**DEPARTMENT OF SOFTWARE ENGINEERING**

**Study Program “Bachelor”**

 **in**

**Software engineering**

**Course Description**

**2021-2022**

**1 st Semester**

**Course: Introduction to Economics**

**Short Description**

Introduction to Economics course (ITE 102) will introduce the students with economic principles, institutions, issues and mechanisms. Primary emphasis is placed upon acquiring skills with which to analyze current economic issues, in focus of establishing critical thinking on understanding everyday life economic problems, and using economic theory to understand and evaluate policy recommendations and proposals. The Microeconomics part of the course will treat in a rigorous way the economic agents’ behavior and choices, their interactions within the different market structures and the influence of market structure on the economic outcome. Topics include: economic principles and modeling; allocation of resources, optimization and pricing; consumer behavior and firm decision-making; perfect and imperfect market structure behavior.

**Course: Academic Reading and Writing I**

**Short Description**

Academic English Reading and Writing I has been designed to prepare students with the required reading and writing skills for success at university level. More specifically, the course focuses on such skills as critical and analytical thinking, skimming and scanning techniques, the writing process, proper identification and documentation of outside sources aiming at compiling a mini-research paper/project and/or report as its main requirement.

Academic Reading and Writing I is designed to focus on the main academic writing and study skills. Special attention will also be paid to developing students’ abilities in professional writing as well including transferable lifelong learning skills such as research and documentation skills.

Particular emphasis will be placed on the main steps of the writing process, the main writing components starting from paragraph to essay to research paper/project/article as well as oral presentation skills.

**Course: Calculus I**

**Short Description**

The purpose of this course is to teach the students the basic techniques of differentiation and integration such as integration by parts and the chain rule. Some real world applications will also be integrated into the course as examples like integral applications in geometry, science and engineering. As such, it helps students improve technical calculation skills as well as mathematics experience required for academic success even in other courses. To serve this purpose, students are expected to master some fundamental skills in differentiation and integration methods.

**Course: Research Methods**

**Short Description**

This course is designed to improve students’ ability to make a scientific research. As such, it helps students improve skills, knowledge and competences on scientific research issues. Furthermore, students will be exposed to various research situations based on primary, secondary and tertiary resources to be able to identify the right sources of data and information to be gathered, processed, analyzed and findings presented. The course provides comprehensive research theories, research methodologies and methods and research proposal writing and final research writing, etc. Students in the course will learn about the cyclical nature of applied research and the iterative process of research writing. To serve this purpose, students are expected to master fundamental skills on business research methods, ranging from understanding research methodology and understanding research methods, developing a research proposal, finalizing it and presenting professionally in both situations as independent / individual studies and work collaboratively too, with a facilitator.

**Course: Computer Application**

**Short Description**

This course aims to introduce students to the fundamentals of computer science, applications and programming. Students will learn the basis of the programming paradigm with real examples and modern programming languages used in the industry. In the practice part of the course, Java will be used.

**2nd Semester**

**Course: Physics I**

**Short Description**

The purpose of this course is to introduce the fundamental concepts of physics. It is meant to broaden the background of students so that their knowledge in software engineering combined with that in physical science be applied in designing/constructing better tools and products. Topics to be covered include: kinematics (motion in one and two dimensions); dynamics (motion and force); gravitation; circular and rotational motion; work, energy, and power; linear momentum and collisions; and fluids.

**Course: Linear Algebra**

**Short Description**

This course aim the student to be able to calculate solutions of systems of linear equations using different methods; To be able to calculate matrices, invers matrices and transpose matrices; To be able find the rank of matrices; To apply these concepts to some domains of science. To understand the concept of linear transformation. Demonstrate the ability to calculate several vectors and their base; To be able to understand the concept of eigenvectors and eigenvalues Demonstrate the ability of calculating different types of systems of linear inequities; Describe how to study the simplex method; Demonstrate the ability to use maximization and mineralization methods;

**Course: Introduction to Statistics**

**Short Description**

This course equips students with the fundamental statistical skills required to complete other courses in the curriculum which contain a significant quantitative component. This course covers the role of statistics in economics fields, probability, discrete and continuous random variables and probability distributions, random sampling and data description, point estimation of parameters, statistical intervals and tests of hypotheses. The level of statistical competency developed in this course will also be sufficient to enable students to conduct and interpret quantitative research at the undergraduate level. This course is an introduction to the nature of statistics; topics include: descriptive statistics and graphs, covariance, correlation, random variables, probability, discrete and continuous distributions, sampling, confidence interval, hypothesis testing.

**Course: Computer Communication and Networks I**

**Short Description**

Topics will include layered network architectures, basics of data transmission and encoding, packet switching networks, Ethernet technology, local area networks, routing protocols, network security, and applications in distributed computing.

**Course: Computer Science fundamentals**

**Short Description**

This course is an introduction to the design and analysis of efficient data structures. Topics include lists, stacks, queues, priority queues, trees, graphs, and their associated algorithms, sorting, searching and hashing techniques; time and space complexity.

**3rd Semester**

**Course: Fundamentals of programming I**

**Short Description**

The objective of this course is to provide students with fundamentals concepts of the object-oriented programming paradigm using the Java programming language. Important topics such as: object-oriented programming principles; classes, objects, and methods; inheritance and polymorphism; exception handling and assertions; GUI and event-driven programming; strings, characters and regular expressions; data structures, searching and sorting algorithms will be discussed in depth both on the theoretical and the practical aspect.

Students will be presented with multiple sample development examples and approaches that integrate together a variety of programming aspects. We take the object-first approach to teaching object-oriented programming with emphasis on proper object-oriented design. Illustrative diagrams are used to explain all key concepts of programming such as the difference between object declaration and creation, the distinction between the primitive data type and the reference data type, the call-by-value parameter passing, inheritance, and many others.

**Course: Fundamentals of physics**

**Short Description**

The purpose of this course is to introduce the fundamental concepts of physics. It is meant to broaden the background of students so that their knowledge in software engineering combined with that in physical science be applied in designing/constructing better tools and products. Topics to be covered include: kinematics (motion in one and two dimensions); dynamics (motion and force); gravitation; circular and rotational motion; work, energy, and power; linear momentum and collisions; and fluids.

**Course: Engineering Fundamentals**

**Short Description**

This course provides the students with fundamental understanding of Engineering and in particular of energy, electric and electronic circuits. It presents an essential background for software and industrial Engineering students. Topics include: Units of Measurement, Scientific Notation, Engineering Notation and Metric Prefixes, Metric Unit Conversions; Voltage and Current Sources, Resistors; Ohm’s Law; Kirchoff’s Laws; Jule’s Law: Energy and Power; Resistors in Series; Resistors in Parallel; Series-Parallel Resistive Circuits; Source Conversions, and certain selected topics related to Superposition Theorem, Thevenin’s Theorem, Norton’s Theorem.Nodal and Mesh Analysis of DC circuits.

**Course: Calculus II**

**Short Description**

This course introduces fundamental concepts of calculus with applications to engineering. It is meant to provide a solid calculus background so that students in Software Engineering will have a calculus context for their studies. Topic covered include: Integration Techniques -Integration using Partial Fractions, Integration Strategy, Improper Integrals and Comparison Test for Improper Integrals. Applications of Integrals - Arc Length, Surface Area, Centre of Mass/Centroid, Hydrostatic Pressure and Force.

**Course: Ethics**

**Short Description**

The course of Ethics is designed to improve students’ ability to analyze and evaluate the main knowledge on Ethics. As such, it helps students to distinguish between ethics, morals, codes of conduct and the law, understanding the ethical dilemmas facing managers.

It also explores models that supports ethical decision making and their limitations, while be aware of different philosophies and their implications. Through this course students go through a series of cases focusing on contemporary issues, examining the evolution of governance and its practice.

Ethic’s course empowers students to understand corporate social responsibility and philanthropy, as well as to consider the role of business in relation to ethics, human rights and sustainability.

**4th Semester**

**Course: Fundamentals of programming II**

**Short Description**

The course will cover two important aspects of object oriented programming: at one hand the methodology of analysis and design of a complex project, abstracted in object oriented terms and at the other hand the materialization of the abstract model in a software program by applying the constructs of the Java programming language . Students will advance their knowledge in topics like Strings, Characters and Regular Expressions; Files, Streams and Object Serialization; Algorithms Analysis through searching, sorting and recursion; Generic classes, methods and data structures.

Furthermore, they will be able to learn through the course advanced techniques in GUI programming and be introduced to databases-related applications. This set of tools will equip the students with the ability to build from scratch important Java programs that find applications in real-world scenarios by addressing and solving specific issues. Students will also be presented to frameworks allowing them to develop Java Web Applications while focusing on key concepts, elements and technologies.

**Course: Calculus III**

**Short Description**

This course introduces advanced concepts of calculus. It is meant to provide a solid calculus background so that students will have a calculus context for their studies. Topic covered include: Mainly the part of multivariable calculus that can be differentiated. The central part is the study of functions of several variables, partial derivatives, and optimization problems using Lagrange multipliers. Also, study vectors, vector-valued functions, and parametric curves. As such, it helps students improve technical calculation skills as well as mathematics experience required for academic success even in other courses. To serve this purpose, students are expected to master some fundamental skills in multiple integrals and in vector calculus.

**Course: Introduction to Software Engineering**

**Short Description**

This course aims to present an engineering approach that will serve as a guide to build and design high-quality software. Present a process including a set of methods, tools and techniques to promote productivity programming. It applies engineering to software. It studies the application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software.

**Course: Engineering Chemistry**

**Short Description**

This course aims to give e general chemistry knowledge to engineering students. This covers fundamental aspects of Inorganic, Organic, Analytical and Physical chemistry Topic covered include: atomic and molecular structure; chemical bonding; stoichiometry, gases, liquids, and solids; water technology, environment and biodegradable materials, waste management, corrosion, equilibrium; chemical thermodynamics; electrochemistry etj..

**Course: Security Engineering**

**Short Description**

Learn IT security fundamentals. Ensure operational, organizational, and physical security; Use cryptography and public key infrastructures (PKIs); Secure remote access, wireless networks, and virtual private networks (VPNs); Authenticate users and lock down mobile devices; Harden network devices, operating systems, and applications; Prevent network attacks, such as denial of service, spoofing, hijacking, and password guessing; Combat viruses, worms, Trojan horses, and rootkits; Manage e-mail, instant messaging, and web security; Explore secure software development requirements; Implement disaster recovery and business continuity measures; Handle computer forensics and incident response; Understand legal, ethical, and privacy issues

**5th Semester**

**Course: Database System**

**Short Description**

This course presents the fundamental concepts of database systems. It provides a study of data models, data description languages, and query facilities including relational algebra and SQL, data normalization, transactions and their properties, physical data organization and indexing, security issues and object databases. It also looks at the new trends in databases, for example, Big Data and NoSQL. The knowledge of the above topics will be applied in the design and implementation of a database application using a target database management system as part of a semester-long group project.

**Course: Introduction to Operating System**

**Short Description**

This course will introduce operating system design and implementation. The operating system provides a well-known, convenient, and efficient interface between user programs and the bare hardware of the computer on which they run. The operating system is responsible for allowing resources (e.g., disks, networks, and processors) to be shared, providing common services needed by many different programs (e.g., file service, the ability to start or stop processes, and access to the printer), and protecting individual programs from one another.

At the end of this course students will be able to know:

* the purpose of an operating system,
* functions,
* types,
* comparing operating systems based on purpose, restrictions, compatibility etc.
* installing an operating system, processes, configurations,
* appropriate system as customer needs,
* maintenance and troubleshoot.

The course will start with a preliminary introduction of the modern operating system evolution during the last decades. An introduction to the open source kernels is made and the major components roles, implementation and functionalities are thoroughly explained. Particular emphasis will be given to three major OS subsystems: process management (processes, threads, CPU scheduling, synchronization, and deadlock), memory management (segmentation, paging, swapping), file systems, and operating system support for distributed systems.

**Course: Software Project Management**

**Short Description**

The aim of this course is to provide software engineering students with a comprehensive overview of the principles, processes, and practices of project management. After passing the course successfully, the students shall be able to conceptualize, initiate, plan and execute a project. Students will participate in a competitive team effort to propose a Software Project Management Plan.

**Course: Computer Architecture and Assembly Language/Microprocessor Systems**

**Short Description**

This course provides in the first part an introduction to Basic architecture of computer systems including fundamental concepts such as register structure, memory organization and management, organization of peripherals, and machine-level operations. The second part provides a background of knowledge and understanding of microprocessor systems.

Topics covered include: instruction sets, symbolic addressing, bus organization, instruction fetch and execution, read/write cycles, interrupt processing, I/O processing, general microprocessor design. Introduction to microprocessor architecture. Instruction sets, addressing modes, and programming. Memories, I/O systems, and interfacing. Development systems. Application to engineering systems.

**Course: Software Architecture and Systems**

**Short Description**

The course offers an introduction to design, analysis, documentation and implementation of software architectures. This course will show how developers use UML to document their architectural designs and how architecture can be understood from multiple perspectives and through different UML diagrams. Next, it will show different software architectures, which include when and how they are used, their advantages and disadvantages, and how they are represented visually. The course will also introduce the most common architectures, their qualities and tradeoffs. During the course students will learn how to evaluate architectures, what makes a good architecture and how to improve an architecture. In the project work student will document a Java Web-basedapplication with UML diagrams and analyze and evaluate the application’s architecture using the Architecture Tradeoff Analysis Method (ATAM).

 **6th Semester**

**Course: Introduction to Web Design**

**Short Description**

During this course students will be introduced with the basic concepts of web pages development in term of design and basic functionalities, including functional design. A significant weight will be given to the framework based development using HTML5 and CSS 3such as bootstrap, JavaScript and jQuery including responsive design. This course will examine the practical aspects of web site design and deployment. It is designed to make the student moderately proficient in producing a site through several methods. It goes form introduction to more sophisticated examples using modern HTML5 techniques for web site creation. Reading assignments and course lectures will be the basis of the two quizzes given during the course. Only material covered in the reading assignments and lectures prior to the quiz will be included on a quiz.

**Course: Computer Communication and Networks II**

**Short Description**

The course is the second one on computer networking. It assumes familiarity with the basics of network architecture including the physical layer, the link layer, the network layer, and the transport layer. This course will give to the students more deep knowledge on the networks, protocols and in the designing of the computer networks.

**Course: System Dynamics**

**Short Description**

Introduction to systems thinking and system dynamics modeling applied to strategy, organizational change, and policy design. Students use simulation models, management flight simulators, and case studies to develop conceptual and modeling skills for the design and management of high-performance organizations in a dynamic world.