



Course Content Report

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|---|---|---|--------|------|------------|
| LE 509 | SCIENTIFIC RESEARCH TECHNIQUES AND PUBLICATION ETHICS | 2 | 0 | 0.00 | 0.00 | Compulsory |

Course Content

Identifying priorities and conducting research studies on the subject. Research methods Concept of ethics and its applications. Designing, organizing and writing a research proposal. Critical research. Main principles of research, analysis, validity and reliability.

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|-------------|---|---|--------|-------|------------|
| BM 500 | MSC. THESIS | 0 | 0 | 0.00 | 30.00 | Compulsory |

Course Content

Study for Master's thesis

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|-----------------------------|---|---|--------|------|------------|
| BM 801 | SPECIALIZATION FIELD COURSE | 4 | 0 | 4.00 | 0.00 | Compulsory |

Course Content

Identifying the research topic and developing alternative suggestions for its solution Making a current literature review with the thesis topic To be able to express ideas and findings related to the research topic effectively orally and in writing. Preparing the infrastructure studies for the application of the thesis topic, determining the methods, conducting the thesis studies

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|-----------------------------|---|---|--------|------|------------|
| BM 802 | SPECIALIZATION FIELD COURSE | 4 | 0 | 4.00 | 0.00 | Compulsory |

Course Content

Identifying the research topic and developing alternative suggestions for its solution Making a current literature review with the thesis topic To be able to express ideas and findings related to the research topic effectively orally and in writing. Preparing the infrastructure studies for the application of the thesis topic, determining the methods, conducting the thesis studies

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|--------------|---|---|--------|------|------------|
| BM 501 | MSC. SEMINAR | 0 | 0 | 0.00 | 7.50 | Compulsory |

Course Content

The content of this course consists of activities that include literature study, data collection, data collection and reporting the results by presenting the results for the subject that the student wants to work under the supervision of the lecturer.

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|-------------------------|---|---|--------|------|------|
| BM 502 | ARTIFICIAL INTELLIGENCE | 3 | 0 | 3.00 | 7.50 | |

Course Content

Introduction to artificial intelligence; heuristic problem-solving approach; artificial intelligence in game programming; learning methods; artificial neural networks; convolutional neural networks; recursive neural networks; deep belief networks; expert systems; artificial intelligence optimization algorithms.

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|---------------------------|---|---|--------|------|------|
| BM 503 | DATA SCIENCE AND ANALYSIS | 3 | 0 | 3.00 | 7.50 | |

Course Content

Data science and big data analysis; relational databases and data modeling; data warehouse and integration; parallel databases; data visualization; machine learning, classification, regression, clustering; natural language processing; information access.

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|-------------------------------|---|---|--------|------|------|
| BM 504 | DATA PREPROCESSING TECHNIQUES | 3 | 0 | 3.00 | 7.50 | |

Course Content

Before using machine learning or data mining methods, some corrections made on the data set, completing missing data, removing duplicate data, transforming, integrating, cleaning, normalizing, dimension reduction, etc. transactions.

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|--|----------------------------|---|---|--------|------|------|
| BM 505 | MACHINE LEARNING | 3 | 0 | 3.00 | 7.50 | |
| Course Content | | | | | | |
| Basic machine learning techniques and algorithms, learning concepts, decision trees, genetic algorithm, bayesian learning, artificial neural networks, support vector machine; evaluation and comparison of learning algorithms; unsupervised learning. | | | | | | |
| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
| BM 506 | DATA MINING | 3 | 0 | 3.00 | 7.50 | |
| Course Content | | | | | | |
| In this course, information is given about the methods and algorithms used during the collection, storage and analysis of data. It contains detailed information about the methods used in the literature and their application areas. Within the scope of the algorithms described in the course, the project assignments requested and the effective use of the taught algorithms are measured. | | | | | | |
| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
| BM 507 | ARTIFICIAL NEURAL NETWORKS | 3 | 0 | 3.00 | 7.50 | |
| Course Content | | | | | | |
| Basic building blocks of ANNs, terminologies, learning rules: perceptron, delta (LMS), Hebb net, single layer perceptrons, multi-layer perceptrons, backpropagation learning algorithm, applications of neural networks. | | | | | | |
| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
| BM 508 | DEEP LEARNING | 3 | 0 | 3.00 | 7.50 | |
| Course Content | | | | | | |
| History and theoretical advantages of the deep learning, basic learning algorithms and architectures for deep learning, regularization of distributed models, optimization techniques for training deep networks, convolutional networks, backpropagating and recurrent networks, autoencoders and linear factor models, learning by demonstration, deep generative networks - Boltzman machines | | | | | | |
| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
| BM 509 | NATURE-INSPIRED COMPUTING | 3 | 0 | 3.00 | 7.50 | |
| Course Content | | | | | | |
| Introduction to nature-inspired computing techniques; classical heuristic search and optimization approaches; annealing simulation; prohibited search; evolutionary algorithms; ant colony optimization; particle swarm optimization; artificial immune system; other nature-inspired computational techniques, Harmony search, bee algorithms, firefly algorithm; meta-heuristics; hybrid systems. | | | | | | |
| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
| BM 510 | EVOLUTIONARY COMPUTATION | 3 | 0 | 3.00 | 7.50 | |
| Course Content | | | | | | |
| Overview of evolutionary algorithm approaches, genetic algorithms, genetic programming, evolutionary strategies, evolutionary programming, differential evolution, working with constraints; working with evolutionary algorithms, theoretical knowledge, experimental design, result in analysis; performance space structure analysis; parameter control; multi-objective evolutionary algorithms; use of evolutionary algorithms in dynamic and uncertain environments; performance function approximations; hybrid approaches; parallelization; interactive evolution; co-evolution; scope of application. | | | | | | |
| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
| BM 511 | COLLECTIVE LEARNING | 3 | 0 | 3.00 | 7.50 | |
| Course Content | | | | | | |
| Reasons of collective learning, its advantages over single learners, Bagging, Random sub-spaces, Random forests, Rotation Forests, Error correcting code-based methods, Factors affecting the success of collective learning, Collective learning practices in classification, clustering, regression areas, Methods of combining decisions in collective learning, Meta learning | | | | | | |
| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
| BM 512 | BIG DATA ANALYTICS | 3 | 0 | 3.00 | 7.50 | |
| Course Content | | | | | | |
| This course covers Hadoop Ecosystem Fundamentals, Hadoop architecture and HDFS, MapReduce Programming, Hadoop management, Apache Spark Programming and Rapid Data and Stream Processing with Spark with RDDs, NoSQL Databases and distributed data storage. | | | | | | |
| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
| BM 513 | STREAM DATA MINING | 3 | 0 | 3.00 | 7.50 | |

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|---|---|---|--------|------|------|
| | Definition of flowing data, scope of flowing data problem, flowing data processing methods, streaming data processing platforms, streaming data evaluation metrics, application areas | | | | | |

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|-------------|---|---|--------|------|------|
| BM 514 | WEB MINING | 3 | 0 | 3.00 | 7.50 | |

Course Content

Introduction, Internet and the Web Graph, Information Retrieval and Web Search, Link Analysis, Web Crawling, Web Usage Mining, Clustering approaches for Web Mining, Classification approaches for Web Mining

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|-----------------------------|---|---|--------|------|------|
| BM 515 | NATURAL LANGUAGE PROCESSING | 3 | 0 | 3.00 | 7.50 | |

Course Content

Morphological analysis of the language; Different grammar structure; Clustering and Classification Algorithms; Information Retrieval; Question Answering, Collocation

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|-------------------|---|---|--------|------|------|
| BM 516 | SPEECH PROCESSING | 3 | 0 | 3.00 | 7.50 | |

Course Content

Fundamentals of Digital Signal Processing, Human hearing mechanism, Speech and audio perception, Speech and audio signals modelling, Short term analysis of speech, Time domain analysis, Short term Fourier analysis, Enhancement of speech and audio, Noise reduction, Feature extraction of Speech and audio signals, Linear Predictive Analysis of Speech Signals, Estimating Speech parameters: Pitch frequency and Formant estimation, Calculating Mel-frequency cepstral coefficients, Speech recognition Methods, Vector quantization algorithm, Automatic Speech Recognition, Hidden Markov Models, Speech coding and compression methods

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|----------------|---|---|--------|------|------|
| BM 517 | BIOINFORMATICS | 3 | 0 | 3.00 | 7.50 | |

Course Content

Bioinformatics is a rapidly growing field that integrates molecular biology, biophysics, statistics, and computer science. The course provides broad overview of bioinformatics with a significant problem-solving component, including hands-on practice using computational tools to solve a variety of biological problems. Topics include: database searching, sequence alignment, gene prediction, RNA and protein structure prediction, construction of phylogenetic trees, comparative and functional genomics

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|------------------|---|---|--------|------|------|
| BM 518 | IMAGE PROCESSING | 3 | 0 | 3.00 | 7.50 | |

Course Content

Digital Image Fundamentals, Image Enhancement Techniques, Spatial Filtering, Color Image Processing, Image Segmentation, Morphological Image Processing, Texture Analysis, Image Representation and Description, Image Compression, Motion Analysis, Pattern Recognition, Deep Learning for Image Processing Applications

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|---------------------|---|---|--------|------|------|
| BM 519 | PATTERN RECOGNITION | 3 | 0 | 3.00 | 7.50 | |

Course Content

Learning and adoption, Bayesian decision theory, discriminant functions, parametric techniques, maximum likelihood estimation, Bayesian estimation, sufficient statistics, non-parametric techniques, linear discriminants, algorithm independent machine learning, classifiers, unsupervised learning, clustering.

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|-----------------|---|---|--------|------|------|
| BM 520 | COMPUTER VISION | 3 | 0 | 3.00 | 7.50 | |

Course Content

Image Formation and Image Models, Image Processing, Edge Detection, Reflectance Map and Photometric stereo

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|----------------------------|---|---|--------|------|------|
| BM 521 | BIOMEDICAL SIGNAL ANALYSIS | 3 | 0 | 3.00 | 7.50 | |

Course Content

Introduction to biomedical signal processing; biomedical device types; examples of biomedical signals (ECG, EEG, EMG), characteristics of signals; biomedical signal processing techniques; noise types and filtering methods in signals; analysis of time and frequency domain feature extraction techniques of biomedical signals; Wavelet analysis for ECG signals; supervised-unsupervised learning; biomedical signal classification application examples.

| Course Unit Code | Course Name Course Name | T | U | Credit Credit | ECTS ECTS | Type Type |
|------------------|---|---|---|------------------|--------------|--------------|
| BM 522 | STATISTICAL NATURAL LANGUAGE PROCESSING | 3 | 0 | 3.00 | 7.50 | |

Course Content

Probabilistic language modeling; context-free grammars; probabilistic context-free grammars; part of speech tagging, Hidden Markov models; logging linear models; unsupervised learning; text categorization; semantics; neural networks; word embedding.

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|--|---|---|--------|------|------|
| BM 523 | FUZZY LOGIC AND ENGINEERING APPLICATIONS | 3 | 0 | 3.00 | 7.50 | |

Course Content

Artificial Intelligence Definition and Purpose, Overview of Artificial Intelligence Algorithms, Definition of Fuzzy Logic, Comparison of Fuzzy Logic and Classical Logic, Basic Steps of Fuzzy Logic, Application Areas of Fuzzy Logic, Student Projects

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|--------------------|---|---|--------|------|------|
| BM 524 | AUTONOMOUS ROBOTIC | 3 | 0 | 3.00 | 7.50 | |

Course Content

Introduction to autonomous robotics; motion patterns of a robot; measurement models of different types of sensors; filtering techniques; simultaneous localization; mapping method.

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|----------------------------|---|---|--------|------|------|
| BM 525 | ADVANCED OPERATING SYSTEMS | 3 | 0 | 3.00 | 7.50 | |

Course Content

Protection in operating systems; security; memory management; core; file systems; synchronization; nomenclature; distributed system architecture.

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|--|---|---|--------|------|------|
| BM 526 | ADVANCED TOPICS IN PROCESSOR ARCHITECTURES | 3 | 0 | 3.00 | 7.50 | |

Course Content

Pushing the limits of a single processor; instruction set design and its impact on computer performance; micro programming; addressing techniques; memory hierarchy; relational, virtual, cache; memory management; interrupts, DMA, and channels; comparative study of commercial computer architecture.

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|---------------------------------------|---|---|--------|------|------|
| BM 527 | COMPUTER SYSTEMS PERFORMANCE ANALYSIS | 3 | 0 | 3.00 | 7.50 | |

Course Content

The nature of computer performance measurement and evaluation; task processing models; queue theory; simulation techniques; system analysis techniques; Predicting CPU performance; programmed measurement techniques; feasibility study; system selection process.

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|---------------------------------------|---|---|--------|------|------|
| BM 528 | COMPUTER NETWORKS ANALYSIS AND DESIGN | 3 | 0 | 3.00 | 7.50 | |

Course Content

Introduction to computer networks analysis and design; measuring network performance; network traffic flow modeling; graph optimization problems and related graph algorithms; delay and loss models for networks; queue nets; static and dynamic routing algorithms; network reliability analysis and design.

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|------------------------------|---|---|--------|------|------|
| BM 529 | ADVANCED NETWORK PROGRAMMING | 3 | 0 | 3.00 | 7.50 | |

Course Content

Overview of TCP/IP layers, transport layer API, network programming topics; socket programming, UNIX sockets, IPC problems, Winsock sockets; RPC programming; TLI programming; Web programming issues, HTML, forms, performance, and scalability; CGI, PERL, PHP, Java programming; case studies and programming projects.

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|---------------------------------------|---|---|--------|------|------|
| BM 530 | COMPUTER SYSTEMS AND NETWORK SECURITY | 3 | 0 | 3.00 | 7.50 | |

Course Content

Computer security techniques; traditional encryption; public key encryption system; key management; message validation; hash function and algorithms; digital signature; verification protocols; access control mechanisms; network security practice; TCP/IP security; Web security; SSL; denial-of-service attacks; intrusion detection; viruses.

| Course Unit | | | | | | |
|-------------|--|--|--|--|--|--|
| | | | | | | |

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|--------------------------------|---|---|--------|------|------|
| BM 532 | MOBILE AND WIRELESS NETWORKING | 3 | 0 | 3.00 | 7.50 | |

Course Content

• Mobile Systems and Technologies • Mobile Operating Systems • Context-Awareness • Wireless Communication • Sensor Networks/Applications and Their Interaction with Mobile Technologies • Mobile Computing • Crowdsourcing Techniques • Mobile Applications using the Sensor Data on Mobile Devices • Activity Recognition

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|--------------------------|---|---|--------|------|------|
| BM 532 | ADVANCED COMPILER DESIGN | 3 | 0 | 3.00 | 7.50 | |

Course Content

Compilers and interpreters, frontend and backend, phases of a compiler, optimization, compiling and optimizing for parallel CPUs

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|------------------------------------|---|---|--------|------|------|
| BM 533 | PARALLEL AND DISTRIBUTED COMPUTING | 3 | 0 | 3.00 | 7.50 | |

Course Content

The course addresses architectures, languages, tools, environments, methods, techniques, and applications related to parallel and distributed computing.

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|--|---|---|--------|------|------|
| BM 534 | ADVANCED ALGORITHM ANALYSIS AND DESIGN | 3 | 0 | 3.00 | 7.50 | |

Course Content

Recurrences, Master Theorem, Greedy Algorithms, Dynamic Programming, Graph Algorithms, Geometric Algorithms, Complexity Classes and NP Problems, Cryptographic Algorithms

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|--------------------------------|---|---|--------|------|------|
| BM 535 | ADVANCED PROGRAMMING LANGUAGES | 3 | 0 | 3.00 | 7.50 | |

Course Content

Introduction to Programming Languages, Evolution of the Well Known Programming Languages, Syntax and Semantics, Lexical and Syntax Analysis, Names, Bindings, and Scopes, Data Types, Expressions and Assignment Statements, Statement-Level Control Structures, Subprograms, Implementing Subprograms, Abstract Data Types and Encapsulation Constructs, Support for Object-Oriented Programming, Concurrency, Exception Handling and Event Handling, Functional Programming Languages, Logic Programming Languages

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|-------------------------------------|---|---|--------|------|------|
| BM 536 | OBJECT ORIENTED DESIGN AND MODELING | 3 | 0 | 3.00 | 7.50 | |

Course Content

Gang of Four design patterns, code smells, refactoring

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|--------------------------------------|---|---|--------|------|------|
| BM 537 | ADVANCED DATABASE MANAGEMENT SYSTEMS | 3 | 0 | 3.00 | 7.50 | |

Course Content

The Relational Model Of Data, Theoretical Concepts, Relational Model Conformity and Integrity, Relational Database Management Systems Implementation Techniques, Advanced Sql Programming, Query Optimization, Concurrency Control And Transaction Management, Database Performance Tuning, Distributed Relational Systems And Data Replication, Security Considerations, Emerging Database Management System Technologies, Introduction and application of recent DBMS(MS SQL, ORACLE, MY SQL), "Object Oriented, Deductive, Spatial, Temporal And Constraint Database Management Systems ", New Database Applications And Environments: E.G. Data Warehousing; Multimedia; Mobility; Multidatabases; Native Xml Databases (Nxd), Internet, Database Related Standards, Sql Standards, Sql 1999, Sql:2003, Object Data Management Group (Odmg) Version 3.0 Standard, Standards For Interoperability And Integration E.G. Web Services, Soap Xml Related Specifications, E.G. Xquery, Xpath.

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|---------------------|---|---|--------|------|------|
| BM 538 | LOGIC AND DATABASES | 3 | 0 | 3.00 | 7.50 | |

Course Content

SQL Server Management Studio, SQL Server Base Databases, Basic T-SQL syntax, T-SQL Scripts, Managing Tables, Select, Where statements and Filtering, NULL values, Formatting result sets, Functions, Grouping Functions, Working with grouped data, Rank, Crosstab queries, Join statements and combining tables, Join techniques, Join with if clauses, nested queries, Relational queries, Sub queries, Recursive Functions, Insert, Update, Delete Statements, Transaction, Basic Database objects, View, User defined functions, Stored procedure, Triggers, Advanced Query Techniques, XML Data, Querying XML data, Full Text Catalogues, Full text Search, Cursor, Dynamic SQL Statements, Data Conversion Techniques, Distributed Queries.

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|-----------------------------|---|---|--------|------|------|
| BM 539 | SOFTWARE PROJECT MANAGEMENT | 3 | 0 | 3.00 | 7.50 | |

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|---|---|---|--------|------|------|
| | Understanding and Defining Software Project-Software Planning- Project Running - Project Closing; Software Metrics and Software Cost Estimation Techniques; Software Risk Management; Project Organizations and Responsibilities; Agile Software Project Management | | | | | |

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|--------------------------------------|---|---|--------|------|------|
| BM 540 | SOFTWARE QUALITY AND TEST TECHNIQUES | 3 | 0 | 3.00 | 7.50 | |

Course Content

Software Quality Models; Software Defect Prevention - Reduction - Fault Tolerance; Software Configuration Management; Formal Verification Methods; Coverage Testing Based on Checklists; Coverage Testing Based on Finite-State Machines and Markov Chains; Control Flow, Data Dependency Testing

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|----------------------------|---|---|--------|------|------|
| BM 541 | ADVANCED COMPUTER GRAPHICS | 3 | 0 | 3.00 | 7.50 | |

Course Content

In this course, Topics covered include basic hardware and software of computer graphics, 2D, and 3D translation and modelling, projections, rendering, clipping and illumination and shading in computer graphics . Students will also learn how to use graphics software to create graphics.

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|-------------------|---|---|--------|------|------|
| BM 542 | GAME TECHNOLOGIES | 3 | 0 | 3.00 | 7.50 | |

Course Content

Understanding and development of computer games and industry recognition. Game types of learning. Learning needs of different hardware needed for games. Game design and implementation.

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|---------------------|---|---|--------|------|------|
| BM 543 | 3D GAME PROGRAMMING | 3 | 0 | 3.00 | 7.50 | |

Course Content

Basic concepts of game programming. The algorithms used in game development, processes and technologies and Create simple animations and games using the game engine to develop

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|-------------------------------------|---|---|--------|------|------|
| BM 544 | INFORMATION SECURITY AND CRYPTOLOGY | 3 | 0 | 3.00 | 7.50 | |

Course Content

Data security and cryptography introduction; security requirement; operation of network systems, topology security; summarization functions; encryption methods up to date; secret key encryption methods; secret key, DES encryption method and application, TRIPLE DES encryption method, AES encryption method, and application; public key encryption methods; SMS encryption method and application; cryptanalysis methods.

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|--------------------------------|---|---|--------|------|------|
| BM 545 | INTRODUCTION TO CYBER SECURITY | 3 | 0 | 3.00 | 7.50 | |

Course Content

Cyber security basic concepts; cyber warfare; introduction to encryption; network security; firewalls; intrusion detection and stopping systems; operating system security; secure software development; security of web applications; penetration tests; malware analysis

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|----------------------------------|---|---|--------|------|------|
| BM 546 | STRATEGIC DESIGN AND GAME THEORY | 3 | 0 | 3.00 | 7.50 | |

Course Content

Mixed strategies; Nash equilibrium; game tree concept; flat-form games; two-stage and recurring games; bargaining models; Nash equilibrium in subgames; cooperative games; apps.

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|-----------------------------|---|---|--------|------|------|
| BM 547 | ADVANCED NUMERICAL ANALYSIS | 3 | 0 | 3.00 | 7.50 | |

Course Content

Summary of some topics of mathematical analysis; Taylor's theorem; error analysis; error propagation; numerical solution methods of nonlinear algebraic equations; numerical solution methods of linear equation systems; Gaussian elimination method; iterative Newton's method for solving nonlinear systems of equations; interpolation and approximation with polynomials; Lagrange and Newton polynomials; curve fitting using the least squares method; numerical differentiation; integrating

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|------------------|---------------|---|---|--------|------|------|
| BM 548 | CODING THEORY | 3 | 0 | 3.00 | 7.50 | |

Course Content

| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
|---|--|---|---|--------|------|------|
| BM 549 | INFORMATION THEORY | 3 | 0 | 3.00 | 7.50 | |
| Course Content | | | | | | |
| Measure of information, Noiseless coding technique, Discrete channels, Channel capacity, Decoding techniques, Noisy coding theorem, Error correction coding, Structure of coding and decoding. | | | | | | |
| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
| BM 550 | GRAPH THEORY AND ALGORITHMS | 3 | 0 | 3.00 | 7.50 | |
| Course Content | | | | | | |
| History of Graph Theory, Usage Areas of Graph Theory, Paths, Trees and Cycles, Shortest Path Problem, Connectivity, Eulerian Tours, Hamiltonian Cycles, Networks, Minimum and Maximum Network Flow Problems, Graph Decomposition, Combinatorial Applications. | | | | | | |
| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
| BM 551 | ADVANCED LINEAR ALGEBRA AND OPTIMIZATION | 3 | 0 | 3.00 | 7.50 | |
| Course Content | | | | | | |
| Solution of linear equations systems (Cramer, inverse matrix, reducing the normal form), matrix and determinant operations, eigenvalues and eigenvectors of the matrix, linear transformations in linear spaces. | | | | | | |
| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
| BM 552 | NUMERICAL METHODS IN OPTIMIZATION | 3 | 0 | 3.00 | 7.50 | |
| Course Content | | | | | | |
| Introduction and basic concepts. Unconstrained optimization. Analytic solution, Numerical methods and algorithms in unconstrained optimization. Constrained Optimization: Optimization with equality constraints, Optimization with equality and inequality constraints, Optimization with special constraints. Linear programming and applications. | | | | | | |
| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
| BM 553 | SYSTEM MODELING AND COMPUTER SIMULATION | 3 | 0 | 3.00 | 7.50 | |
| Course Content | | | | | | |
| Dynamic simulation, user data types in simulation, operators and control structures, model generators, simulation programming, simulation problems. | | | | | | |
| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
| BM 554 | PROBABILITY THEORY AND RANDOM PROCESSES | 3 | 0 | 3.00 | 7.50 | |
| Course Content | | | | | | |
| This course focuses on limit theorems and discrete-time stochastic processes at the graduate level. Prior experience with probability at the undergraduate level is necessary. This course is useful for any engineers, mathematician or scientist who wants to learn probability theory and see how it can be applied to solving models arising from the engineering and sciences. Firstly, this course gives an advanced introduction to probability and random variables. The topics about probability and random variables include the definition of probability, probability axioms, probability space, conditional probability, Bayes' theorem, independence, definition of random variables, probability density function, cumulative distribution function, special discrete and continuous distributions (uniform, Gaussian, exponential, Rayleigh, Rice, Nakagami, lognormal, Poisson, Bernoulli, binomial), functions of random variables, concept of transformation of random variables, Chebyshev and Markov inequalities, characteristic functions, moment generating function, two random variables, joint distribution and joint density, joint moments, joint characteristic function, joint moment generating functions, conditional probability, sums of random variables, sample mean and sample variance, laws of large numbers, central limit theorems for sums and products, hypothesis testing. Secondly, this course gives the introduction of stochastic processes and limit theorems. The topics include the definition of stochastic processes, statistics of stochastic processes, strict-sense stationary and wide-sense stationary stochastic processes, ergodic processes, discrete and continuous time processes, autocorrelation and cross-correlation functions, Wiener-Khinchin theorem, power spectral density, cross-power spectral density, linear time invariant systems with stochastic inputs, Wiener-Lee relation, white noise, system identification, matched filter. | | | | | | |
| Course Unit Code | Course Name | T | U | Credit | ECTS | Type |
| BM 555 | STATISTICAL DATA ANALYSIS | 3 | 0 | 3.00 | 7.50 | |
| Course Content | | | | | | |
| The basic laws of probability and descriptive statistics, conditional probability, random variables, expectation, discrete and continuous probability models, joint and sampling distributions, hypothesis testing, point estimation, confidence intervals, contingency tables, logistic regression, linear and multiple regression. | | | | | | |