

Bachelor of Computer Science (Big Data)

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Program Structure

To qualify for award of the degree of Bachelor of Computer Science (Big Data), a candidate shall accrue an aggregate of at least 144 credit points (cp) which include core, electives and general education subjects and final year project.

Year 1

Programming Fundamentals

The broad aim of this subject is to develop in students an understanding of the fundamental principles of programming. The subject focuses on the object-oriented view of problem analysis and solving. It enables students to develop skills in the design and implementation of well-structured programs in a range of domains.

Problem Solving

This subject introduces the analysis of problems and the strategies used to manage them, primarily in the context of computing. Problem classification is introduced, as are formal and informal approaches to problem solving. The importance of method and method classification for problem solving strategies is motivated, and the need to compare and analyse strategies is justified. Introductory tools for the analysis of strategies are covered. Appropriate representations for problem solving are explored.

System Analysis

This subject provides an introduction to different techniques and technologies for understanding and specifying what a computer based information system should accomplish. It examines the complementary roles of systems analysts, clients and users in a system development life cycle. Students will learn different fact-finding techniques to elicit system requirements and how to develop business models, data and process models, and object models representing a system. Students will also make use of a Computer Aided Software Engineering (CASE) tool to build those models that capture the specifications of a system.

Data Management and Security

The subject investigates three major areas of modern data management systems: data modelling, data processing, and data security. The goal of the subject is to learn the fundamental concepts in data management including conceptual modelling, the relational data model, processing of relational data with Structured Query Language (SQL), enforcing the concepts of data confidentiality, integrity, and availability data management systems. The subject develops the skills in the design, implementation, processing, and security of data management systems. The subject covers the following topics in data security: discretionary access control, user management, enforcing data security and integrity. The subject also explains the important ethical issues associated with responsible disclosure, responsibility, liability, security weaknesses, and privacy in data management systems.

Object Oriented Design and Programming

The aims of this subject are to consolidate and extend student's knowledge and skills in structured programming and to develop their understanding and practice of object oriented programming. To achieve this aim the subject will provide students with an opportunity to develop further programming skills and good coding style; develop skills in using the object oriented concepts of encapsulation, inheritance, polymorphism, access control, overloading and messaging; develop and display competency in the design and implementation of object oriented programs to solve business problems.

Networks and Communications

This subject introduces students to the fundamentals of data communications and computer networks. Topics covered include: different types of data and the history of data communications; signals; modulation and multiplexing, switching and routing, network architectures: LANs, WANs and the Internet; Internet services and protocols; and emerging topics. The subject explains computer networking models that interconnect diverse communication systems, including the OSI reference model and the TCP/IP protocol Suite.

Introduction to Web Technology

This subject introduces students to fundamental web technologies that underlie the World Wide Web and its commercial applications. Topics include an overview of internet communications, an introduction to the web-browser/web-server client-server systems, HTML5/CSS/XHTML/XML markup languages, web forms and client side scripting. Students will build working web-sites with dynamic content. The subject explains the differences between client-side and server-side Web development, and demonstrates how to build simple applications using scripting and other tools. The subject also covers current Web standards and future W3C recommendations.

Year 2

Advanced Programming

This subject develops a thorough understanding of advanced programming features, and how to implement them in modern C++. It consists of three primary components, namely procedural programming, object-based/object-oriented programming, and generic programming. In addition to the core of each of those components, this subject addresses topics including resource management tied to RAII, in particular the management of dynamic memory; the use of the standard template library; profiling and debugging; programming for efficiency including concepts such as moving; exception handling; C++ RTTI; and recent additions to C++.

Database Systems

The subject presents advanced topics in the modern relational database technology and it introduces the new non-relational (NoSQL) database technologies. The relational database technology component of the subject includes database normalization,

introduction to indexing in relational database systems, programming of relational database server with stored PL/SQL procedures, functions, and triggers, concurrency control and database recovery techniques, design and programming of distributed database systems. The non-relational (NoSQL) database technology component of the subject includes a review of non-relational data models such as the key-value data model, document-oriented model, column-family stores, and graph data model. The non-relational component of the subject presents the new approaches to database design, data distribution, consistency preserving, and transaction processing in distributed and clustered database systems. Programming of NoSQL database server includes the new data definition and data manipulation languages, a new query language, indexing, design and implementation of replication and sharing.

Mathematics for Computer Science

MATH221 delivers core skills required for learning in computer science. Such skills include logic, formal proof, formal data structures and relations between these data structures. Realised mathematically as sets, bijections, equivalence classes, and graphs, MATH221 gives students hands-on experience with basic mathematical manipulations of these structures, as well as an exposition on their most fundamental properties.

Algorithms and Data Structures

Approaches to analysing algorithm complexity and implementation efficiency will be introduced; and used to motivate the development of appropriate abstract data types. Students will be taught to recognise the role of abstract data types and algorithms in solving real-world problems; and given the opportunity to implement solutions to such problems.

Human Computer Interaction

The subject provides students with an understanding of Human Computer Interaction (HCI) principles and practices, and how to apply them in the context of developing usable interactive computer applications and systems. The subject also emphasises the importance of taking into account contextual, organisational, and social factors in the design of computer systems. Students will be taken through the analysis, design, development, and evaluation of user interfaces. They will acquire hands-on design skills through an interaction design project. The subject will cover topics including user-centred design, the development process, prototyping, usability testing, measuring and evaluating the user experience and accessibility.

IT Project Management

The primary aim of this subject is to acquaint students with the methodologies and processes associated with the task of managing information technology and software development projects. Topics may include: stakeholder and impact analysis, setting project objectives and conflict resolution, project planning and the selection of appropriate project approaches, software project effort estimation, cost-benefit analysis, activity planning and scheduling, risk management, contract management, quality assurance, professional and ethical responsibilities, and case studies.

Year 3

Software Development Methodologies

The subject introduces to students modern methodologies for software development. Topics may include software development life cycle activities, the role of software process models, different types of evolutionary models, Unified Process and UML, agile principles of software development, Dynamic Systems Development Method (DSDM), Scrum and extreme programming, test driven software development, the Capability Maturity Model Integration (CMMI), software engineering knowledge management, software architecture, and emerging trends in software development processes.

Project

This subject is the capstone project for undergraduate students in the School of Computing and Information Technology it aims to provide students with: practical experience in complete systems development. The projects connect groups of students with supervisors and clients that are facing an ICT-based problem for which the students are required to find innovative and creative solutions. Working in groups, students design, implement, and document a system. This involves: project planning and scheduling, seminars and individual presentations, group coordination, research of proposed application domain, use of design methodologies, design documentation, coding, module and system integration, testing, verification, and implementation. Teams will meet weekly with supervisors to discuss progress and problems.

Internship

The core of the internship program is a six to eight weeks period of work placement spent in supervised work in environment-related work during the summer. The summer internship is not compulsory and when carried out as per the regulation of the College of Informatics and Computer Science can be counted as one of the elective courses only, so it cannot substitute for any required course. While the precise nature of internship will vary considerably, students will normally gain experience in some of the following areas: Software/hardware analysis, design, development and testing; The use and application of Software/Hardware tools in the design, development and implementation of problem solutions; Database design and development; Database implementation and maintenance; Installation and testing of hardware/software systems; Systems maintenance; Customer support; Software support for research projects; Software/Hardware evaluation and re-engineering. The internship requires a good deal of planning and arrangements from both the student side and the University side and have to be made in advance for it to serve its purpose. Students interested in the internship program must i) secure an internship position, and ii) approach the college before the beginning of the summer semester and submit an internship proposal. The university will do its best through the career advisor office and the College to secure internship positions every summer but it does not guarantee a placement for students. The internships available through the university will be distributed on a merit base and with consultation with external partners.

Major Subjects

Big Data Management

The subject addresses the problems of managing and processing of extremely large data sets in a single-server centralized computing systems and in multi-server clustered and distributed computing systems. The topics related to processing of large data sets in centralized environments include the techniques based on the classical data warehouse technologies ... For more content click the Read More button below. The subject addresses the problems of managing and processing of extremely large data sets in a single-server centralized computing systems and in multi-server clustered and distributed computing systems. The topics related to processing of large data sets in centralized environments include the techniques based on the classical data warehouse technologies such multidimensional data model, data warehouse architecture, data warehouse design both at conceptual and logical levels, and data warehouse processing with appropriate specialised query operations. The topics related to processing of large data sets in distributed environments include the techniques that can be implemented on the clusters of inexpensive computing nodes using MapReduce programming model. The subject introduces the students to the real time analytical processing of large data sets with analytical cluster-based distributed data processing systems. Discussion and hands on exercises related to these topics will equip students to meet the challenges in Big Data environments and appreciate the added challenges of dealing with unstructured data. Students will be presented with opportunities to do hands-on work with appropriate commercial tools.

Big Data Mining Techniques and Implementation

The subject considers the problems related to data mining techniques and implementation in Big Data environment. The topics include data pre-processing techniques, pattern, association and correlation discovery, classification and clustering, stream and real-time processing techniques and post-processing techniques like outlier detection, statistical and, proximity, and clustering base approaches. Laboratory classes and hands-on programming exercises related to these topics will provide the students with the abilities to design and implement Big Data algorithms and to use already existing software libraries. The subject also addresses the problems of scalability, selection of appropriate implementation techniques, and performance aspects when mining Big Data.

Database Performance Tuning

The subject addresses the problems related to performance tuning of relational database systems. The subject presents the principles and methods of database performance tuning and software tools used for performance evaluation and tuning. Three groups of solutions are investigated: structural, operational, and architectural. The structural solutions presented in the subject include data modelling related solutions, denormalizations, indexing, clustering, partitioning, and materializations. The operational solutions include application of specialized SQL statements, transformation of SQL statements, transformations of stored procedures, function and database triggers and improvements in performance through application of appropriate SQL implementation

techniques. The architectural solutions consider performance tuning through the appropriate application and configuration of the traditional and the new architectures of database systems based on modern hardware such as main memory database systems, Graphical Processing Unit (GPU) database systems, Non-Volatile Memory (NVM) database systems.

Modern Artificial Intelligence

This subject introduces students to the advanced theories, algorithms and applications in the modern development of AI. For each topic covered, its important concepts and principles will be presented to help students gain an essential understanding. Advanced approaches, methods and algorithms will be introduced to show how artificial intelligence is realised. State-of-the-art applications, tools, and platforms will be demonstrated and analysed to connect theories with practices. This subject will equip students with advanced knowledge of modern AI and enhance their skills to appropriately choose and apply AI techniques to resolve practical problems.

Data Mining and Knowledge Discovery

Introduction to Data Mining, Knowledge Discovery, and Big Data with coverage of Data Structures, role of Data Quality and per-processing, Association Rules, Artificial Neural Networks, Support Vector methods, Tree Based Methods, Clustering and Classification Methods, Regression and Statistical Methods, Overfitting and Inferential issues, Evaluation, Use of Data Mining packages with ... For more content click the Read More button below.

Take 1 Arabic Language Subject or Challenge Test

Arabic Language

Language is key to everything we do. From verbal communication and the way, we talk, to non-verbal communication and the emojis we use in our text messages, to the visuals we use to construct compelling visual stories, language is how we communicate. Living, studying and working the UAE, having a basic understanding of Arabic language can give you a huge competitive advantage. This introductory subject provides some of the basics of Arabic language, and you'll leave this subject able to communicate on a basic, conversational level.

Final General Elective

Muslim Societies Across the Ages: Tradition, Secularism & Modernity

This course aims to provide students with critical thinking perspectives about the relationship between history, religion and culture, in this case, the formation of Islamic culture(s). A sociological introduction to the study of Islamic culture will introduce students to the emergence of Islam in its 7th century historical context, its relationship to the other monotheistic traditions of the region, its growth into the dominant cultural paradigm of the Near East by the 9th century, alongside its impact and contribution to key fields of medieval science and knowledge. A historical approach will help students

acquire familiarity with key Islamic texts, institutions, concepts of authority, traditions of jurisprudence and spirituality, artistic expressions, as well as milestones in Islamic history. The course wraps up with a discussion of issues central to contemporary debates relating to Islamic culture, such as identity, gender, multiculturalism, pluralism, secularism and religiosity.

Choose 1 UAE Studies Subject

Urban Sociology

The societies and places in which we live are very complex, and the interactions of individuals, as well as social institutions, have a direct impact on the life path we take. This course provides an engaging and accessible introduction to urban sociology and the study of cities, with particular focus on the experience of the UAE and Dubai. We'll examine a number of substantive urban topics, including but not limited to the growth of cities and urban spaces in the UAE, sustainable development and practices, and the 'built' environment.

Public Health

This course will introduce Public Health as an interdisciplinary science concerned with topics central to the population of U.A.E and on a wider scale of GCC region with regard to their physical, mental, and social well-being. The course focuses on current pertinent public health problems, assessing causation and examining intervention and management strategies at personal, social, and organizational levels.

UAE and International Relations

This course offers an overview of the UAE's rapidly emerging significance and its increased roles in global networks of international relations and diplomacy. Within that overview, the course examines the internal dynamics of the UAE, in particular, the priorities that emerge from a specific workforce dependency, a construction and tourism industry that looks 'East' as much as it does 'West'. Thus the new 'Look East' policy complements the country's historical partnership with the Western states. With the expansion of its global ties and relations, the UAE also becomes more sensitive to transnational issues, such as immigration, fluctuations in international markets or terrorism.

Society and Environment – Resources, Challenges, Futures

This subject aims to provide an understanding of relations and interactions between society and environment, including impact of societies on the Earth and its processes. Topics covered include the agricultural, industrial and urban revolutions; governance of environments; Indigenous land management; climate change; sustainability; and environmental impacts in the context of the Anthropocene.