**DEPARTMENT OF SOFTWARE ENGINEERING**

**Study Program “Master of Science”**

 **in**

**Computer Engineering and Information Technology**

**Profile : CEIT & Big Data**

**Course Description**

**2021-2022**

 **1st Semester**

**Course: User Interface Design**

**Short Description**

The course User Interface Design introduces proper design of user interfaces. We will look at how to design good user interfaces, covering important design principles (learnability, visibility, error prevention, efficiency, and graphic design) and the human capabilities that motivate them (including perception, motor skills, color vision, attention, and human error). This course examines systematic, disciplined and quantifiable approaches to designing high-quality, reliable and usable applications. We will learn techniques for evaluating and measuring interface usability, including heuristic evaluation, predictive evaluation, and user testing. We will learn how to conduct empirical research involving novel user interfaces. Students will develop User Interface design skills in knowledge within the context of established best practice in user interface design. Students are then prepared to 1) evaluate whether or not UI design is a viable career option for them, and 2) to pursue more advanced study in UI design if they choose to do so.

**Course: Advanced Java Programming**

**Short Description**

This course is designed to introduce to students’ the paradigm of generic programming, abstract data types and the concepts, generic classes and functions. As well as, developing skills to use collections in Java. Introducing graphics in Java, as well as design application with GUI.

**Course: Database Design and Administration**

**Short Description**

During this course students will be introduced with the basic concepts of data modelling and in particular the entity relationship model, schema normalization for and optimization, relation algebra and the database query language. To conclude, some database administrative aspects will be discussed.

**Course: Advanced Project Management**

**Short Description**

This course will prepare students to design, manage, and deliver complex project solutions. The course adopts a practitioner’s focus, and is consistent with the principles laid out in the Project Management Professional (PMP) certification

Students commence their study with an investigation into the Project Management Framework from PMI. Topics covered include scoping the project, project planning, and change control. Students then study project communications, the use of project management software, and the use of modeling and analysis tools. Key factors in project success, such as people management and the identification of risk factors, are also studied. Graduates of the course will use their knowledge to successfully implement projects across a range of industry sectors.

**Course: Advanced Research Methods**

**Short Description**

The MSc course provides a comprehensive introduction to research methods and methodologies, and foundational research theories. As such, students enrolled in this course will be provided with sound knowledge in both qualitative and quantitative research as well as the main phases of the writing process and data collection and processing methods. In addition, this course could be regarded as a foundation course for other master courses and thesis writing that students are supposed to submit by the end of their study program. The second part of the course will focus on individual projects and data gathering and analyses procedures. To serve this purpose, students are expected to master some fundamental skills in engineering research ranging from developing a research proposal to understanding research methodology and understanding research methods, populations and sampling, to name a few.

 **2nd Semester**

**Course: Data Visualization**

**Short Description**

This course will introduce students to the field of data visualization. Students will learn basic visualization design and evaluation principles, and learn how to acquire, parse, and analyse large datasets. Students will also learn techniques for visualizing multivariate, temporal, text-based, geospatial, hierarchical, and network/graph-based data. Additionally, students will utilize Matlab,Processing, D3, R and ggplot2, and many other tools to prototype many of these techniques on existing datasets.

**Course: Pattern Recognation**

**Short Description**

Foundations of pattern recognition algorithms and machines, including statistical and structural methods. Data structures for pattern representation, feature discovery and selection, classification. description, parametric and nonparametric classification, supervised and unsupervised learning, use of contextual evidence, clustering, recognition with strings, and small sample-size problems.

**Course: Fundations of Data Science and Data Structure**

**Short Description**

In this course students will learn concepts, techniques and tools they need to deal with various facets of data analytics and data science practice, including data collection and integration, exploratory data analysis, predictive modeling, descriptive modeling, data product creation, evaluation, and effective communication. The focus in the treatment of these topics will be on breadth, rather than depth, and emphasis will be placed on integration and synthesis of concepts and their application to solving problems. To make the learning contextual, exercises with datasets form variety of disciplines will be used.

**Course: Advanced Data mining**

**Short Description**

Data has been accumulating throughout the computer age in many forms, including database systems, spreadsheets, text files, and recently web pages. Data mining aims to search through data for hidden relationships and patterns in your data. This is a special topic course on data mining. We will cover advanced topics such as web data mining, stream data mining, relational data mining, tree/graph mining, spatiotemporal data indexing and mining, privacy-preserving data mining, high-dimensional data clustering, basics of natural language processing, social network and linkage analysis.

**Course: Network Programming**

**Short Description**

The purpose of this course is to provide a solid understanding of Network Programming and automation and Security concerns implementation. Moreover, it aims at providing solid knowledge in TCP/IP set of protocols as well as ARQ protocols and their programming with emphasis in socket programming. Network programming is based on Java and Python language. Meanwhile in Security, implementations based on Kali linux will be studied such as: Policy Rules in IPTABLES, Vulnerability Assessment in WEB and FTP, Scanning with Nmap tool, Reverse Engineering, Password Cracking, Wireless Cracking, Logging Spyware, Intrusion and Backdoor penetration etc Although emphasis will be put on all main tools of Kali Linux, special emphasis will be paid to penetration testing and ethical hacking tools.

 **3rd Semester**

**Course: Data Analysis I: Statistics**

**Short Description**

This course is designed to improve students’ ability to analyze and evaluate the sources commonly used in Statistics. As such, it helps students can explore the practical implications of the formal results to problem-solving, so students gain an understanding of the logic behind the techniques as well as practice in using them. The examples, exercises, and applications were chosen specifically for students in engineering and computer science and include opportunities for real data analysis.

The second part of the course will focus on individual projects and data gathering and analyses procedures. To serve this purpose, students are expected to master some fundamental skills in descriptive analysis, inferential analysis, and model building.

**Course: Data Analysis II:Machine Learning**

**Short Description**

This course provides a broad introduction to machine learning and statistical pattern recognition. Topics include supervised learning (generative/discriminative learning, parametric/non-parametric learning, neural networks, support vector machines); unsupervised learning (clustering, dimensionality reduction, kernel methods); learning theory (bias/variance tradeoffs, practical advice); reinforcement learning and adaptive control. The course will also discuss recent applications of machine learning, such as to robotic control, data mining, autonomous navigation, bioinformatics, speech recognition, and text and web data processing. This course aims to increase the skills of the students in the cloud design and especially in the implementation in Business related area. The different cloud architectures will be analyzed and implemented during the course by the students.

**Course: Web Engineering**

**Short Description**

The course Web Engineering introduces a structured methodology utilized in software engineering to Web development projects. The course addresses the concepts, methods, technologies, and techniques of developing Web sites that collect, organize and expose information resources. Topics covered include requirements engineering for Web applications, design methods and technologies, interface design, usability of web applications, accessibility, testing, metrics, operation and maintenance of Web applications, security, and project management. Specific technologies covered in this course include client-side (HTML, JavaScript, and CSS) and server-side (PhP). Many applications continue to be developed in an ad-hoc way, contributing to problems of usability, maintainability, quality and reliability. This course examines systematic, disciplined and quantifiable approaches to developing of high-quality, reliable and usable web applications. The course introduces the methodologies, techniques and tools that support their design, development, management, evolution, and evaluation.

**Course: Advanced Digital Design with Verilog FPGA**

**Short Description**

This course aims to guide the students to mastering FPGAs through digital system design. While doing this, the main focus will be on implementation. Hence, the students will grasp theoretical digital design concepts via implementing real-life applications. Verilog is a popular hardware description language (HDL) used to implement a digital system on an FPGA. The course will focus only on important and necessary topics. A special focus is given to student preparation in the FPGA programming field. Of great importance is the practical case study.