D-r Habil**	**dimova@fmi.uni-sofia.bg**

The course introduces the main notions and ideas of the FEM. It shows how to apply the FEM to the main classes of stationary and non-stationary differential problems, which are mathematical models of variety of real-world phenomena and processes. As a basis of the laboratory exercises the PDE toolbox of MATLAB will be used. The students will use the Graphical user interface for solving different engineering problems in the fields of electrostatics and magnetostatics, diffusion and transfer (of heat and particles), deformation and stresses in elastic bodies.

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MI A 2321 16 / Z812E	**NUMERICAL METHODS FOR DIFFERENTIAL EQUATIONS**	**English**	**MA**	**Summer**	**5**	**30**	**0**	**30**	**Prof. Stefka Dimova, D-r Habil**	**dimova@fmi.uni-sofia.bg**

The main topics to be considered: Cauchy problem for first order ODE. Physical interpretation, examples. Finite difference methods – one-step and multistep methods. Approximation stability and convergence. Boundary value problem for second order ODE. One-dimensional stationary heat equation, interpretation of the boundary conditions. Finite difference methods, variation methods. One-dimensional nonstationary heat equation, other physical interpretations. Weighted multilevel difference schemes. First order hyperbolic equation, physical interpretations. Characteristics. Finite difference methods, monotonicity. First order hyperbolic nonlinear equation, physical interpretations. Shock waves. Total variation Diminishing difference schemes. Poisson equation, physical interpretations. Finite difference methods. Wave equation. Characteristics. Finite difference methods.

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MI A 2321 16 / Z912E	**MATHEMATICAL MODELS AND COMPUTATIONAL EXPERIMENT**	**English**	**MA**	**Summer**	**5**	**30**	**0**	**30**	**Prof. Stefka Dimova, D-r Habil**	**dimova@fmi.uni-sofia.bg**
The main topics are: – Construction and investigation of mathematical models: dimensional analysis and scaling. – Hierarchy of mathematical models. – Connection between the symmetry of physical systems and the invariance of the mathematical models: similarity and invariant solutions of differential equations. – Construction of discrete methods that incorporate the invariant properties of the continuous models. The explanation is on the mathematical models of different physical processes. The laboratory exercises are devoted to the numerical analysis of the mathematical models under consideration using MATLAB and specially developed software.										

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MI I 4121 16 / A531E	**BUSINESS MATHEMATICS 1 (Linear Algebra)**	**English**	**MA**	**Winter**	**5**	**30**	**30**	**0**	**Assoc. Prof. Maya Stoyanova, PhD**	**stoyanova@fmi.uni-sofia.bg**
Business mathematics I is a course of Applied Mathematics, in which discuss some mathematical methods that find use in science, engineering, business, computer science, and industry. The course description is introduction to both theoretical and algorithmic aspects of linear algebra and linear programming: systems of linear algebraic equations, matrix algebra, determinants, geometry of linear programs, simplex method, duality theory and dual simplex method and integer linear programming.										

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MI I 4121 16 / P512E	**BUSINESS MATHEMATICS 2 (Statistics)**	**English**	**MA**	**Winter**	**5**	**30**	**30**	**0**	**Assoc. Prof. Kamen Spasov, PhD**	**kspasov@fmi.uni-sofia.bg**
Statistics is a way to get information from data, and a tool for creating an understanding from a set of number. Like a branch of statistic, Business Statistics is a science assisting to make business decisions under uncertainties based on some numerical and measurable scales. The main objective of Business Statistics is to make inference about certain characteristics of a population based on information contained in a random sample from the entire population, so the business statistic is the science of good decision making in the face of uncertainty. A typical Business Statistics course is intended for business majors and covers statistical study, descriptive statistics, probability, and the binomial and normal distributions, test of hypotheses and confidence intervals, linear regression, and correlation. Prerequisites: None									

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MI I 4121 16 / F663E	**BUSINESS MATHEMATICS 3 (Graphs and Algorithms)**	**English**	**MA**	**Winter**	**5**	**30**	**30**	**0**	**Assoc. Prof. Minko Markov, PhD**	**minkom@fmi.uni-sofia.bg**
The course introduces graphs in all their flavors: undirected graphs, directed graphs, multigraphs, and weighted graphs. Numerous fundamental graph concepts are presented: adjacency, incidence, vertex degrees, walks, tours, paths, cycles, Euler tours and Hamilton cycles, trees, spanning trees, graph connectivity, bipartite graphs, vertex and edge colorings, matching, planarity, flows, optimal paths, and planar embedding. An emphasis is placed on the algorithmic aspects of Graph Theory and on its practical aspects. Every significant graph problem is demonstrated as an abstraction of a particular real-life problem. The most fundamental algorithmic problems on graphs are discussed in detail: graph traversal, minimum spanning tree, shortest and longest paths, topological sorting, maximum matching, the edge coloring of bipartite graphs, various transportation problems, the Chinese postman problem, the color ability of planar graphs. Numerous algorithms are presented and analyzed: BFS, DFS, Prim's and Kruskal's algorithms for MST, Dijkstra's algorithm for shortest paths, the construction of Eulerian tours, several max-flow algorithms, algorithms for maximum matchings on bipartite graphs. To that end, the fundamentals of algorithm analysis are presented briefly with emphasis on polynomial-time complexity. Prerequisites: None									

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MI C 0101 17 / F653E	**Fundamentals of Algorithms**	**English**	**BA/MA**	**Winter**	**5**	**30**	**30**	**0**	**Assoc. Prof. Minko Markov, PhD**	**minkom@fmi.uni-sofia.bg**
We introduce computational problems and algorithms, the concept of input size and time and space complexities as functions of the input size. Further, we introduce the five asymptotic notations O, o, Θ, Ω, ω. We consider SORTING as a fundamental computational problem and present both naïve and sophisticated algorithms for it. In doing so, we introduce binary heaps and priority queues, as well as the Divide-and-Conquer paradigm, recursive algorithms, recurrent relations and methods for solving them. We introduce the concept of lower bounds on computational problems and methods for proving lower bounds. We consider numerous Graph Theory computational problems: graph traversal, topological sorting, cut vertices, minimum spanning trees and shortest paths. We introduce the Greedy paradigm and the Dynamic Programming paradigm, illustrating the latter with numerous examples. We introduce the basics of Computational Complexity and the phenomenon of intractability.										

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MI A 0101 16 / F753E	**Computational Complexity**	**English**	**BA/MA**	**Winter**	**5**	**30**	**30**	**0**	**Assoc. Prof. Minko Markov, PhD**	**minkom@fmi.uni-sofia.bg**
Introduction to Turing machines and Universal Turing Machines. Time and Space Complexity of problems. Nondeterministic Turing machines. Computational Classes P and NP. NP-completeness: Cook's theorem. P versus NP. Ladner's theorem. Complexity class co-NP. Polynomial hierarchy. Space complexity: class PSPACE. Approximation algorithms. Parameterized complexity.										

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MI I 4121 16 / S674E	**WEB TECHNOLOGIES AND ARCHITECTURES**	**English**	**MA**	**Winter/ Summer**	**6**	**45**	**30**	**0**	**Assoc. Prof. D. Birov, PhD**	**birov@fmi.uni-sofia.bg**
The course is designed to help participants to acquire basic knowledge and skills to design and build web applications and web sites. Web technologies and architectures are discussed and applied to go get hands-on experience. Prerequisites: Basic programming skills										

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MI E 0101 16 / F687E	**AGILE SOFTWARE DEVELOPMENT**	**English**	**BA/MA**	**Summer**	**5**	**30**	**30**	**0**	**Assoc. Prof. D. Birov, PhD**	**birov@fmi.uni-sofia.bg**
This course will establish the most important principles of Agile development: delivering value to the customer, focusing on individual developers and their skills, collaboration, an emphasis on producing working software, the critical contribution of technical excellence, and a willingness to change course when demands shift. Following agile methods will be presented during the course: • Scrum • Dynamic Systems Development Method • Crystal Methods • Feature-Driven Development • Lean Development • Extreme Programming • Adaptive Software Development										

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MI E 0101	**ADVANCED SOFTWARE**	**English**	**BA/MA**	**Summer**	**6**	**45**	**30**	**0**	**Assoc. Prof. D.**	**birov@fmi.un**

16 / F667E	**ENGINEERING**								**Birov, PhD**	**i-sofia.bg**

This course should help the students to understand theories, methods, and technologies applied in professional software development. It gives a general introduction as well as advanced methodologies and state of art in the field of 'software engineering' with a main focus on obtaining an understanding what it means to do software engineering and on reflecting on alternative methods and approaches. An overview of philosophies, methods, and techniques to project management and modeling supplemented by insights into the use and implementation of tools and approaches to process analysis and improvement will be provided.

Course code according to the curriculum	Course title in English	Language of instruction	Course offered to BA/MA/PhD	Course duration (winter/ summer semester/ full year)	Credits	Number of hours			Lecturer/s	E-mail/s
						Lectures	Exercises/Seminars	Practical work		
MI E 0101 16 / F657E	**SOFTWARE TESTING AND QUALITY ASSURANCE**	**English**	**BA/MA**	**Summer**	**5**	**30**	**30**	**0**	**Assoc. Prof. D. Birov, PhD**	**birov@fmi.uni-sofia.bg**

This course embraces this diversity of approaches, by surveying some of the main ideas, techniques, and results in software quality, testing, validation and verification. The focus of the class will be both on the process of quality assurance as well as on the techniques used in software testing. Using the techniques learned the student will participate in the entire range of test activities: Analyzing a requirements document for test conditions Writing a test plan Designing, creating and executing test cases using various testing approaches Recording defects Writing a test report. Ultimately the student will have sufficient confidence to organize and carry out the testing phase for a small or medium-size software project.

Course code according to the curriculum	Course title in English	Language of instruction	Course offered to BA/MA/PhD	Course duration (winter/ summer semester/ full year)	Credits	Number of hours			Lecturer/s	E-mail/s
						Lectures	Exercises/ Seminars	Practical work		
MI E 0101 16 / F647E	**SOFTWARE EVOLUTION AND MAINTENANCE**	**English**	**BA/MA**	**Summer**	**5**	**30**	**30**	**0**	**Assoc. Prof. D. Birov, PhD**	**birov@fmi.uni-sofia.bg**

This course covers topics of the principles, tools, and techniques for disciplined software evolution. Also will be included migration strategies, change patterns, software maintenance, legacy system reengineering, reverse engineering for program understanding, middleware, source code analysis, software visualization, and program transformation tools. The maintenance of software systems is an essential phase of the software lifecycle. The

maintenance phase takes approximately two thirds of the total budget for the construction and operation of a software system from the idea (vision) to decommissioning. The lecture presents the software maintenance lifecycle and the laws of software evolution in detail and sets thematic priorities in the areas of legacy systems, reverse and re-engineering, refactoring, Change Patterns and Design for Change. This maintenance emphasis is placed on the holistic treatment of the subject software, by the non-technical aspects such as organization and management are also discussed.

Course code according to the curriculum	Course title in English	Language of instruction	Course offered to BA/MA/PhD	Course duration (winter/ summer semester/ full year)	Credits	Number of hours			Lecturer/s	E-mail/s
						Lectures	Exercises/ Seminars	Practical work		
MI E 0101 16 / F677E	**SOFTWARE ARCHITECTURES**	**English**	**BA/MA**	**Winter**	**6**	**45**	**30**	**0**	**Assoc. Prof. D. Birov, PhD**	**birov@fmi.uni-sofia.bg**

This course introduces the essential concepts of software architecture. Software architecture is an abstract view of a software system distinct from the details of implementation, algorithms, and data representation. In this course we will discuss what software architecture is, styles and patterns; how to deal with quality attributes requirements and implementation; We will discuss main topics of software architecture perspectives - static, dynamic and physical, S&C views and styles, software architecture documentation and visualization. The role of software architect and his/her importance for the project, project management and company he/she plays. Main software architecture families will be discussed. We will talk about architecture centric software engineering and development, agile software development and architecting.

Course code according to the curriculum	Course title in English	Language of instruction	Course offered to BA/MA/PhD	Course duration (winter/ summer semester/ full year)	Credits	Number of hours			Lecturer/s	E-mail/s
						Lectures	Exercises/ Seminars	Practical work		
MI C 0101 16 / F664E	**ADVANCED WEB PROGRAMMING**	**English**	**BA/MA**	**Summer**	**5**	**30**	**30**	**0**	**Assoc. Prof. D. Birov, PhD**	**birov@fmi.uni-sofia.bg**

This course will present the fundamental technologies behind the Web, as well as techniques for designing, developing, and evaluating Web-based applications. Topics include HTML, Cascading Style Sheets (CSS), dynamic client-side programming with JavaScript, HTML forms and CGI scripting, PHP, and (given time) Java Applets and dynamic web programming using Ajax, scalability, security and other current web technologies.
Upon completion of this course the student shall be able to demonstrate a proficiency using a number of web based application development strategies

including: JavaScript, CSS, PHP, AJAX, REST, Java Servlets, Java Server Pages and Enterprise Java Beans. Two and three tier applications to be run on the Internet.

Course code according to the curriculum	Course title in English	Language of instruction	Course offered to BA/MA/PhD	Course duration (winter/ summer semester/ full year)	Credits	Number of hours			Lecturer/s	E-mail/s
						Lectures	Exercises/ Seminars	Practical work		
MI C 0101 16 / F674E	**TYPE THEORY IN PROGRAMMING LANGUAGES**	**English**	**BA**	**Summer**	**5**	**30**	**30**	**0**	**Assoc. Prof. D. Birov, PhD**	**birov@fmi.uni-sofia.bg**

A type system is a syntactic method for enforcing levels of abstraction in programs. The study of type systems and of programming languages from a type-theoretic perspective has important applications in software engineering, language design, high-performance compilers, and security.
This course provides an introduction both to type theory in computer science and to the basic theory of programming languages. The approach is pragmatic and operational; each new concept is motivated by programming examples and the more theoretical modules are driven by the needs of implementations. Each lecture is accompanied by numerous exercises and solutions, as well as a running implementation.
The core topics include the untipped lambda-calculus, simple type systems, type reconstruction, universal and existential polymorphism, subtyping, bounded quantification, recursive types, kinds, and type operators. Extended case studies develop a variety of approaches to modeling the features of object-oriented languages.

Course code according to the curriculum	Course title in English	Language of instruction	Course offered to BA/MA/PhD	Course duration (winter/ summer semester/ full year)	Credits	Number of hours			Lecturer/s	E-mail/s
						Lectures	Exercises/ Seminars	Practical work		
MI B 0101 16 / H766E	**PROJECT MANAGEMENT**	**English**	**BA/MA**	**Winter**	**5**	**30**	**30**	**0**	**Prof. K. Kaloyanova, PhD**	**kkaloyanova@fmi.uni-sofia.bg**

The course covers all operational and organizational aspects of project management, namely scope, time, cost, quality, human resources, communication, risk, procurement, stakeholders. Multiple learning formats are used throughout the course, including lectures, practice sessions, homework assignments and classroom presentations. The lectures cover the main aspects of project management following the PMBOK including all process groups and their interactions. During practice sessions students develop real-life PM work products. Homework assignments are performed in

an intensive group work environment. Results of the group work are discussed and presented in a predefined format. The learning process includes implementation of various project management practices and techniques.

Course code according to the curriculum	Course title in English	Language of instruction	Course offered to BA/MA/PhD	Course duration (winter/ summer semester/ full year)	Credits	Number of hours			Lecturer/s	E-mail/s
						Lectures	Exercises/ Seminars	Practical work		
MI B 0101 16 / H746E	**DATA BASES**	**English**	**BA**	**Summer**	**6**	**75**	**0**	**0**	**Prof. V. Dimitrov, PhD**	**cht@fmi.uni-sofia.bg**

The course cover the relational model: relational design using the entity-relationship model, followed by an overview of the relational model, how to convert E/R models to relations, and how one uses a relational database system to create a database. SQL (Structured Query Language), the standard query language for relational databases, will be learned and experienced.

Course code according to the curriculum	Course title in English	Language of instruction	Course offered to BA/MA/PhD	Course duration (winter/ summer semester/ full year)	Credits	Number of hours			Lecturer/s	E-mail/s
						Lectures	Exercises/ Seminars	Practical work		
MI B 0101 16 / H396E	**COMPUTATIONAL INTELLIGENCE**	**English**	**BA/MA**	**Winter**	**5**	**30**	**30**	**0**	**Prof. Maria Nisheva, PhD**	**marian@fmi.uni-sofia.bg**

The course introduces to the students the main concepts, problems and methods of Computational Intelligence (CI). We examine certain classical directions of CI: search algorithms, knowledge representation, communication via a limited natural language, action planning, computational self-learning and knowledge acquisition, image recognition, etc. The foundations of the connectionist approach in CI are also given. At seminars we examine example programs, illustrating the main algorithms for solving problems in part of the mentioned directions.

Course			C o u	Course	C r	Number of hours				

code according to the curriculum	Course title in English	Language of instruction		duration (winter/ summer semester/ full year)		Lectures	Exercises/ Seminars	Practical work	Lecturer/s	E-mail/s
MI B 0101 16 / F726E	**CLOUD COMPUTING AND TECHNOLOGIES**	**English**	**BA**	**Summer**	**5**	**30**	**30**	**0**	**Asst. Prof. Eng. Galia Novakova, PhD**	**g.novak@fmi.uni-sofia.bg**
The purpose of this course is to introduce Cloud computing-related technology topics in a manner that is accessible to bachelor students as well as to empower participants with an understanding of the fundamental mechanics of a cloud platform, how the different "moving parts" can be combined, and how to address common threats and pitfalls.										

Course code according to the curriculum	Course title in English	Language of instruction	Course offered to BA/MA/PhD	Course duration (winter/ summer semester/ full year)	Credits	Number of hours			Lecturer/s	E-mail/s
						Lectures	Exercises/ Seminars	Practical work		
MI I 41 21 16 / S557E	**SUPPLY CHAIN MANAGEMENT (SCM)**	**English**	**MA**	**Winter/ Summer**	**5**	**30**	**30**	**0**	**Asst. Prof. Eng. Galia Novakova, PhD**	**g.novak@fmi.uni-sofia.bg**
This course covers the basic concepts of planning and control of material flow into, within and outside the organization. Besides, it deals with the fundamental relationships between different kind of activities in the supply chain from suppliers of raw materials to the final client as well as with a management approach for integration of the supply chain; Supply Chain Operational Reference Model – SCOR, benchmarking, the Value Chain Management, VCOR Model. Readings include designated chapters, a case, and one supplementary article. We will also explore Web sites and other material as it becomes available. The cases and articles were selected to develop issues to match the program. A term project is expected from every student. The course on SCM complements and builds on the knowledge and skills acquired in training and practice. Teaching this course provides preparation of powerful human potential of quality professionals with a good scientific and practical training. The program is designed specifically for students in graduate programs or specialists who will gain the knowledge and experience to improve the competitiveness of organizations through various approaches, and will learn.										

Course code	Course	Languag	Co urs e off	Course duration	Cr edi	Number of hours				
						L e	E x	P r a		

according to the curriculum	title in English	e of instructi on		(winter/ summer semester/ full year)					Lecturer/s	E-mail/s
MI I 41 21 16 / S517E	**QUALITY MANAGEMENT IN THE SOFTWARE DEVELOPMENT LIFE-CYCLE**	**English**	**MA**	**Winter/ Summer**	**5**	**30**	**30**	**0**	**Asst. Prof. Eng. Galia Novakova, PhD**	**g.novak@fmi.uni-sofia.bg**

The course “Quality Management in the Software Development Life-Cycle (SDLC)" covers basic ideas, views and major trends on the concept of quality in the development life cycle and maintenance of software.
Furthermore, it considers the definition of software product quality according to ISO 9126 and IEEE Std 729 standards and models for software quality evaluation, use of quality software metrics; cost of software product quality; multi-criteria approach, statistical and probabilistic methods and Bayesian approach for software quality evaluation.
In addition, this course covers the use of fuzzy logic and fuzzy values in the evaluation of software quality; methods of classification and clustering for evaluation of software product quality.
The program is designed specifically for students in graduate programs or experts who would like to obtain additional knowledge and experience to improve the quality of software products.
Input and output connections: it completes and builds on the knowledge and skills acquired in training and practice.
Course organization: lectures, seminars.
- Part of the presentations will be developed and presented by the students themselves, which will also help them to develop presentation skills.
Management & form of control: test
- There are two intermediate tests as an essential part of the final grade of the course.

Course code according to the curriculum	Course title in English	Language of instructio n	Course offered to BA/MA/PhD	Course duration (winter/ summer semester/ full year)	Credits	Number of hours			Lecturer/s	E-mail/s
						Lectures	Exercises/ Seminars	Practical work		
MI I 41 21 16 / Y597E	**SOFTWARE DEVELOPMENT LIFE-CYCLE MANAGEMENT (SDLC)**	**English**	**MA**	**Winter/ Summer**	**5**	**30**	**30**	**0**	**Prof. Sylvia Ilieva, PhD**	**sylvia@fmi.uni-sofia.bg**

The SDLC course aims at strenthening the knowledge of Master students on required concepts and methods for large software systems development. It will provide new knowledge on processes and techniques related to development of complex software systems. Additional aim is broad undertanding of

software engineering discipline.
The students will have lectures and seminars, also will prepar critical analyses and essays on given subjects.

Course code according to the curriculum	Course title in English	Language of instruction	Course offered to BA/MA/PhD	Course duration (winter/ summer semester/ full year)	Credits	Number of hours			Lecturer/s	E-mail/s
						Lectures	Exercises/ Seminars	Practical work		
MI I 39 21 16 / Y916E	**FUZZY SETS AND APPLICATIONS**	**English**	**MA**	**Winter**	**5**	**30**	**0**	**30**	**Assoc. Prof. O. Georgieva, PhD**	**o.georgieva@fmi.uni-sofia.bg**

The course covers scientific foundations for software engineering based on the use of precise, abstract models for characterizing and reasoning about properties of software systems. This course considers many of the standard models for formal representation of sequential and concurrent systems. The models are based on paradigms such as state machines, algebras, and traces. The course shows how different logics can be used to specify properties of the software systems. Concepts such as composition mechanisms, abstraction, relations, invariants, non-determinism, inductive definitions and denotational descriptions are building themes throughout the course.
The course gives an opportunity to acquire practical skills through elaboration of practical tasks using specific notation.

Course code according to the curriculum	Course title in English	Language of instruction	Course offered to BA/MA/PhD	Course duration (winter/ summer semester/ full year)	Credits	Number of hours			Lecturer/s	E-mail/s
						Lectures	Exercises/ Seminars	Practical work		
MI I 34 21 16 / Y627E	**MODELS OF SOFTWARE SYSTEMS**	**English**	**MA**	**Winter**	**5**	**30**	**0**	**30**	**Assoc. Prof. O. Georgieva, PhD**	**o.georgieva@fmi.uni-sofia.bg**

The course covers scientific foundations for software engineering based on the use of precise, abstract models for characterizing and reasoning about

properties of software systems. This course considers many of the standard models for formal representation of sequential and concurrent systems. The models are based on paradigms such as state machines, algebras, and traces. The course shows how different logics can be used to specify properties of the software systems. Concepts such as composition mechanisms, abstraction, relations, invariants, non-determinism, inductive definitions and denotational descriptions are building themes throughout the course.
The course gives an opportunity to acquire practical skills through elaboration of practical tasks using specific notation.

Course code according to the curriculum	Course title in English	Language of instruction	Course offered to BA/MA/PhD	Course duration (winter/ summer semester/ full year)	Credits	Number of hours			Lecturer/s	E-mail/s
						Lectures	Exercises/ Seminars	Practical work		
MI I 34 21 16 / Y587E	**INTERNET TECHNOLOGIES AND WEB PROGRAMMING**	**English**	**MA**	**Winter**	**5**	**30**	**0**	**30**	**Assoc. Prof. M. Petrov, PhD**	**milenp@fmi.uni-sofia.bg**

Main goal of the course is to provide students with insights on how web-based frameworks are constructed, upgrading knowledge and skills from course "Network Programming with Java" and to create fundamental knowledge on web programming with Java and JSF framework. Students will use contemporary achievements in Java technologies (JavaEE7 or newer) and JSF2+ framework. It is assumed that technologies as Servlet and JSP are familiar to the students. Components of JavaEE – such as web and application servers, java beans, internationalization and localization, MVC architecture, lifecycle of web application development. Development of convertors, validators and custom messages. Internal and external support of Ajax. Working with database (JDBC4).

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						Lectures	Exercises/ Seminars	Practical work		
MI I 34 21 16 / Y537E	**ARCHITECTURES OF SOFTWARE INTENSIVE SYSTEMS**	**English**	**MA**	**Summer**	**5**	**30**	**15**	**15**	**Assoc. Prof. A. Dimov, PhD**	**aldi@fmi.uni-sofia.bg**

Software architecture results from the design phase of software development process. It focuses on different views of the software system. A view represents a configuration of abstract elements (e.g. modules, layers, processes, etc.) and the interconnections between them, while removing details, like algorithms and source code.
The role of software architecture in the major activities of software engineering is explored, including application conception, design, implementation, and analysis. An architecture-centric perspective on development is explored in this course.

The course explores the conceptions of effective analysis, design, concepts and practices of software architectures. The main building elements – components and connectors are analyzed as well as common issues of analysis and design, evaluation techniques and standards are explored.
We do assume that the students and visitors are generally familiar with the most basic elements of software engineering and programming. As well as this course will be appropriate for professionals in software design and development. This course will be useful for software engineers as well and will help them to have a closer look on advanced ideas in software development process, software architecture frameworks and software architecture as a backbone of the qualify software.
Expected results: After successful course completion, the participants will be able to: Explain and reason about the notion of software architecture Analyze and refine quality requirements on software systems Design and document software architectures Understand and use in practice different architectural styles Will have preliminary knowledge about different options to analyze and evaluate software architectures and design decisions
Preliminary requirements: Knowledge on programming languages, data structures, algorithms and object-oriented design.

Course code according to the curriculum	Course title in English	Language of instruction	Course offered to BA/MA/PhD	Course duration (winter/ summer semester/ full year)	Credits	Number of hours			Lecturer/s	E-mail/s
						Lectures	Exercises/ Seminars	Practical work		
MI I 41 21 16 / Y547E	**TECHNOLOGY ENTREPRENEURSHIP**	**English**	**MA**	**Winter/ Summer**	**5**	**30**	**15**	**15**	**Assoc. Prof. P. Ruskov, PhD**	**petkor@fmi.uni-sofia.bg**

This course has been put together by the Intel and Berkeley University to provide students with a high-level survey of the field of Entrepreneurship. The course provides students perspectives by prominent entrepreneurs from organizations at various stages of development and representing a broad range of industries and topics. Entrepreneurs speak on how they created their organizations and the lessons they learned. This course is for both aspiring entrepreneurs as well as those simply interested in learning more about the field. It does not teach you how to be an entrepreneur, but it aims to inspire you and give you a perspective on what life as an entrepreneur is like. If you hope to start a company this course will help to prepare to fully-utilize the resources available at Berkeley and maximize your potential for success. At the end of this lecture series you will have a broad understanding of entrepreneurship and how entrepreneurship happens on campus.

Course code according to the curriculum	Course title in English	Language of instruction	Course offered to BA/MA/PhD	Course duration (winter/ summer semester/ full year)	Credits	Number of hours			Lecturer/s	E-mail/s
						Lectures	Exercises/ Seminars	Practical work		
MI I 43 21 16 / Y557E	**INNOVATION AND ENTREPRENEURSHIP (JA**	**English**	**MA**	**Summer**	**5**	**30**	**15**	**15**	**Assoc. Prof. P. Ruskov, PhD**	**petkor@fmi.uni-sofia.bg**

	PROGRAM)									

Junior Achievement programs help prepare young people for the real world by showing them how to generate wealth and effectively manage it, how to create jobs which make their communities more robust, and how to apply entrepreneurial thinking to the workplace. Students put these lessons into action and learn the value of contributing to their communities. JA Innovation and Entrepreneurship, a new high school program, focuses on challenging students, through interactive classroom activities, to start their own entrepreneurial venture while still in high school. One of ten JA programs designed with the specific needs of upper grade students in mind, JA Be Entrepreneurial provides useful, practical content to assist students to transition into becoming productive, contributing members of society.
The purpose of the practical course "Student company" is to introduce students with the basics of entrepreneurship in order to build skills for starting their own business. In theory classes there will be presented main features for organization and management of real student company.
Students are introduced to basic management skills and organizational functions. During the classes, students register a student company – Joint Stock Company, realize real product or service and realize financial profit. The student company has about 8 members and all students have signed roles and positions. The course is part of the international initiative "Junior Achievement", and student companies compete on local and international competitions.
Prerequisites: None

Course code according to the curriculum	Course title in English	Language of instruction	Course offered to BA/MA/PhD	Course duration (winter/ summer semester/ full year)	Credits	Number of hours			Lecturer/s	E-mail/s
						Lectures	Exercises/ Seminars	Practical work		
MI I 43 21 16 / Y567E	**TECHNOLOGICAL ENTREPRENEURSHIP IN IT**	**English**	**MA**	**Summer**	**5**	**30**	**15**	**15**	**Assoc. Prof. P. Ruskov, PhD**	**petkor@fmi.uni-sofia.bg**

Berkeley University to provide students with a high-level survey of the field of Entrepreneurship. The course provides students perspectives by prominent entrepreneurs from organizations at various stages of development and representing a broad range of industries and topics. Entrepreneurs speak on how they created their organizations and the lessons they learned. This course is for both aspiring entrepreneurs as well as those simply interested in learning more about the field. It does not teach you how to be an entrepreneur, but it aims to inspire you and give you a perspective on what life as an entrepreneur is like. If you hope to start a company this course will help to prepare to fully-utilize the resources available at Berkeley and maximize your potential for success.
At the end of this lecture series you will have a broad understanding of entrepreneurship and how entrepreneurship happens on campus.
Prerequisites: None

Course			Cou	Course	Cr	Number of hours				

code according to the curriculum	Course title in English	Language of instruction		duration (winter/ summer semester/ full year)		Lectures	Exercises/ Seminars	Practical work	Lecturer/s	E-mail/s
MI I 43 21 16 / Y577E	**INNOVATION AND INNOVATION MANAGEMENT**	**English**	**MA**	**Summer**	**5**	**30**	**15**	**15**	**Assoc. Prof. P. Ruskov. PhD**	**petkor@fmi.uni-sofia.bg**

Innovations are the engine of the modern economy, and the companies' capacity to launch new products and services is one of the major factors for their further success and sustainable development. The aim of the course "Innovation and innovation management" is to present the fundamentals, stages and methods for innovation management combining both theory and practice.
The course has three parts.
The first part focuses on introducing some of the basic concepts, frameworks and theories of technological change and evolution of the industry, including: technological and industrial life cycles, technological gaps, paradigms and processes; emergence of dominant designs; dependencies and network effects; drilling theory of innovation.
In the second part it applies the knowledge acquired in the first part in the implementation of existing theories and frameworks of analysis of changes in the industry as technology, pattern recognition, including 1) identifying early signals of technological change, 2) analyses of the potential of competitive opportunities based on the effect on the emergence and adoption of new technologies, 3) analyses of strategic solutions for companies affected by the current technological changes and \ or industrial evolution, and 4) analyses of non-market forces, technological development and change by government regulation, standardization.
The third part focuses on the introduction of scientific methods and analysis tools of technology. This final section will give students the opportunity to perform analyses of technologies and their changes over time.

MI I 43 21 16 / Y527E	**MARKETING MANAGEMENT**	**English**	**MA**	**Summer**	**5**	**30**	**15**	**15**	**Assist. Prof. SiaTsolova, Ph.D.**	**siyat@fmi.uni-sofia.bg s.valentinova@gmail.com**

The curriculum in Marketing Management is designed for Master Program "Technological Entrepreneurship and Innovation in IT," Informatics, Faculty of Mathematics and Informatics, Sofia University "St. KlimentOhridski ".

The Syllabus of Marketing Management aims at shaping an entrepreneurial culture and competence in the field of Marketing, as well as personal qualities that are important for the further successful professional activity of students, regardless of whether they work as independent employees in the field of technology and in particular ICT or employees in a changing labor market.

The basis of the course are the interdisciplinary connections. Educational content of Marketing Management is consistent with the training courses: Strategic Management, Technological Entrepreneurship, Technological Entrepreneurship in IT, Innovation Management, Entrepreneurship "Student Company". The course has general and specific focus, such specifics are mainly targeted at digital marketing management and to the specificities of

marketing management in ICT technology.

An active participation of students in the learning process is recommended as combination of teaching and learning by lectures, case studies, discussions, situational analysis, debates, role plays, scenarios methods, project works, self-study meetings with entrepreneurs and professional representatives of the study field.

Examination and evaluation of the knowledge and skills of the students is numerical, subject to the requirements of Regulation № 3 of the Ministry of Education and Science of the evaluation system in Bulgaria. Students must be familiar with the evaluation criteria and methods of evaluation at the beginning of the academic year.

Course code according to the curriculum	Course title in English	Language of instruction	Course offered to BA/MA/PhD	Course duration (winter/ summer semester/ full year)	Credits	Number of hours			Lecturer/s	E-mail/s
						Lectures	Exercises/ Seminars	Practical work		
MI I 3321 16 / T514E	**CISCO ACADEMY 1 - INTRODUCTION TO NETWORKS**	**English**	**MA**	**Winter**	**6**	**30**	**15**	**30**	**Prof. K. Stefanov. PhD**	**krassen@fmi.uni-sofia.bg**

The goal of this course is to introduce to the student the fundamental networking concepts and technologies. The online course materials will assist students in developing the skills necessary to plan and implement small networks across a range of applications. The specific skills covered in each chapter are mastered through the applied tasks and cases.

The principles of IP addressing and fundamentals of Ethernet concepts, media, and operations are introduced to provide a foundation for the curriculum. By the end of the course, students will be able to build simple LANs, perform basic configurations for routers and switches, and implement IP addressing schemes.

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						Lectures	Exercises/ Seminars	Practical work		

MI I 3321 16 / T524E	**CISCO ACADEMY 2 - CCNA R&S: ROUTING AND SWITCHING ESSENTIALS**	**English**	**MA**	**Winter**	**6**	**15**	**15**	**45**	**Prof. K. Stefanov. PhD**	**krassen@fmi.uni-sofia.bg**

The course follows Cisco course "CCNA R&S: Routing and Switching Essentials". The content of the course covers following topics: WAN and Routers; Introduction to routes; Configuring routers; Managing Cisco network operating system; Distance vector routing protocol; Basic routers troubleshooting; Access control lists (ACLs), VLANs and routing between them, dynamic routing protocols, distance vector and link-state routing protocols, Dynamic Host Configuration Protocol (DHCP), Network Address Translation (NAT).

Course code according to the curriculum	**Course title in English**	**Language of instruction**	**Course offered to BA/MA/PhD**	**Course duration (winter/ summer semester/ full year)**	**Credits**	**Number of hours**			**Lecturer/s**	**E-mail/s**
						Lectures	**Exercises/ Seminars**	**Practical work**		
MI I 3321 16 / T534E	**CISCO ACADEMY 3 - SCALING NETWORKS**	**English**	**MA**	**Winter**	**6**	**15**	**15**	**45**	**Prof. K. Stefanov. PhD**	**krassen@fmi.uni-sofia.bg**

The course follows Cisco course CCNA3: Scaling Networks. The content of the course covers following topics: Classless routing, Routing protocol OSPF, Routing protocol EIGRP, Rapid Spanning Tree Protocol (RSTP), Per VLAN Spanning Tree Plus Protocol (PVST+), EtherChannel, first hop redundancy protocols (HSRP), wireless routers and wireless clients, Segmenting networks in Virtual local networks (VLANs), Virtual trunking protocol.

Course code according to the curriculum	**Course title in English**	**Language of instruction**	**Course offered to BA/MA/PhD**	**Course duration (winter/ summer semester/ full year)**	**Credits**	**Number of hours**			**Lecturer/s**	**E-mail/s**
						Lectures	**Exercises/ Seminars**	**Practical work**		
MI I 3321 16 / T544E	**CISCO ACADEMY 4 - CONNECTING NETWORKS**	**English**	**MA**	**Winter**	**6**	**15**	**15**	**45**	**Prof. K. Stefanov. PhD**	**krassen@fmi.uni-sofia.bg**

The course follows Cisco course CCNA4: Connecting Networks. The content of the course covers following topics: Network address translation (NAT) and port address translation (PAT), WAN technologies, Virtual private networks (VPNs), tunneling and tunneling operations, serial and broadband connections, Using syslog, SNMP and NetFlow, Borderless networks, Data centers and virtualization.

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						Lectures	Exercises/ Seminars	Practical work		
MI I 4121 16 / S519E	**FINANCIAL MANAGEMENT OF ICT COMPANY**	**English**	**MA**	**Winter**	**5**	**30**	**30**	**0**	**Assoc. Prof. Altin Idrizi, PhD**	**altinidrizi@yahoo.com**
The focus of this course is in the area of financial management. We will show managers how to interface with accounting and finance departments; help them to understand how IT firms meet their financial objectives utilizing financial decision-making. This course will also explain financial tools and techniques, which can be used to help IT firms maximize value by improving decisions relating to capital budgeting, capital structure, and working capital management. This course will deal with a number of related topics, including multinational financial management, risk management, mergers and acquisitions. Prerequisites: None										

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MI I 4121 16 / S619E	**PROJECT MANAGEMENT (PM)**	**English**	**MA**	**Winter**	**5**	**30**	**30**	**0**	**Assoc. Prof. K. Spassov, PhD**	**kspasov@fmi.uni-sofia.bg**
Project Management is the art of 'getting things done.' This project management course will focus specifically on software related projects. It will introduce project management from the standpoint of a manager who must organize, plan, implement, and control tasks to achieve an organization's schedule, budget, and performance objectives. Tools and concepts such as project charter, scope statement, work breakdown structure, project estimating, and scheduling methodologies are studied. What is a project? How do you manage one? What is the best approach? We'll answer those questions and many more in the weeks to come. This is an opportunity to learn the project management fundamentals that can guide a project through a maze of challenges to successful completion! Successful projects do not occur by luck or by chance. In fact, many projects do not achieve their organization's goals! Project management is often challenging and difficult to execute. Many people do not possess the personal qualities and leadership potential to lead project teams to successful completion. However, it is refreshing to know that the understanding for the project management lifecycle, as well as the tools, techniques, and necessary documents to be created can be learnt through course study by anyone wishing to do so.										

Prerequisites: None

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						Lectures	Exercises/ Seminars	Practical work		
MI I 4121 16 / S629E	**SALES AND MARKETING AT AN ICT COMPANY**	**English**	**MA**	**Summer**	**5**	**30**	**30**	**0**	**Assoc. Prof. V. Slantcheva-Baneva, PhD**	**kspasov@fmi.uni-sofia.bg**

Sales and Marketing at IT Company is designed as an introduction to the theory and practice of selling and marketing in a determined IT context. Students will establish an ability to suggest relevant marketing approaches and assess market opportunities, as well as to design an experience of going through core processes of segmentation, targeting and positioning. From the perspective of "sales", is built on analysing, designing and managing a sale. In addition, students will have the opportunity to communicate and defend their recommendations and build upon the recommendations of their peers. The course explores the principles and applications of sales and marketing concepts through a mix of lectures, guest speakers, cases, and individual or team assignments.
Prerequisites: None

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						Lectures	Exercises/ Seminars	Practical work		
MI I 4121 16 / S639E	**CUSTOMER RELATIONSHIP MANAGEMENT (CRM)**	**English**	**MA**	**Summer**	**5**	**30**	**30**	**0**	**Assoc. Prof. K. Spassov, PhD**	**kspasov@fmi.uni-sofia.bg**

The purpose of the course is to introduce students to the basic principles of Customer Relationship Management (CRM).
Customer relationship management is a combination of business strategy and operational activities to identify, attract, retain and develop customers yielding high profits through effective and efficient management of the customer's life cycle.
During the course students learn how to gather, store and process data and information about customers from different sources inside and outside the organization. They acquire hands on experience using CRM in marketing, sales and customer service.
Prerequisites: Basic ICT skills

Course			Cou	Course	Cr	Number of hours				

code according to the curriculum	Course title in English	Language of instruction		duration (winter/ summer semester/ full year)		Lectures	Exercises/ Seminars	Practical work	Lecturer/s	E-mail/s
MI I 4121 16 / S649E	**ELECTRONIC PAYMENTS (E-PAYMENTS)**	**English**	**MA**	**Winter**	**5**	**30**	**30**	**0**	**Assoc. Prof. K. Spassov, PhD**	**kspasov@fmi.uni-sofia.bg**
Electronic business is hard to imagine without of electronic payments. Understanding of the operation of payment systems, proper use of payment instruments in different types of payments - national, international, mobile, inter-company or to end customers is a key success factor. During the course students will learn main concepts in payments, billing, payment instruments, payment systems and existing risks in payment systems – conventional and electronic. Particular attention is given to the current payment instruments such as credit cards, electronic checks, electronic wallets, electronic wallets and trending technologies for electronic payments based on mobile, RFID and NFC communications. Prerequisites: Basic ICT skills										

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MI I 4121 16 / S549E	**E-BUSINESS FOUNDATION**	**English**	**MA**	**Winter**	**5**	**30**	**30**	**0**	**Assoc. Prof. K. Spassov, PhD**	**kspasov@fmi.uni-sofia.bg**
The program of the course combines the capabilities of information and communication technologies and management strategies of commercial operations and transactions. It presents the students the basics of e-business, e-commerce standards and technologies for its realization. The focus is on the usage of ICT in the companies as well on how to use the technologies to build successful businesses and operations. Different aspects like build vs. buy, open source vs. proprietary software, outsource vs. on the spot, ROI of implementation of business applications, etc., are discussed. Prerequisites: Basic ICT skills										

Course			Cou	Course	Cr	Number of hours				

code according to the curriculum	Course title in English	Language of instruction		duration (winter/ summer semester/ full year)		Lectures	Exercises/ Seminars	Practical work	Lecturer/s	E-mail/s
MI I 4121 16 / S669E	**BUSINESS PROCESS MODELING AND REENGINEERING**	**English**	**MA**	**Winter**	**5**	**30**	**30**	**0**	**Assoc. Prof. K. Spassov, PhD**	**kspasov@fmi.uni-sofia.bg**
The goal of the course is to help students to understand business processes and to improve their skills to describe, analyze, and optimize business processes. They will become acquainted and acquire knowledge about the basic standards, concepts and services from leading companies. Prerequisites: None										

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						Lectures	Exercises/ Seminars	Practical work		
MI I 4121 16 / S615E	**NETWORKS AND COMMUNICATIONS**	**English**	**MA**	**Summer**	**5**	**30**	**30**	**0**	**Assoc. Prof. Elior Vila, PhD**	**kspasov@fmi.uni-sofia.bg**
The course covers the fundamentals of data communication networks, their architecture, principles of operations, and performance analyses. The goal is to give some insight into the rationale of why networks are structured the way they are today and to understand the issues facing the designers of next-generation data networks. Introduction to analysis and design of computer and communication networks through understanding the network layered architecture and the protocol stack. Prerequisites: Basic ICT skills										

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						Lectures	Exercises/ Seminars	Practical work		
MI I 4121 16 / S529E	**ENTERPRISE RESOURCE PLANNING (ERP)**	**English**	**MA**	**Summer**	**5**	**30**	**30**	**0**	**Assist. Prof. R. Antonova, PhD**	**kspasov@fmi.uni-sofia.bg**

The course explores the use of ICT technologies to automate internal business processes in a company. It covers business processes and respective software solutions of accounting and financial management, manufacturing, inventory management and internal logistics, human resources, order management, document lifecycle management, management reporting, etc. Software from different vendors will be discussed with focus on SAP ERP modules and solutions - on premises and in the cloud. With the knowledge and skills acquired during the course students will be able to participate actively in the processes of design, development, testing, and implementation of ERP systems and integration with other systems.
Prerequisites: Basic ICT skills

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						Lectures	Exercises/ Seminars	Practical work		
MI I 4121 16 / S679E	**BUSINESS INTELLIGENCE (BI)**	**English**	**MA**	**Summer**	**5**	**30**	**30**	**0**	**Assoc. Prof. D. Birov, PhD**	**birov@fmi.uni-sofia.bg**

To successfully compete in today's global business environment an organization must constantly monitor, recognize and understand every aspect and every issue of its operations, its industry and the overall business environment. This course focuses on business intelligence – an information technology approach to data collection and data analysis to support a wide variety of management tasks, from performance evaluation to trend spotting and policy making. Students learn analytical components and technologies used to create dashboards and scorecards, data/text/Web mining methods for trend and sentiment analysis, and artificial intelligence techniques used to develop intelligent systems for decision support. Students will actively participate in this course through class discussions, project preparation and presentation, and visual tool utilization.
Prerequisites: Basic ICT skills

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						Lectures	Exercises/ Seminars	Practical work		
MI I 4121 16 / S515E	**ICT SECURITY**	**English**	**MA**	**Summer**	**5**	**30**	**30**	**0**	**Ludmil Anatchkov, PhD**	**kspasov@fmi.uni-sofia.bg**

The course is focused on the requirements for ensuring the security of modern electronic systems. Description of the major tools used, the challenges

and threats related to e-business is argued. Discussed are issues related to ensuring the security of users and providers of electronic services with special attention to the requirements for building a secure and reliable infrastructure to meet modern security requirements. An overview of standards for Information security and ensuring the availability of services such as ITIL, ISO 20000, ISO 27000 is included.
Prerequisites: Basic ICT skills

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						Lectures	Exercises/ Seminars	Practical work		
MI I 4121 16 / S719E	**ORGANIZATIONAL BEHAVIOR AND DEVELOPMENT**	**English**	**MA**	**Winter**	**5**	**30**	**30**	**0**	**Krassimir Dimitrov**	**kspasov@fmi.uni-sofia.bg**

The aim of the course is to acquaint students with the basic problems of human relations in organizations and methods for analyzing and overcoming them. These problems manifest themselves both individual and group, and organizational levels and their deeper understanding requires a combination of knowledge and methods from psychology, sociology and organizational theory.
Prerequisites: None

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						Lectures	Exercises/ Seminars	Practical work		
MI I 40 21 17 / H776E	**PROJECT RISK MANAGEMENT**	**English**	**MA**	**Winter**	**5**	**30**	**15**	**15**	**Chief Assist. Prof. Ioannis Patias, PhD**	**patias@fmi.uni-sofia.bg**

The course covers different aspects of project risk management. The lectures cover the main concepts of project management following the PMI methodology. The student understands the basics of project risk identification, analysis, assessment, and management. The course devotes significant time to the Project Management Institute's PMBOK methodology for project risk management.
The project assignment aims to provide the student with the opportunity to work on real life problem, and apply the methodology learned in real situations.
Students passed successfully the course will have
• knowledge about the project risk management concepts, methods and frameworks;
• practical skills for project risk management PMI's methodology.

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						Lectures	Exercises/ Seminars	Practical work		
MI I 40 21 17 / H786E	**DESIGN OF ROBOTICS SYSTEMS**	**English**	**MA**	**Winter**	**5**	**30**	**15**	**15**	**Chief Assist. Prof. Ioannis Patias, PhD**	**patias@fmi.uni-sofia.bg**

Robotics has several specific requirements in terms of design. Each robotic system requires tight integration of planning, sensor subsystems for monitoring, control and modeling, and the robot must take into account the interactions between themselves and their environment to operate in resolving its task. The more intelligent robot more stable is to be a complete system against deviations that may arise. In other words, one such robotic system consisting of subsystems, where many of the subsystems are not even under direct control of the robot itself as subsystems contain agents that have their own behavior.

The aim of this course is to develop the quality of students in building real applications of embedded systems, which systems are expected to constitute an essential element of many applications.

The program focuses on basic tools and their application to solve real problems.

Through lectures, case studies, exercises, test examples and tasks students will acquire both basic knowledge and understanding of the key factors for successful implementation of applications of embedded systems.

Within the course project, students will have to demonstrate practical skills through the realization of a working example of the application of embedded system.

As a result, students will be able to handle cases related to the implementation of complex projects related to the applications of embedded systems.