INTERNATIONAL BALKAN UNIVERSITY

EXCELLENCE FOR THE FUTURE!

INTERNATIONAL BALKAN UNIVERSITY

COURSES SUMMARY
CATALOG
SPRING SEMESTER

FACULTY OF ENGINEERING

Skopje, 2017

COMMON COURSES FOR ALL DEPARTMENTS

FIRST YEAR

SECOND SEMESTER

ENG 102 – English Language II; Weekly hours: 2+1, ECTS: 5

The purpose of this course is to enrich student vocabulary, to practice spoken language, to learn the various linguistic / grammatical structures, to overcome the various models of academic writing skills in written English. The curriculum includes the following themes: Introduction, Adventures of Ideas by A.N. Whitehead; Non-auditory Effects of Noise (writing comparison and differences), The Past Life of Earth; The Raising of the 'Vasa' (reading, discussion, writing), Patients and Doctors; The Pegasus Book of Inventors (reading, discussion, writing-problem solving), Exploring the Sea-floor by TF Gaskell; On Telling the Truth (reading, discussion, writing), (writing essays for the application study program).

TUR 102 – Turkish Language II; Weekly hours: 2+1, ECTS: 5

The aim of this course is to introduce the students to elementary Turkish language skills. The course begins with the Turkish alphabet and studies basic Turkish by reading and writing of easy and simple sentences. The curriculum includes the following themes: Locations, prepositions, agglutination, vowel harmony, Time Passes by: Simple past tense, from past to now; past perfect tense, Memories: Present Tense; linkings, with, 'ile, "Where shall we dine? Where shall we go? What shall we do? "What shall we eat?", Negative Imperatives; Subjunctive Mood: Comparatives: Adjectives / Adverbs; Superlative Adj / Adv.;, "Dear Officer / Sir/ Madam"; Present tense; ", Request for Help: "Diminutives; Dative, Locative suffix; ablative forms ., Negative Verb: Interrogative Particle.

MK 102 – Macedonian Language II; Weekly hours: 2+1, ECTS: 5

The goal of this course is to enrich vocabulary, practicing spoken language, learning the various linguistic, grammatical structures, overcoming the various models of academic writing skills in written forms in Macedonian Language. The curriculum includes the following themes in Macedonian: Adjectives; At the market, Personal pronouns. Family, Future tense; At a hotel, Stories – Past Tenses, The Past Definite Imperfective Tense – Imperfect, The Modal Verbs in the Imperfect, Causal Clauses, Negative Quantifying and Universal Quantifying Pronouns and Adverbs, The Adverb МНОГУ.

CE 102 – Introduction to Programming; Weekly hours: 2+1, ECTS: 5

The aim of the course is to give some basic terms, concepts, general structure and methodology of programming. The course covers the topics of introduction to machine architecture, introduction to binary operations, computer languages, programming phases, algorithms, flow charts, data types, control structures and some object oriented concepts. Visual Basic programming language is applied during the laboratory classes. The curriculum includes the following themes: Introduction to Machine Architecture: Hardware, Software; System Software and Application Software; Introduction to Binary Operations: Binary to Decimal Conversion, Decimal to Binary Conversion; Binary Operations; Data Types and Identifiers; Expressions; Algorithms; Flow Chart Symbols and structures; Control Structures: If Then Else, Do While, Sub Programs, Input/Output, and Abstraction; Object oriented concepts; Arrays and Strings.

PHYS 102 – Physics II; Weekly hours: 2+1, ECTS: 5

In this course we aim to familiarize students with the principles of modern physics which are applicable in industry and technical equipment, such as optical equipment and ultra sound equipment. The student will be able to describe wave motion, superposition of waves, wave reflection and transmission, explain the traveling and standing waves, wave velocity, energy; describe straight-line-motion behavior of light through ray optics using reflection and refraction in mirror lenses; understand the use of mirror and lenses in optical instruments such as telescopes, cameras and human eye; solving simple problems involving flat and spherical mirrors and ray-optics instruments. The curriculum includes the following themes: Waves, Superposition and Interference of waves, Standing waves, Resonance; Reflection and refraction (ray optics, reflection and refraction, total internal refraction, the prism and dispersion, images formed by plane mirrors, spherical mirrors, the speed of light); Lenses and Optical Instruments (lenses, the dimple magnifier, the compound microscope, telescopes, the eye, lens Maker's formula); Wave Optics (Interference of light, condition of interference, Young's double-slit experiment,

intensity distribution of the double-slit interference pattern, phasor addition waves, change of phase due to reflection, interference in thin films, Michelson Interferometer, coherence); Diffraction and Polarization (Fraunhofer and Fresnel diffraction, single-slit diffraction, the Rayleigh criterion, gratings and multiple slits, single slit diffraction intensity).

MATH 102 – Mathematics II; Weekly hours: 2+1, ECTS: 5

The objectives of the course are to give students knowledge related to improper integrals, infinite sequences and series, partial differentiation, extremum points of multivariable function, double integrals, complex numbers and their applications in engineering. The curriculum includes the following themes: Improper Integrals, Convergence Tests for Improper Integrals, Infinite Sequences and Series, Convergence Tests for Series, Power Series, Taylor and MacLaurin Series, Limits and Continuity of Two Variable Functions, Partial Derivatives, Tangent planes, Linear Approximations, Chain Rule, Implicit Differentiation, Directional Derivatives and Gradient Vector, Extremum Points of Multivariable function, Double Integrals, Applications of Double Integrals, Triple Integrals. Complex Numbers, Polar Form of a Complex Number, Exponential Form of a Complex Number. Operations With Complex Numbers.

IE 101 – Introduction to Engineering; Weekly hours: 2+1, ECTS: 5

The aim of the course is to introduce students to the basics of the various branches of engineering. The curriculum includes the following themes: The engineering profession, concept engineering, ethics and responsibility. It is considered to systems of numbers and units of measure, using computers and graphic techniques. One of the main goals of this course is to prepare the engineer for teamwork, and creating the ability to solve problems and ways of communication in the team. This course covers the basic knowledge needed for the following types of engineering: Fundamentals of Mechanical Engineering, Fundamentals of electrical engineering, Fundamentals of Chemical Engineering, Bio-Medical Engineering, Engineering design, Reversed engineering, Engineering maintenance, Engineering safety at work, Human factors engineering, use of computers in engineering.

COMPUTER ENGINEERING

SECOND YEAR

FOURTH SEMESTER

CE 202 – Algorithms; Weekly hours: 2+1, ECTS: 6

This course aims to introduce the classic algorithms in various domains, and techniques for designing efficient algorithms. It covers fundamental ideas in algorithms; and teaches the students to design algorithms, prove their correctness, and analyze their efficiency. Emphasis is on the cost associated with different algorithms, studying the basic mathematical tools for analyzing algorithm cost, exploring design heuristics and how the cost can be affected by subtle choices. During the computer labs, C programming language is going to be used. After completing this course, students will be able to: Prove the correctness and analyze the running time of the basic algorithms for those classic problems in various domains; Apply the algorithms and design techniques to solve problems; Analyze the complexities of various problems in different domains; Using C programming language to implement algorithms. The role of algorithms in computing, analysing and designing algorithms; Growth of functions; Asymptotic notations; Standard notations and common functions; The substitution method and recursion-tree method; The master method; Probabilistic analysis and randomized algorithms; Sorting and order statistics algorithms; Binary search trees; Randomly build binary search trees; Red-black trees.

MATH 202 – Differential equations; Weekly hours: 2+1, ECTS: 5

The objectives of the course are to give students knowledge of differential equations, solving them using software and application of differential equations in engineering. The curriculum includes the following themes: Introduction to Ordinary Differential Equations (What is an Ordinary Differential Equation (ODE), How to recognize the order of an ODE, Formation of differential equations). First-order ODEs (Solution of ODEs by direct integration, Solution of ODEs by separating the variables). First order ODEs (Solution of ODEs by an appropriate substitution, Solution of ODEs by an integrating factor, Solution of Bernoulli's equation). Homogeneous differential equations of second order. Solution of ODE of the form $\frac{d^2y}{dx^2} \pm n^2y = 0$. Non-homogeneous differential equation. Solution of ODE of the form y"=F(y, y') . ODE Applications (Modeling vertical motion – the Galilean approach, Modeling fish population, Modeling radioactive decay, Modeling of cold medication, Modeling of accumulation of pollutant, Qualitative analysis of linear differential equations of first order, Vertical motion, Model for current in an LRC loop). Introduction to computer software ODE Architect Solver Tool and how to use the software for solving differential equations and applications modeled by differential equations.

STA 201 – Probability and statistics; Weekly hours: 2+1, ECTS: 5

The aim of the course is to give some basic terms, concepts, and learn how the stochastic methods come about and why they work. This course will provide students with a good understanding of the theory of probability, both discrete and continuous, including some combinatorial, a variety of useful distributions, expectation and variance, analysis of sample statistics, the law of large numbers, central limit theorem, confidence interval, testing hypotheses, t-test, and comparing two samples. After completing this course, students will be able to: Develop the ability to solve problems using probability; Make connections between probability and other branches of mathematics; Understand the meaning of statistical statements as well as judge the quality of their content. Sets and operations with sets; Sample space and events; Probability function definition; Products of sample spaces; Conditional probability; Multiplication rule; The law of total probability; Bayes' rule and independence; Discrete and continuous random variables; Expectation and variance; Joint distribution; Covariance and correlation; The law of large numbers; Central limit theorem; Basics of statistical models; Data analysis.

MATH 203 – Mathematics modelling; Weekly hours: 2+1, ECTS: 5

The aim of the course is to give the students basic knowledge of mathematical modelling with stress on empirical modeling. Students will learn how to analyze and interpret the experimentally obtained data, hot to develop empirical model, but also to analyze the empirical models using software.Introduction to mathematical modelling (What is mathematical model, Properties of models, Judge a model, Building a model, Steps in model building, Model application areas, Model classification, Characteristic nature of process models, Empirical models, Model

equation forms). Treatment of engineering data - Numerical interpolation using computer software MATLAB.Treatment of engineering data - Numerical differentiation using computer software MATLAB.Treatment of engineering data - Numerical integration using computer software MATLAB. Empirical models - Linear regression model (Correlation coefficient and its properties, Computing the equation of regression line, Short-cut formulas, Measures of goodness of fit, Uncertainties of the least squares coefficients). Using MATLAB software for least- squares calculations, Empirical models and physical laws). Empirical models - Multiple regression model (Estimating the coefficients, Developing a model, Estimating least-squares coefficients in multiple regression model by MATLAB software, Drawing graphs with MATLAB software, Confounding and collinearity, Model selection).

CE 203 – Computer architecture; Weekly hours: 2+1, ECTS: 4

The aim of this course is to discuss the fundamentals of computer organization (physical design) and architecture (logical design) and relates this to contemporary design issues. This course will cover machine level representation of data, assembly level organization, memory system organization and architecture, system connection, memory, input/output, instruction sets, CPU structure and functions and the control Unit operation. Besides emphasizing the fundamental concepts, the course will discuss the critical role of performance in driving computer design. Students will also learn MipsIT hardware simulator in computer labs. Students successfully completing the course will be able to:Describe computer architecture and organization, computer arithmetic, and CPU design.Describe I/O system and interconnection structures of computer.Identify high performance architecture design.Use assembly language to program a microprocessor system.Develop independent learning skills and be able to learn more about different computer architectures and hardware. Introduction to computer architecture; Computer classes; Defining computer architecture; Trends in technology; Power in integrated circuits, and Benchmarks; Dependability; Quantitative Principles of Computer Design; Amdahl's Law; CPU performance; Processor performance equation; Pipelining; Instruction-level parallelism; Introduction to Memory organization and Hierarchy; Cache performance and its optimization; Storage systems: Failure and faults; I/O performance and reliability measures; Little's Law and Single server queuing system.

MAN 212 – Entrepreneurship; Weekly hours: 2+1, ECTS: 5

There has never been a more invigorating and opportunistic time to study entrepreneurship. Around the world, the current economic crisis is not just negatively affecting business, this crisis is also generating business opportunities for the creative and daring. This course aims to show how to take advantage with entrepreneurship and to introduce the students to the process of entrepreneurial success and shows them how to be effective every step of the way. Introduction to Entrepreneurship Recognizing Opportunities and Generating Ideas Feasibility Analysis; Writing a Business Plan Industry and Competitor Analysis Developing an Effective Business Model Preparing the Proper Ethical and Legal Foundation Assessing a New Venture's Financial Strength and Viability Building a New Venture Team Getting Financing or Funding Unique Marketing Issues The Importance of Intellectual Property Preparing for and Evaluating the Challenges of Growth Strategies for Firm Growth

THIRD YEAR

SIXTH SEMESTER

CE 304 – Operating systems; Weekly hours: 2+2, ECTS: 6

The course studies the fundamental concepts and principles of operating systems. The parts of an operating system are described in terms of their functions, structure and implementation. Process, memory and storage management are discussed. Introduction and overview of operating systems.System structures.Process concepts.Multithreaded programming.CPU scheduling.Synchronization.Deadlocks.Memory management. File system introduction. File system implementation. Secondary storage structure.I/O Systems.System protection and security.

CE 305 – Database design and management; Weekly hours: 2+1, ECTS: 6

The course goal is to provide understanding of database systems. The course will focus on the fundamental concepts of database management with the thoroughness and attention to detail. Database query languages, schema design, database application development, database internals, data analysis and database mining will be

covered. Introduction to database systems; Relational models; SQL; Database design process; The entity-relationship approach; Relational database design; Application design; Object-based databases; XML; Data storage and querying; Transaction management; Data analysis; Data mining.

RMNS 307 – Research methods for natural sciences; Weekly hours: 2+1, ECTS: 5

To introduce some of the major issues in understanding of natural and technical sciences; To gain an understanding of the nature of research; To make distinction among several research methods and their application; To gain some experience in writing research proposals; To provide some skills on reporting. The course defines the understanding of science and engineering and describes the links between the interrelated technical subjects. Further, it considers the methods of scientific research and focuses on the five methods most widely used for natural sciences and engineering, giving much emphasis on experimental and field studies research methods. It also stresses the importance of simulation and modelling and integrated research methods. It gives some clues on the important aspects of writing and presenting scientific reports (thesis). Finally it provides some information on research ethics and on resolving controversies in research.

CE 307 – Computer graphics; Weekly hours: 2+1, ECTS: 5

This course covers fundamental principles and algorithms underlying computer graphics, including line drawing algorithms, circle/ellipse drawing algorithms, triangle and polygon rasterization, 2D geometrical transformation, 3D geometric transformations, viewing in 3D (orthographic projection and perspective projection), hidden surface elimination algorithms, surface shading, ray tracing, graphics pipeline (including clipping), texture mapping, and brief coverage of advanced topics (computer animation, image-based rendering, and global illumination). It will also provide a brief introduction to openGL. This course is intended for senior computer science students and graduate students who are interested in computer graphics related careers or in learning and applying computer graphics techniques. General introduction to computer graphics; Line drawing algorithms; Triangle rasterization algorithms; Matrices; Viewing in three dimensions; Surface shading; Advanced reflection models; Ray tracing; Texture mapping; Graphic pipeline; Selected advanced topics; Case studies.

CE 308 – Data mining; Weekly hours: 2+0, ECTS: 4

The aim of the course is to introduce some basic concepts, tasks, methods, and techniques in data mining. During this course students will learn about various data mining problems and their solutions. They will develop an understanding of the data mining process and issues, learn various techniques for data mining, and apply the techniques in solving data mining problems using data mining tools and systems. Data preprocessing; Data classification; Decision trees; Bayesian; Back-propagation; Rule-based classification; k-nearest neighbors; Ensemble and evaluating; Clustering; Partitioning; Hierarchical clustering; Density based methods; Cluster evaluation; Association rule mining; A priori and FP-growth.

FOURTH YEAR

EIGHTH SEMESTER

CE 402 – Telecommunications; Weekly hours: 2+2, ECTS: 6

The course provides an introduction to the fundamentals of communication theory. Analog communications, including amplitude, phase and frequency modulation are studied. The basics of digital communication systems are introduced. Transmission of digital signals through additive white Gaussian noise channels is discussed. Introduction to communications.Amplitude modulation.Discussion of amplitude modulation techniques.Angle modulation and concept of instantaneous frequency.Phase modulation.Frequency modulation.Probability and random processes overview. Digital communications: waveform generation. Digital modulation techniques.Digital transmission through the additive white Gaussian noise channel.Probability of error for signal detection in additive white Gaussian noise.

CE 405 – Wireless information networks; Weekly hours: 2+1, ECTS: 5

The course introduces underlying principles of wireless communications and practical systems. Topics covered include radio signal propagation, interference-limited communications, multiple access, radio resources management and mobility management. It describes the building blocks of wireless networks. The essential functions of cellular telephone systems and cellular planning. Details of the most important technologies including GSM, TDMA, FDMA, CDMA, and wideband CDMA. Introduction and overview personal communications; Principles of personal communications; Overview of digital communication systems; Functions of cellular telephone systems; Cellular planning; Analog cellular systems; Inter-system operations; Time and frequency division multiple access TDMA and FDMA; Global system for mobile communications (GSM); Spread Spectrum; Code division multiple access (CDMA); Wideband CDMA.

CE 407 – Software engineering; Weekly hours: 2+1, ECTS: 4

To explain what software engineering is and why it is important; To explain some ethical and professional issues that are important for software engineers; To explain what a socio-technical system is and the distinction between this and a computer-based system; To discuss legacy systems and why these are critical to many businesses; To explain what is meant by a critical system where system failure can have severe human or economic consequence; To introduce software process models and to describe some generic process models and when they may be used; To introduce CASE technology to support software process activities; To introduce the concepts of user and system requirements; To distinguish the role of requirements management in support of other requirements engineering processes; To introduce architectural design and to discuss its importance; To explain the advantages and disadvantages of different distributed systems architectures; To discuss client-server and distributed object architectures; To introduce peer-to-peer and service-oriented architectures as new models of distributed computing; To discuss the essence of agile development methods; To explain the principles and practices of extreme programming; To introduce software verification and validation and to discuss the distinction between them; To explain the distinctions between validation testing and defect testing; To describe the principles of system and component testing; To introduce the fundamentals of software costing and pricing; To explain why different techniques should be used for software estimation; To introduce the quality management process and key quality management activities; To explain the role of standards in quality management. Introduction to software engineering; Socio-technical system; Critical system; Software processes; Software requirements; Requirement engineering processes; Architectural design; Distributed systems architecture; Rapid software development; Verification and validation; Software testing; Software cost estimation; Quality management.

EE 407 - Electromagnetic Waves; Weekly hours: 2+1, ECTS: 5

In this course we aim to introduce the students to basic concept of electromagnetic waves, Maxwell's equations, Propagation of electromagnetic waves, Waveguides, antennas and radiation, Course Contents: Introduction to electromagnetic waves, Maxwell's equations in time and frequency domains, Wave equation, Uniform plane electromagnetic waves; reflection and refraction. Introduction to transmission lines, waveguides, antennas and radiation.

EE 416- Introduction to Robotics; Weekly hours: 2+0, ECTS: 4

The course introduces students to the basics of modeling, design, planning and control of robots. The material covered represents an overview of relevant results in geometry, kinematics, statics, dynamics, and control. Course Contents: Introduction. Spatial descriptions 1 and 2.Kinematics 1 and 2.Velocities. Explicit forms of static forces. Vision of robotics.Inverse kinematics/generation of trajectories. Dynamics: explicit forms. PID control. Control: joint control. Control: work space control. Force control.

INDUSTRIAL ENGINEERING

SECOND YEAR

FOURTH SEMESTER

IE 203 – Systems Management; Weekly hours: 2+1, ECTS: 6

The requirement and needs of the customers for better products and services are increasing every day. Technology development, particularly telecommunications, Internet, media, and transportation facilitate communication, and thus easier products and services trade. It is obvious that the responsibilities of production and service systems increase, as the requirements for better, high-quality and cheaper products and / or high-quality and in-time service increases. Thus, the required minimum a company to become or to retain its compatibility on the markets: quality, productivity (and the price), the accurate and in-time distribution of a ready product. This course will provide the knowledge for the production and service systems, and their development in a way that will provide development of effective, efficient and reliable systems, but in total systems that will satisfy the customers' needs and requirements. Students will be introduced to the activities / decisions related to management of processes, which will enable Just in time production, as well as production without defects: product design, quality policy, process selection, selection of basic and auxiliary equipment, raw materials procurement and storage, working standards setting, protection and maintenance systems, inspection and control methods, transport and distribution, production planning, supervision, appointing the problem areas related to the labor, materials, equipment, etc.

MATH 202 – Differential Equations; Weekly hours: 2+1, ECTS: 5

Introduction to Ordinary Differential Equations (What is an Ordinary Differential Equation (ODE), How to recognize the order of an ODE, Formation of differential equations). First-order ODEs (Solution of ODEs by direct integration, Solution of ODEs by separating the variables). First order ODEs (Solution of ODEs by an appropriate substitution, Solution of ODEs by an integrating factor, Solution of Bernoulli's equation). Homogeneous differential equations of second order. Solution of ODE of the form $\frac{d^2y}{dx^2} \pm n^2 y = 0$. Non-homogeneous differential equation. Solution of ODE of the form y"=F(y, y') . ODE Applications (Modeling vertical motion – the Galilean approach, Modeling fish population, Modeling radioactive decay, Modeling of cold medication, Modeling of accumulation of pollutant, Qualitative analysis of linear differential equations of first order, Vertical motion, Model for current in an LRC loop). Introduction to computer software ODE Architect Solver Tool and how to use the software for solving differential equations and applications modeled by differential equations.

STA 201 – Probability and Statistics; Weekly hours: 2+1, ECTS: 5

The aim of the course is to give some basic terms, concepts, and learn how the stochastic methods come about and why they work. This course will provide students with a good understanding of the theory of probability, both discrete and continuous, including some combinatorial, a variety of useful distributions, expectation and variance, analysis of sample statistics, the law of large numbers, central limit theorem, confidence interval, testing hypotheses, t-test, and comparing two samples. After completing this course, students will be able to: Develop the ability to solve problems using probability;

MATH 203 – Mathematical Modelling; Weekly hours: 2+1, ECTS: 5

The aim of the course is to give the students basic knowledge of mathematical modelling with stress on empirical modeling. Students will learn how to analyze and interpret the experimentally obtained data, hot to develop empirical model, but also to analyze the empirical models using software.
Introduction to mathematical modelling (What is mathematical model, Properties of models, Judge a model, Building a model, Steps in model building, Model application areas, Model classification, Characteristic nature of process models, Empirical models, Model equation forms). Treatment of engineering data - Numerical interpolation using computer software MATLAB.Treatment of engineering data - Numerical differentiation using computer software MATLAB.Treatment of engineering data - Numerical integration using computer software MATLAB. Empirical models - Linear regression model (Correlation coefficient and its properties, Computing the equation of regression line, Short-cut formulas, Measures of goodness of fit, Uncertainties of the least squares

coefficients). Using MATLAB software for least- squares calculations, Empirical models and physical laws). Empirical models - Multiple regression model (Estimating the coefficients, Developing a model, Estimating least-squares coefficients in multiple regression model by MATLAB software, Drawing graphs with MATLAB software, Confounding and collinearity, Model selection).

CE 213 – Information Technology; Weekly hours: 2+1, ECTS: 4

The aim of this course is to give some basic terms and concepts of the information technology. It is geared to draw attention to the important concepts underlying the field of IT, and can steer you to useful supplementary material. As IT is a rapidly advancing technology, the main objective of this course is to emphasize reasonably stable fundamental concepts on which this technology is built. After completing this course, students will be able to: Have good knowledge across the basic concepts of the whole field of IT. Know competitive advantages and strategic information systems. Know evaluation and classification of the information systems. Know about modern and emerging computing systems. Know managing information systems. Learn about both the systems and application software.Introduction to Information Technology; Why Should you Learn About Information Technology? Competitive Advantage and Strategic Information Systems; Strategic Information Systems; Information Systems Infrastructure and Architecture; Memory Storage; Computer hierarchy; Input and Output Technologies; Computer Software and applications; Managing Organizational Data and Information; Database Management Systems; Network and Telecommunications Basics; Network Basics; Network Communications software and Telecommunications applications; IT Ethics, Impacts, and Security.

MAN 212 – Entrepreneurship; Weekly hours: 2+1, ECTS: 5

There has never been a more invigorating and opportunistic time to study entrepreneurship. Around the world, the current economic crisis is not just negatively affecting business, this crisis is also generating business opportunities for the creative and daring. This course aims to show how to take advantage with entrepreneurship and to introduce the students to the process of entrepreneurial success and shows them how to be effective every step of the way.
Introduction to Entrepreneurship Recognizing Opportunities and Generating Ideas, Feasibility Analysis; Writing a Business Plan, Industry and Competitor Analysis, Developing an Effective Business Model, Preparing the Proper Ethical and Legal Foundation, Assessing a New Venture's Financial Strength and Viability, Building a New Venture Team, Getting Financing or Funding, Unique Marketing Issues, The Importance of Intellectual Property, Preparing for and Evaluating the Challenges of Growth, Strategies for Firm Growth

THIRD YEAR

SIXTH SEMESTER

IE 307 – Production and planning control II; Weekly hours: 2+1, ECTS: 6

The aim of this course is to inform students about basic models and methods of production system analysis and optimizing. The models concern phases of design, control, performance measurement and improvement of production systems.
Introduction to Production Systems; Flow-shop systems and solving algorithms; Johnson algorithms, CDS algorithms, PALMER algorithms, RAP algorithms; GUPTA algorithms, NEH algorithms; Parallel Machine Scheduling; Johnson algorithms for n/2/G/Fmax problem, Lawler Algorithms for single mach; Smith Algorithms for single machine, Van Wassenhove and Gelders algorithm; Roy Algorithms, Dynamic Programming for single machine problem ; Statistical Process Control; Location and Layout Strategy; Capasity Planning, Just in time production systems; Group Technology production systems; Flexible Manufacturing Systems; Supply Chain Management.

IE 308 – Operations Research; Weekly hours: 2+1, ECTS: 6

Describe the origins and basic methodology of operations research; Give examples of applications of operations research in and outside of industrial engineering; Develop linear programming formulations to represent a variety of applied problems including transportation, assignment, and network models; Solve two-variable linear programming problems using the graphical method; Apply the simplex algorithm to solve linear programming problems; Use software to solve linear programming and integer programming problems; Interpret reports

generated by software outputs; Explain the role of sensitivity analysis in linear programming; Apply sensitivity analysis to determine parameter ranges for which a solution to a linear programming problem remains optimal; Explain the role of duality in linear programming; Construct and interpret the dual of linear programming problems; Develop integer programming formulations to represent a variety of scenarios; Solve integer programming problems "by hand" and using software.
Introduction to linear programming; Modelling of the problem; Graphical solution of the LP problems; Simplex method; Simplex method; M-Method and two-phase method; Special Cases in the Simplex Method; Sensitivity Analysis; Duality and post optimal analysis; Transportation Models and its variants; Transportation Models and its variants; Integer Linear Programming; Integer Linear Programming; Integer Linear Programming; Markov Chains.

RMNS 307 – Research Methods in Natural Sciences; Weekly hours: 2+1, ECTS: 5

To introduce some of the major issues in understanding of natural and technical sciences; To gain an understanding of the nature of research; To make distinction among several research methods and their application; To gain some experience in writing research proposals; To provide some skills on reporting.The course defines the understanding of science and engineering and describes the links between the interrelated technical subjects. Further, it considers the methods of scientific research and focuses on the five methods most widely used for natural sciences and engineering, giving much emphasis on experimental and field studies research methods. It also stresses the importance of simulation and modelling and integrated research methods. It gives some clues on the important aspects of writing and presenting scientific reports (thesis). Finally it provides some information on research ethics and on resolving controversies in research.

BA 302 – Analysis and cost control; Weekly hours: 2+1, ECTS: 5

The basic of the subject is to set clear direction and implementing appropriate cost-benefit analysis. Students acquire meaning of costs, types of costs, direct and indirect costs, and assessment of costs for items that are produced.
Introduction to analysis and control of costs, Managerial Accounting, Concepts of management costs and cost behavior, Cost Systems at Work, Value Systems: ABM and LEAN, Analysis of cost behavior, Evaluation and management of results, Analysis of standard costs and variances, Managing and measuring quality, Analysis of short-term decisions, Budgeting

CE 308 – Data mining; Weekly hours: 2+0, ECTS: 4

The aim of the course is to introduce some basic concepts, tasks, methods, and techniques in data mining. During this course students will learn about various data mining problems and their solutions. They will develop an understanding of the data mining process and issues, learn various techniques for data mining, and apply the techniques in solving data mining problems using data mining tools and systems.
Data preprocessing; Data classification; Decision trees; Bayesian; Back-propagation; Rule-based classification; k-nearest neighbors; Ensemble and evaluating; Clustering; Partitioning; Hierarchical clustering; Density based methods; Cluster evaluation; Association rule mining; A priori and FP-growth.

FOURTH YEAR

EIGHTH SEMESTER

IE 405 – Project Management; Weekly hours: 2+1, ECTS: 6

Introduce general issues of project management. To provide insights into problem solving and persuasive presentation of solutions. To increase awareness of how people work as team members and as individuals.Introduction to project management; Introduction to Critical Path Method; Equilibrium of sources; Critical Path Method – cost calculation (CPM-COST); Program estimation and techniques of research (PERT). Application of MS Project.

IE 406 – Occupational Safety and Health Engineering; Weekly hours: 2+0, ECTS: 4

Appropriate design of various environmental sanitation facilities, health assessment and safety measures and works for the industrial factory workers, officers etc.Controlling work-related risks.Workable strategy in managing occupational health and safety. After completion of the course, the student should know and be able to do: 1. The student learn about principle of occupational health and safety which is enough for them to work at the basic operational level. 2. The student understand the relationship between occupational health and safety and

environmental science. 3. The student can apply the knowledge obtained to the real working situation appropriately and efficiently. 4. The student can apply basic ideas and knowledge for further specialized study in the field.Health and safety foundations; Policy; Organizing for health and safety; Promoting a positive health and safety culture; Risk assessment; Principles of control; Monitoring, review and audit; Incident and accident investigation recording and reporting; Movement of people and vehicles-hazard and control; Manual and mechanical handling hazards and control; Work equipment hazards and control; Electrical hazards and control; Fire hazards and control; Chemical and biological health hazard and control; Physical and psychological health hazard and control; International aspects of health and safety.

MAN 407 – Quality Management; Weekly hours: 2+1, ECTS: 5

This course will focus on Quality concepts and philosophies in organizational processes. By this focus, it will present a general framework for creating a superior performance as a final organizational output. This course aims at establishing a high level understanding in the minds of students for quality, and its reflections on organizational performance.
The intent of the course is to help students in understanding the basic framework for studying quality management, narrower and broader definitions of quality and the result of its application, the functions of quality management for organizational performance and competitiveness. In this context, particular attention is paid to the following aspects: the principles of quality management, quality principles, the quality imperative: the economic imperative – the social imperative – the environmental imperative – the challenge for service organizations, as well the barriers to quality in organizations. It also emphasizes the importance of the system approach in managing quality, and in this context quality management with ISO 9000, and How ISO 9000 made us think about quality. The program provides an overview of Total Quality Management (TQM), Deming philosophy and gurus of TQM and Six Sigma as a strategic concept.

IE 414 – Equipment in Industry; Weekly hours: 2+1, ECTS: 4

The aim of the courses is to give the student knowledge of categories of the equipment and criteria for design.Basic process Engineering Principles; Engineering Flow Diagrams;Momentum Transfer Phenomena; Fluid flow – Equipment; Mechanical Separation and Equipment; Size Reduction; Heat Transfer Phenomena; Heat Transfer Equipment; Mass Transfer Phenomena; Chemical Separation Equipment; Reactors, Mixing; Field work.

MAN 404 – Financial Management; Weekly hours: 2+1, ECTS: 5

The objective of this course is to learn students with the basic concepts and practices of financial management. The concept is set on the basics of managerial accounting. The course will allow future managers to learn the basics of managerial accounting and the obligations of financial and nonfinancial managers.Introduction to financial management, Financial planning and projected financial reports, Financial ratios, Capital Investing, Capital Investing (additional remarks), Budgeting, Sources of capital, Management of assets, Dividends and dividend policy, Measuring and management of dividend policy, Mergers and acquisitions.

ELECTRICAL AND ELECTRONIC ENGINEERING

SECOND YEAR

FOURTH SEMESTER

EE 203 - Circuit Theory II; Weekly hours: 2+2, ECTS: 6

The course provides a continued coverage of selected topics in circuit theory. It extends the development of general procedures used in analyzing electric circuits. These methods are applied first to resistive circuits and later to circuits with more complex elements such as capacitors and inductors. Useful relationships are derived for passive element combinations when the components are in series or in parallel, including voltage and current division. Thévenin's and Norton's theorems are used to determine equivalent circuits. Circuits with AC sinusoidal sources are analyzed. Application of complex power calculations is also highlighted. The lectures contain outlines of the theory. The exercises are based on worked examples, as solved problems. A number of laboratory exercises are also included in the course. In addition, WEB educypedia animations and Java applets are used to visualize the electric circuit occurrences. Homework as good practice for encouraging students to learn continuously and to check their understanding is assigned. Course Contents: Introduction, Magnetic field and magnetic induction, Magnetic flux, Ampere's law, Ferromagnetic materials, Generalized Ampere's law, Electromagnetic induction, Sinusoids and phasors; phasor rep. of circuit elements, Impedance and admittance,Kirchoff's law in the frequency domain, Impedance combinations, AC circuit steady-state analysis, Nodal and mesh analysis, Superposition and source transformation,Thevenin and Norton equivalent circuits, AC power analysis, RMS, power factor, complex power, Circuit analysis methods, Series and parallel resonance, Filter design, Passive filters, Three-phase circuits.

MATH 202 - Differential Equations; Weekly hours: 2+1, ECTS: 5

The objectives of the course are to give students knowledge of differential equations, solving them using software and application of differential equations in engineering. Course Contents: Introduction to Ordinary Differential Equations (What is an Ordinary Differential Equation (ODE), How to recognize the order of an ODE, Formation of differential equations), First-order ODEs (Solution of ODEs by direct integration, Solution of ODEs by separating the variables), First order ODEs (Solution of ODEs by an appropriate substitution, Solution of ODEs by an integrating factor, Solution of Bernoulli's equation), Homogeneous differential equations of second order. Solution of ODE of the form $\frac{d^2y}{dx^2} \pm n^2 y = 0$.Non-homogeneous differential equation. Solution of ODE of the form y"=F(y, y') . ODE Applications (Modeling vertical motion – the Galilean approach, Modeling fish population, Modeling radioactive decay, Modeling of cold medication, Modeling of accumulation of pollutant, Qualitative analysis of linear differential equations of first order, Vertical motion, Model for current in an LRC loop),Introduction to computer software ODE Architect Solver Tool and how to use the software for solving differential equations and applications modeled by differential equations.

STA 201 - Probability and Statistics; Weekly hours: 2+1, ECTS: 5

The aim of the course is to give some basic terms, concepts, and learn how the stochastic methods come about and why they work. This course will provide students with a good understanding of the theory of probability, both discrete and continuous, including some combinatorial, a variety of useful distributions, expectation and variance, analysis of sample statistics, the law of large numbers, central limit theorem, confidence interval, testing hypotheses, t-test, and comparing two samples. After completing this course, students will be able to: Develop the ability to solve problems using probability, Make connections between probability and other branches of mathematics, Understand the meaning of statistical statements as well as judge the quality of their content, when facing such problems on your own, Design and conduct experiments, as well as to analyze and interpret data. Course Contents:Sets and operations with sets; Sample space and events; Probability function definition; Products of sample spaces; Conditional probability; Multiplication rule; The law of total probability; Bayes' rule and independence; Discrete and continuous random variables; Expectation and variance; Joint distribution; Covariance and correlation; The law of large numbers; Central limit theorem; Basics of statistical models; Data analysis; The method of least squares; Confidence intervals for the mean; Testing hypothesis; t-Test.

MATH 203 - Mathematical Modelling; Weekly hours: 2+1, ECTS: 5

The aim of the course is to give the students basic knowledge of mathematical modeling with stress on empirical modeling. Students will learn how to analyze and interpret the experimentally obtained data, hot to develop

empirical model, but also to analyze the empirical models using software. Course Contents: Introduction to mathematical modeling (What is mathematical model, Properties of models, Judge a model, Building a model, Steps in model building, Model application areas, Model classification, Characteristic nature of process models, Empirical models, Model equation forms), Treatment of engineering data - Numerical interpolation using computer software MATLAB, Treatment of engineering data - Numerical differentiation using computer software MATLAB, Treatment of engineering data - Numerical integration using computer software MATLAB, Empirical models - Linear regression model (Correlation coefficient and its properties, Computing the equation of regression line, Short-cut formulas, Measures of goodness of fit, Uncertainties of the least squares coefficients). Using MATLAB software for least- squares calculations, Empirical models and physical laws). Empirical models - Multiple regression model (Estimating the coefficients, Developing a model, Estimating least-squares coefficients in multiple regression model by MATLAB software, Drawing graphs with MATLAB software, Confounding and collinearity, Model selection).

CE 203 – Computer ArchitectureWeekly hours: 2+1, ECTS: 4

The aim of this course is to discuss the fundamentals of computer organization (physical design) and architecture (logical design) and relates this to contemporary design issues. This course will cover machine level representation of data, assembly level organization, memory system organization and architecture, system connection, memory, input/output, instruction sets, CPU structure and functions and the control Unit operation. Besides emphasizing the fundamental concepts, the course will discuss the critical role of performance in driving computer design. Students will also learn MipsIT hardware simulator in computer labs. Students successfully completing the course will be able to:Describe computer architecture and organization, computer arithmetic, and CPU design. Describe I/O system and interconnection structures of computer. Identify high performance architecture design. Use assembly language to program a microprocessor system. Develop independent learning skills and be able to learn more about different computer architectures and hardware. Contents: Introduction to computer architecture; Computer classes; Defining computer architecture; Trends in technology; Power in integrated circuits, and Benchmarks; Dependability; Quantitative Principles of Computer Design; Amdahl's Law; CPU performance; Processor performance equation; Pipelining; Instruction-level parallelism; Introduction to Memory organization and Hierarchy; Cache performance and its optimization; Storage systems: Failure and faults; I/O performance and reliability measures; Little's Law and Single server queuing system.

MAN 212 – Entrepreneurship; Weekly hours: 2+1, ECTS: 5

Course Objectives:There has never been a more invigorating and opportunistic time to study entrepreneurship. Around the world, the current economic crisis is not just negatively affecting business, this crisis is also generating business opportunities for the creative and daring. This course aims to show how to take advantage with entrepreneurship and to introduce the students to the process of entrepreneurial success and shows them how to be effective every step of the way.Course Contents:Introduction to Entrepreneurship Recognizing Opportunities and Generating Ideas, Feasibility Analysis; Writing a Business Plan, Industry and Competitor Analysis ,Developing an Effective Business Model, Preparing the Proper Ethical and Legal Foundation, Assessing a New Venture's Financial Strength and Viability, Building a New Venture Team, Getting Financing or Funding, Unique Marketing Issues, The Importance of Intellectual Property, Preparing for and Evaluating the Challenges of Growth, Strategies for Firm Growth.

THIRD YEAR

SIXTH SEMESTER

EE 303 - Digital Electronics; Weekly hours: 2+2, ECTS: 6

This course is designed to teach the students of the fundamentals of digital systems. The students will obtain advanced knowledge of the concepts of digital electronics elements and design, together with the software tools for analysis. The emphasis is put on implementation of digital circuit technology via practical examples for both combinational and sequential circuits. Especially, arithmetic circuits, latches and flip-flops, registers and counters, converters and memory circuits are deeply analyzed. In addition, VHDL language is utilized for the purpose of software implementation of various practical types of these circuits. Course Contents: Introduction to the digital design and concepts, Implementation Technology for Digital Circuits, Electrical Aspects of Digital Circuits,

Introduction to Logical Circuits, Boolean Algebra rules and manipulations, Optimized Implementation.VHDL Examples, Arithmetic Circuits, Design of Arithmetic Circuits Using CAD Tools, Combinational Circuits Building Blocks, Flip-Flops, Registers and Counters, Synchronous Sequential Circuits, Asynchronous Sequential Circuits, Digital Integrated Circuit Design, Examples.

EE 304 - Static Power Converters; Weekly hours: 2+2, ECTS: 6

The aim of the course is to introduce to students to the basic types of static power converters, Power converter definitions, classification and their characteristics. Course Contents: Introduction, definition and classification of static power converters.Power switches and their characteristics. Midpoint and bridge rectifiers: non-ideal commutation, harmonics, input power factor, utility-factor, winding utilization and unbalances in rectifier transformers. Centre-tap inverter.Voltage-fed inverters; Current-fed inverters.

RMNS 307 - Research methods in natural sciences; Weekly hours: 2+1, ECTS: 5

Course Objectives are to introduce some of the major issues in understanding of natural and technical sciences, to gain an understanding of the nature of research, to make distinction among several research methods and their application, to gain some experience in writing research proposals, to provide some skills on reporting. Course Contents:The course defines the understanding of science and engineering and describes the links between the interrelated technical subjects. Further, it considers the methods of scientific research and focuses on the five methods most widely used for natural sciences and engineering, giving much emphasis on experimental and field studies research methods. It also stresses the importance of simulation and modeling and integrated research methods. It gives some clues on the important aspects of writing and presenting scientific reports (thesis). Finally it provides some information on research ethics and on resolving controversies in research.

CE 308 - Data Mining; Weekly hours: 2+0, ECTS: 4

The aim of the course is to introduce some basic concepts, tasks, methods, and techniques in data mining. During this course students will learn about various data mining problems and their solutions. They will develop an understanding of the data mining process and issues, learn various techniques for data mining, and apply the techniques in solving data mining problems using data mining tools and systems. Course Contents: Data preprocessing; Data classification; Decision trees; Bayesian; Back-propagation; Rule-based classification; k-nearest neighbors; Ensemble and evaluating; Clustering; Partitioning; Hierarchical clustering; Density based methods; Cluster evaluation; Association rule mining; A priori and FP-growth.

CE 307 - Computer Graphics; Weekly hours: 2+1, ECTS: 5

This course covers fundamental principles and algorithms underlying computer graphics, including line drawing algorithms, circle/ellipse drawing algorithms, triangle and polygon rasterization, 2D geometrical transformation, 3D geometric transformations, viewing in 3D (orthographic projection and perspective projection), hidden surface elimination algorithms, surface shading, ray tracing, graphics pipeline (including clipping), texture mapping, and brief coverage of advanced topics (computer animation, image-based rendering, and global illumination). It will also provide a brief introduction to openGL. This course is intended for senior computer science students and graduate students who are interested in computer graphics related careers or in learning and applying computer graphics techniques. Course Contents: General introduction to computer graphics; Line drawing algorithms; Triangle rasterization algorithms; Matrices; Viewing in three dimensions; Surface shading; Advanced reflection models; Ray tracing; Texture mapping; Graphic pipeline; Selected advanced topics; Case studies.

FOURTH YEAR

EIGHTH SEMESTER

EE 402 - Power Systems Analysis; Weekly hours: 2+2, ECTS: 6

Students are introduced to the basic characteristics, definitions, and principles of mathematical modeling of power systems and their elements, Mathematical-numerical techniques used for power systems analysis, and methods for the calculation of powers, currents, and voltages. Course Contents: Basic structure of electrical power systems, Electrical characteristics of transmission lines, transformers and generators,Representation of power systems, Analysis of power systems networks and methods of solution.

CE 405 - Wireless Information Networks; Weekly hours: 2+1, ECTS: 5

The course introduces underlying principles of wireless communications and practical systems. Topics covered include radio signal propagation, interference-limited communications, multiple access, radio resources management and mobility management. It describes the building blocks of wireless networks. The essential functions of cellular telephone systems and cellular planning. Details of the most important technologies including GSM, TDMA, FDMA, CDMA, and wideband CDMA. Introduction and overview personal communications; Principles of personal communications; Overview of digital communication systems; Functions of cellular telephone systems; Cellular planning; Analog cellular systems; Inter-system operations; Time and frequency division multiple access TDMA and FDMA; Global system for mobile communications (GSM); Spread Spectrum; Code division multiple access (CDMA); Wideband CDMA.

EE 407 - Electromagnetic Waves; Weekly hours: 2+1, ECTS: 5

In this course we aim to introduce the students to basic concept of electromagnetic waves, Maxwell's equations, Propagation of electromagnetic waves, Waveguides, antennas and radiation, Introduction to electromagnetic waves, Maxwell's equations in time and frequency domains, Wave equation, Uniform plane electromagnetic waves; reflection and refraction. Introduction to transmission lines, waveguides, antennas and radiation.

CE 407 - Software Engineering; Weekly hours: 2+1, ECTS: 4

To explain what software engineering is and why it is important; To explain some ethical and professional issues that are important for software engineers; To explain what a socio-technical system is and the distinction between this and a computer-based system; To discuss legacy systems and why these are critical to many businesses; To explain what is meant by a critical system where system failure can have severe human or economic consequence; To introduce software process models and to describe some generic process models and when they may be used; To introduce CASE technology to support software process activities; To introduce the concepts of user and system requirements; To distinguish the role of requirements management in support of other requirements engineering processes; To introduce architectural design and to discuss its importance; To explain the advantages and disadvantages of different distributed systems architectures; To discuss client-server and distributed object architectures; To introduce peer-to-peer and service-oriented architectures as new models of distributed computing; To discuss the essence of agile development methods; To explain the principles and practices of extreme programming; To introduce software verification and validation and to discuss the distinction between them; To explain the distinctions between validation testing and defect testing; To describe the principles of system and component testing; To introduce the fundamentals of software costing and pricing; To explain why different techniques should be used for software estimation; To introduce the quality management process and key quality management activities; To explain the role of standards in quality management. Course Contents: Introduction to software engineering; Socio-technical system; Critical system; Software processes; Software requirements; Requirement engineering processes; Architectural design; Distributed systems architecture; Rapid software development; Verification and validation; Software testing; Software cost estimation; Quality management.

EE 416- Introduction to Robotics; Weekly hours: 2+0, ECTS: 4

The course introduces students to the basics of modeling, design, planning and control of robots. The material covered represents an overview of relevant results in geometry, kinematics, statics, dynamics, and control. Course Contents: Introduction. Spatial descriptions 1 and 2.Kinematics 1 and 2.Velocities. Explicit forms of static forces. Vision of robotics.Inverse kinematics/generation of trajectories. Dynamics: explicit forms. PID control. Control: joint control. Control: work space control. Force control.

ARCHITECTURE

FIRST YEAR

SECOND SEMESTER

ARCH 102 - Architectural Design I;Weekly hours: 2+2, ECTS: 5

The aim of the course is introduction to the basic features of the architectural and design features of the space and facilities. Fundamentals of Architecture Design: Architecture as an idea, theory and materialization. Drawing freehand. Mechanical drawing: Basic rules of painting, orthographic plan, section, evaluation perspective. Specific principles.Modeling.Skills in design, awareness and perception, visual assessment, organizational ideas, formal relations.Hierarchy in two and three dimensions.Interaction between object and space/environment.

ARCH 103 - Design Studio I;Weekly hours: 0+4, ECTS: 5

Completion of the project for building a small size at a given draft plan with a simple plan and simple structure. Students complete a project for building a small size at a given draft plan with a simple and simple structure, using materials such as wood, brick or stone. The schedule of the project should be consistent with the spatial constraints. The completed project will be presented and exhibited.

ARCH 104 - History of Architecture and Art I; Weekly hours 2+2, ECTS: 5

Students acquire knowledge of different concepts of history of art and architecture in relation to socio-economic conditions in the respective period of the development of civilization. Overview of key objects from the history of architecture, as representatives of different eras throughout history and create a wide range of architectural styles. This course deals with the analysis of objects in terms of structure, form and symbolic content, concentrating on architectural beginnings in prehistory, then Mesopotamia, Egypt, Persia, Aegean culture, Greek and Roman civilizations, the influence of the old century in further development of architecture.

ARCH 105 - Introduction to Architecture;Weekly hours 2+2, ECTS: 5

The course provides an opportunity for introducing the basic concepts used in architectural design, covers fundamental aspects of architecture, mainly architectural forms, structures and functions. Definition of architecture and architectural forms: basic elements, basic forms (2D), basic bodies (3D) and the characteristics of the forms. Forms: Laws perception of visual organization (Gestaltstheory) and principles of composition. Proportion and scale.Forms and space in architecture - bodies and cavities.Organization of forms and architectural space.Texture and architectural acoustics.Color and light in architecture.Structure in Architecture - Architectural elements and structural systems. Function architecture. Physical and cultural determinants in architectural forms.Architectural products in their context.

SECOND YEAR

FOURTH SEMESTER

ARCH 205 - Architectural Design III, Weekly hours 2+2, ECTS: 5

Creative thinking in the creation of an architectural project, exploring different strategies in creating drawings and models, and their relationship to psychological, physiological, sociological and cultural needs. By making the project the students will be able to learn the basic principles and elements of architectural design. Extension of the subject Architectural Design II.Spatial concepts, relations between interior and exterior, vertical part of the plan; facade as a team and understanding the structural concept of the building. The basic example is based on the concept of home (house) while taking into account the structure to include harmonization of the house, and openness of the house to the outside world.

ARCH 206 - Design Studio III, Weekly hours 0+4, ECTS: 5

Students complete a project for a larger building in an urban environment, with complex layout, taking into account the structural layout and dimensioning, design of useful space, and imposed requirements for fire protection. The course is a continuation of the subject Design Studio II. A project for building more urban, with more complex structure: defining the project, modular layout of the project, structural layout and design, technology, construction, designing useful space, requirements imposed for the protection of fires. The project will be completed with a public presentation and exhibition.

ARCH 207 - Computer Aided Design; Weekly hours 2+1, ECTS: 5

The main objective of this course is to introduce the students into the basics of computer aided design (CAD). Using CAD programming packages, the student will prepare full three-dimensional display architecture. Computer Aided Design (CAD) systems enable multiple possible solutions, evaluating them and if necessary correct the design. Elements of 2D and 3D graphics, elements of three-dimensional computer image layers, basic graphic elements projections, views, sections, transformations, rotation, and perspective will be part of this course as well as using the drawing tools of structural elements.

CIV 204 - Strength of Materials; Weekly hours 2+2, ECTS: 6

Students will become familiar with the concept: different kinds stresses, deformations, different types of modules, and stress - deformation depending on the different structural elements: columns, beams, springs, shafts. Introduction, definition of stresses and deformations, types of stresses, fundamental hypothesis and principles. Stresses and deformations in axially loaded items, diagram, dimensioning and permissible stresses, axial loading in statically undetermined problems. Items stressed by a pure shear, analysis and condition of stresses and deformations. Moments in flat surfaces, static moment, inertia moments of elementary and complex cross sections, resisting moment.Stresses from transverse load, normal and tangent stresses, analysis of a condition of stresses, trajectories of main stresses.Stresses in obliquely bending.Condition of stresses in an eccentric action of a normal force, core of a section, Stability of pressed rods, critical buckling force, buckling length, slenderness of rods.Stresses of torsion.Deformations of line beams, differential equation of an elastic line, Mohr's graph-analytical method, static undetermined beams, definition of an external and internal static uncertainty, decomposition method, tri-moment rule.

ARCH 213 - Acoustics in Architecture; Weekly hours 2+1, ECTS: 4

This course covers the fundamental theories, such as hearing, room acoustics, styles of music and architecture. Through assignments, discussions and projects, students will learn to create acoustic models of the selected/existing buildings as well as analyze the sound qualities in these spaces. Students will be asked to prepare/lead the weekly discussion for a selected topic from the textbook. Introduction; Acoustic and the Performers; Sound propagation; Physics of sound; Acoustics and Musical Periods - Baroque and Classical Periods; Perception of sounds; Sound Measurement; Working with decibels and sound level; Acoustics and Musical Periods - Romantic and Twentieth Century Periods; Acoustical properties of building materials; Noise criteria and effects of noise; Reverberation time/ Impulse response theory Handout; Acoustics and Musical Periods - European Opera; Room acoustics: design for speech; Design of Theaters and Concert Halls Handout.

MAN 212 – Entrepreneurship; Weekly hours: 2+1, ECTS: 5

There has never been a more invigorating and opportunistic time to study entrepreneurship. Around the world, the current economic crisis is not just negatively affecting business, this crisis is also generating business opportunities for the creative and daring. This course aims to show how to take advantage with entrepreneurship and to introduce the students to the process of entrepreneurial success and shows them how to be effective every step of the way. Introduction to Entrepreneurship Recognizing Opportunities and Generating Ideas Feasibility Analysis; Writing a Business Plan Industry and Competitor Analysis Developing an Effective Business Model Preparing the Proper Ethical and Legal Foundation Assessing a New Venture‟s Financial Strength and Viability Building a New Venture Team Getting Financing or Funding Unique Marketing Issues The Importance of Intellectual Property Preparing for and Evaluating the Challenges of Growth Strategies for Firm Growth.

THIRD YEAR

SIXTH SEMESTER

ARCH 304 - Architectural Design V; Weekly hours 2+2, ECTS: 6

Students acquire knowledge how professionally to solve project tasks and how to master the techniques of systematic analysis, re-compositions and use of program components in the design of strategies to resolve complex situations (educational institutions and hospitals). Genesis.Classification of buildings; aspects that influence project program. Programming and planning factors: zoning, legislation, planning the location, space organization. Shaping and the factors that influence on it (basic spatial systems, the configuration structure, typological and morphological patterns specific factors , structural , technical and technological concepts, energy and requirements of the environment, spatial norms and standards) . Detailed review of the specific design concepts; case study for a variety of programming and contextual situations as educational institutions and hospitals.

ARCH 305 - Design Studio V; Weekly hours 0+4, ECTS: 6

The objective of this course is to upgrade the knowledge of students in the field of design, depending on the interest of the studio. Areas of design that are the subject of upgrading Design Studio IV. Project task is designed depending on the focus of the studio. The selected mentor guides the student, while working closely with the lecturers of technical subjects.

RMNS 307 - Research Methods for Natural Sciences; Weekly hours 2+1, ECTS: 5

To introduce some of the major issues in understanding of natural and technical sciences, to gain an understanding of the nature of research, to make distinction among several research methods and their application, to gain some experience in writing research proposals, to provide some skills on reporting. The course defines the understanding of science and engineering and describes the links between the interrelated technical subjects. Further, it considers the methods of scientific research and focuses on the five methods most widely used for natural sciences and engineering, giving much emphasis on experimental and field studies research methods. It also stresses the importance of simulation and modeling and integrated research methods. It gives some clues on the important aspects of writing and presenting scientific reports (thesis). Finally it provides some information on research ethics and on resolving controversies in research.

CIV 314 - Building Technology and Materials; Weekly hours 2+1, ECTS: 5

Students are introduced to the basics of building technology and materials. Overview of the development and use of construction materials throughout history.Review and analysis of the properties of different types of construction materials.Development of building materials throughout history.Criteria for the selection of construction materials.Systematic review of the properties of various building materials. Architectural and design solutions in finishing the construction of buildings and during their surface treatment.

ARCH 307 - Theory of Architecture; Weekly hours 2+1, ECTS: 5

This course will provide knowledge in basic architectural forms, need for cooperation during design, complexities in architecture, basic geometric forms, a lot of design alternatives, as well as the two languages used in architecture. Physical laws for architecture. Scientific base for creation of architecture forms. Hierarchical cooperation in architecture: need of mathematics for ornaments. Sensor value of ornaments.Life and complexity in architecture – analogy with thermodynamics.Architecture, pattern and mathematics.The role of path design as a mean for relevance transfer.Modularity and design alternatives.The basic geometrical forms.Memetic modernistic theory.Languages of architectures.

FOURTH YEAR

EIGHTH SEMESTER

ARCH 404 - Urban Planning; Weekly hours 2+2,ECTS: 6

Introduction to methods of urban planning taking into account various operational and analytical methods.Methods of urban planning, analytical and operational methods and techniques for distribution of land use; Organizational functions; management networks; templates physical structure of cities.

ARCH 405 - Design Studio VII (Project II); Weekly hours 0+4,ECTS: 6

The objective of this course is upgrading the knowledge of students in the field of design and preparation of diploma work. Areas of design that are the subject of upgrading Design Studio VI, and parallel preparation of the diploma work. Project task is designed depending on the focus of the studio. The selected mentor guides the student, while working closely with the lecturers of technical subjects.

ARCH 406 - Planning Studio; Weekly hours 2+1, ECTS: 5

The Planning Studio will challenge students to integrate other planning coursework, prior academic work, their own life experiences, professional training and experience, and an understanding of urban life in response to a real-world project that will require broad, detailed data collection and analysis and the development and presentation of appropriate planning goals, recommendations, policies, concepts, plans and designs at either a regional, local, or site-specific scale. Introduction.Bridging Planning theory and practice.Institutional support for community-based architecture and planning.An evaluative framework for community-based design.Multiplying knowledge.Funded planning and design studios.

ARCH 413 - Sustainable Architecture; Weekly hours 2+1, ECTS: 4

Introduction to the fundamental concepts of sustainable and ecological architecture.Architectural performance and shaping, energy efficiency, environmental protection and material technology.Introduction; sources of energy, energy and environment; historical development and contemporary technologies.Energetic rational, law energetic and energetic sustainable architecture.Architecture and ecology.Passive solar architecture.Calculations, dimensioning, designing, simulation.Materials, prefabrication, shaping, intelligent architecture.

CIV 403 - Infrastructure Structures; Weekly hours 2+1, ECTS: 5

Acquisition of the basic knowledge in the field of bridges, tunnels, retaining walls and culverts. General definitions for tunnels.Geological, tectonic and hydrological characteristics of the rocks through which tunnels are built. Light profile and shape of tunnels. Methods for tunnels construction.Retaining walls and basics of their design.Types of culverts and their applications.

CIV 409 - Construction Regulations; Weekly hours 2+0, ECTS: 4

Acquisition of knowledge in the field of civil engineering regulations, standards and alignment with quality.Harmonization of the regulations. The influence of EU in the development of the standards New approach and global approach directives. Quality infrastructure.Quality infrastructure in Macedonia. Review of national legislation. The role of national standardization in the application of the European law in the free movement of goods.Basis for standards and standardization.Contemporary standardization.International and European standardization organizations.National organization for standardization.Construction law. The role of the Chamber of authorized architects and authorized engineers.

CIVIL ENGINEERING

SECOND YEAR

FOURTH SEMESTER

CIV 204 - Strength of Materials; Weekly hours 2+2, ECTS: 5

Students will become familiar with the concept: different kinds stresses, deformations, different types of modules, and stress - deformation depending on the different structural elements: columns, beams, springs, shafts. Introduction, definition of stresses and deformations, types of stresses, fundamental hypothesis and principles. Stresses and deformations in axially loaded items, diagram, dimensioning and permissible stresses, axial loading in statically undetermined problems. Items stressed by a pure shear, analysis and condition of stresses and deformations. Moments in flat surfaces, static moment, inertia moments of elementary and complex cross sections, resisting moment.Stresses from transverse load, normal and tangent stresses, analysis of a condition of stresses, trajectories of main stresses.Stresses in obliquely bending.Condition of stresses in an eccentric action of a normal force, core of a section, Stability of pressed rods, critical buckling force, buckling length, slenderness of rods.Stresses of torsion.Deformations of line beams, differential equation of an elastic line, Mohr's graph-analytical method, static undetermined beams, definition of an external and internal static uncertainty, decomposition method, tri-moment rule.

MATH 202 - Differential Equations; Weekly hours: 2+1, ECTS: 5

The objectives of the course are to give students knowledge of differential equations, solving them using software and application of differential equations in engineering. Course Contents: Introduction to Ordinary Differential Equations (What is an Ordinary Differential Equation (ODE), How to recognize the order of an ODE, Formation of differential equations), First-order ODEs (Solution of ODEs by direct integration, Solution of ODEs by separating the variables), First order ODEs (Solution of ODEs by an appropriate substitution, Solution of ODEs by an integrating factor, Solution of Bernoulli's equation), Homogeneous differential equations of second order. Solution of ODE of the form $\frac{d^2y}{dx^2} \pm n^2 y = 0$.Non-homogeneous differential equation. Solution of ODE of the form y"=F(y, y') . ODE Applications (Modeling vertical motion – the Galilean approach, Modeling fish population, Modeling radioactive decay, Modeling of cold medication, Modeling of accumulation of pollutant, Qualitative analysis of linear differential equations of first order, Vertical motion, Model for current in an LRC loop),Introduction to computer software ODE Architect Solver Tool and how to use the software for solving differential equations and applications modeled by differential equations.

STA 201 - Probability and Statistics; Weekly hours: 2+1, ECTS: 5

The aim of the course is to give some basic terms, concepts, and learn how the stochastic methods come about and why they work. This course will provide students with a good understanding of the theory of probability, both discrete and continuous, including some combinatorial, a variety of useful distributions, expectation and variance, analysis of sample statistics, the law of large numbers, central limit theorem, confidence interval, testing hypotheses, t-test, and comparing two samples. After completing this course, students will be able to: Develop the ability to solve problems using probability, Make connections between probability and other branches of mathematics, Understand the meaning of statistical statements as well as judge the quality of their content, when facing such problems on your own, Design and conduct experiments, as well as to analyze and interpret data. Course Contents:Sets and operations with sets; Sample space and events; Probability function definition; Products of sample spaces; Conditional probability; Multiplication rule; The law of total probability; Bayes' rule and independence; Discrete and continuous random variables; Expectation and variance; Joint distribution; Covariance and correlation; The law of large numbers; Central limit theorem; Basics of statistical models; Data analysis; The method of least squares; Confidence intervals for the mean; Testing hypothesis; t-Test.

MATH 203 - Mathematical Modelling; Weekly hours: 2+1, ECTS: 5

The aim of the course is to give the students basic knowledge of mathematical modeling with stress on empirical modeling. Students will learn how to analyze and interpret the experimentally obtained data, hot to develop empirical model, but also to analyze the empirical models using software. Course Contents: Introduction to mathematical modeling (What is mathematical model, Properties of models, Judge a model, Building a model, Steps in model building, Model application areas, Model classification, Characteristic nature of process models, Empirical models, Model equation forms), Treatment of engineering data - Numerical interpolation using

computer software MATLAB, Treatment of engineering data - Numerical differentiation using computer software MATLAB, Treatment of engineering data - Numerical integration using computer software MATLAB, Empirical models - Linear regression model (Correlation coefficient and its properties, Computing the equation of regression line, Short-cut formulas, Measures of goodness of fit, Uncertainties of the least squares coefficients). Using MATLAB software for least- squares calculations, Empirical models and physical laws). Empirical models - Multiple regression model (Estimating the coefficients, Developing a model, Estimating least-squares coefficients in multiple regression model by MATLAB software, Drawing graphs with MATLAB software, Confounding and collinearity, Model selection).

CIV 205 - Kinematics and Dynamics; Weekly hours 2+1, ECTS: 5

The objective of the course is the students to become able to understand the basic kinematic and dynamic characteristics of movement, knowing the laws of dynamics and the ability of their application in solving of application problems related to the movement of bodies. Kinematics.Introduction.Finite equations of movement of a point, speed and acceleration.Movement of a point in a natural coordinate system.Movement of a point in a polar coordinate system. Kinematic diagrams. Movement of a rigid body in space, degree of freedom. Finite equations of free movement of a rigid body around a immovable axis. Complaint movement of a rigid body.Mechanisms, degree of freedom, instantaneous poles of speeds. Dynamics: Differential equations of movement of a point and general integration. Dynamics of a rectilinear motion and oblique shot.Forced movement of a point of a material line.Dynamics of a rigid body during translation.Dynamics of a rigid body during a rotation around a stationary axis.Differential equations of movement of a material system.Laws of dynamics of a material system.Principles in dynamics.

MAN 212 – Entrepreneurship; Weekly hours: 2+1, ECTS: 5

There has never been a more invigorating and opportunistic time to study entrepreneurship. Around the world, the current economic crisis is not just negatively affecting business, this crisis is also generating business opportunities for the creative and daring. This course aims to show how to take advantage with entrepreneurship and to introduce the students to the process of entrepreneurial success and shows them how to be effective every step of the way. Introduction to Entrepreneurship Recognizing Opportunities and Generating Ideas Feasibility Analysis; Writing a Business Plan Industry and Competitor Analysis Developing an Effective Business Model Preparing the Proper Ethical and Legal Foundation Assessing a New Venture‟s Financial Strength and Viability Building a New Venture Team Getting Financing or Funding Unique Marketing Issues The Importance of Intellectual Property Preparing for and Evaluating the Challenges of Growth Strategies for Firm Growth

THIRD YEAR

SIXTH SEMESTER

CIV 307 – Theory of Structures II; Weekly hours 2+2, ETCS: 6

Judges get familiar with basic concepts and methods of line analysis Systems of carriers, application of the matrix method of deformations and introduction to the method of Finite elements. The curricula includes the following themes: Introduction. Basic concepts and concepts in matrix analysis.Basic principles in Analysis.Principles of virtual work.Energy theorems.Flexibility and Rigidity.Matrices of the flexibility and rigidity of the element-stick.Matrices of Flexibility and rigidity of gentle elements.Matrices of transformations from a local to Global system.Matrix deformation method for analysis of line systems.The matrix of rigidity of the element.Global matrix of rigidity. Loads of elements and Equivalent node loads. Matrix analysis of lattice and frame systems.Special Topics in Matrix Analysis.Analysis of the influence of horizontal loads.An Introduction to the Finite Element Method.

CIV 308 – Concrete Technology; Weekly hours 2+2, ECTS: 6

Acquisition of knowledge from the theory and technology of concrete, quality of constituentsMaterials, design of the composition of the concrete-recipe, technological procedures ofPreparation, transport, installation, concrete properties. The curricula includes the following themes: Introduction. Cement - in general, the basis of the production of portland cement, mineral phases of
Portland-cement clinker and cement separation. Cement - the basic aspects of The process of hydration of the cement. Water - quality conditions. Aggregate – Basic Conditions for quality, shape and texture of the grains, strength, corrosion resistance of the aggregate. Additives - types of additives, quality conditions. Properties of

fresh concrete - selection and composition Concrete, technological procedures for the construction, transport, installation and care of Embedded concrete, concrete production in special conditions of low or high Temperatures. Hardened concrete - general, basic mechanical properties, pressure strength, Brand of concrete, tensile strength, deformable characteristics of concrete, The behavior of multiple multiplying loads, the elasticity module and the Poisson Coefficient. Rheological properties of concrete.Properties of concrete durability.Thermal Properties of concrete. Concrete project - lots of concrete, control of the
production of Concrete.

RMNS 307 - Research Methods for Natural Sciences; Weekly hours 2+1, ECTS: 5

To introduce some of the major issues in understanding of natural and technical sciences, to gain an understanding of the nature of research, to make distinction among several research methods and their application, to gain some experience in writing research proposals, to provide some skills on reporting. The course defines the understanding of science and engineering and describes the links between the interrelated technical subjects. Further, it considers the methods of scientific research and focuses on the five methods most widely used for natural sciences and engineering, giving much emphasis on experimental and field studies research methods. It also stresses the importance of simulation and modeling and integrated research methods. It gives some clues on the important aspects of writing and presenting scientific reports (thesis). Finally it provides some information on research ethics and on resolving controversies in research.

CIV 310 - Pre-Stressed Concrete; Weekly hours 2+0, ECTS: 4

Getting knowledge about pre-stressed structures, basic design of elements and structures.Introduction.Materials for the making of pre-stressed concrete.Concrete.Steel for pre-stressing.Mixture injection.Classification of pre-stressed steel.Classification according to the way of pre-stressing.Classification according to the level of pre-stressing.Pre-stressing of elements.Systems for pre-stressing.Preparation work for the execution of pre-stressing.Tightening of the reinforcement for pre-stressing. Control over the force of pre-stressing. Calculation of pre-stressed elements.Choice of the cross-sections.Dimensioning of total and limited pre-stressed elements.Proof for limit states of tensioning.Layout of the reinforcement in cross sections.Running of the cables along the beam. Securing the areas where the pre stressed force is applied. Ideal effects of the pre-stressing forces.Real effects from the effects from the pre-stressing forces.Checking of the limit states of bearing capacity and usability. Partial pre-stressed elements and structures. General, choice of the level of pre-stressing.Recommendations for designing according to PNB90.Calculating of partial pre-stressed elements.

CIV 314 - Building Technology and Materials; Weekly hours 2+1, ECTS: 5

Students are introduced to the basics of building technology and materials. Overview of the development and use of construction materials throughout history.Review and analysis of the properties of different types of construction materials.Development of building materials throughout history.Criteria for the selection of construction materials.Systematic review of the properties of various building materials. Architectural and design solutions in finishing the construction of buildings and during their surface treatment.

FOURTH YEAR

EIGHTH SEMESTER

CIV 405 – Foundation; Weekly hours 2+2, ECTS: 6

This course aims to introduce the Management with modern techniques of designing / dimensioningthe foundations and Familiarization with design regulations. The curricula includes the following themes: Shallow foundation. Classification of foundations.Lentovent foundation. The foundation is small and small Great eccentricity in one direction. Centering the foundation single.Foundation onExtraction.A thorough beam.Centered thorough beams.A thorough barbecue.Thick plate.General protection of the construction pit.Construction pit in soils without underground water.Construction pit in soils with the appearance of underground water.Dimensioning.SurfaceDrainage.Deep foundation.Funding of columns.General principles.Loading capacitySingle digit.Methods of calculation.Colloid foundations.Overhead plate.

ARCH 406 - Planning Studio; Weekly hours 2+1, ECTS: 5

The Planning Studio will challenge students to integrate other planning coursework, prior academic work, their own life experiences, professional training and experience, and an understanding of urban life in response to a real-world project that will require broad, detailed data collection and analysis and the development and presentation of appropriate planning goals, recommendations, policies, concepts, plans and designs at either a regional, local, or site-specific scale. Introduction.Bridging Planning theory and practice.Institutional support for community-based architecture and planning.An evaluative framework for community-based design.Multiplying knowledge.Funded planning and design studios.

CIV 403 - Infrastructure Structures; Weekly hours 2+1, ECTS: 5

Acquisition of the basic knowledge in the field of bridges, tunnels, retaining walls and culverts. General definitions for tunnels.Geological, tectonic and hydrological characteristics of the rocks through which tunnels are built. Light profile and shape of tunnels. Methods for tunnels construction.Retaining walls and basics of their design.Types of culverts and their applications.

CIV 409 - Construction Regulations; Weekly hours 2+0, ECTS: 4

Acquisition of knowledge in the field of civil engineering regulations, standards and alignment with quality.Harmonization of the regulations. The influence of EU in the development of the standards New approach and global approach directives. Quality infrastructure.Quality infrastructure in Macedonia. Review of national legislation. The role of national standardization in the application of the European law in the free movement of goods.Basis for standards and standardization.Contemporary standardization.International and European standardization organizations.National organization for standardization.Construction law. The role of the Chamber of authorized architects and authorized engineers.

ARCH 413 - Sustainable Architecture; Weekly hours 2+1, ECTS: 4

Introduction to the fundamental concepts of sustainable and ecological architecture.Architectural performance and shaping, energy efficiency, environmental protection and material technology.Introduction; sources of energy, energy and environment; historical development and contemporary technologies.Energetic rational, law energetic and energetic sustainable architecture.Architecture and ecology.Passive solar architecture.Calculations, dimensioning, designing, simulation.Materials, prefabrication, shaping, intelligent architecture.