- تفاصيل المقررات العامة (General courses)

GS501 English for academic purposes

The main aim of the course is preparing students to write their dissertations in English but due to the relatively poor background of the postgraduate students in English as revealed by the results of diagnostic examination, there was no other alternative but to divide the course into two parts; General English part and Academic Writing part.

1. **General English part**

This is based on revision of previously studied grammer on English starting at the intermediate level.

Past tenses (simple past ,past continuous,and past perfect)

Present perfect and present perfect continuous.

Active voice and passive voice.

Comparison of adjectives.

Conditionals.

2.Academic Writing part

This part is basically based on presenting the technicalities of writing to the postgraduate students with practice on topic such as:

Technological inventions, argumentation and position essay etc.

The teaching written materials presented to the students are taken from TOEFL test strategies, Third Edition by Dr.Eli hinkl, seatle university.

GS502 Research methodology

Investigation of minor research problems to introduce graduate students to the methods of research in computer science by assigning a problem, which is of research interest but within the capacity of a graduate student to complete within a semester.

GS666 Advance topics

Advanced topics in the field of computer science are emerging every day. This course deals with the state of the art technology in the field such as including high-speed wide area networks and local area networks, wireless, security and fault tolerance of distributed systems, advanced topics in pattern recognition and computer vision such as Markov random fields, modeling and recognition of three dimensional objects, and integration of visual modules.

GS699 Research project

Master's degree research for individual student project: original research, research replication, or survey and reporting on a topic such as system design and development, or system conversion or installation.

AI501 Cluster analysis

Introduction to cluster analysis. Different data types and how to handle them. Dissimilarities and Similarities for binary variables, nominal, ordinal, ratio variables and mixed variables. Different clustering methods (partitioning methods, hierarchical methods). Computing dissimilarities. Different Clustering methods (partitioning methods, Hierarchical methods, Fuzzy methods). Programming assignments involving different clustering method.

AI502 Knowledge Based Systems

Historical perspective of knowledge-based systems and their relationship to artificial intelligence. Concepts of knowledge representation and automated reasoning. Survey of expert systems in a variety of applications in engineering and other fields. Implementation of expert systems and expert system shells.

AI503 Artificial intelligence

The course will cover topics such as knowledge representation, propositional logic, predicate calculus, search methods, learning, languages for AI programming, natural language representation, automated reasoning, knowledge based systems and project implementation and knowledge application.

AI504 Expert systems

The primary intent of this course is to demonstrate a philosophy and procedure through which one may learn how to properly model the knowledge-base component of an expert system. This course addresses the design and implementation of Rules Based Expert Systems that are used to capture and utilize the knowledge of human experts in a particular area of expertise. The topics covered include: knowledge acquisition, knowledge processing, validation, implementation, and the role of scientists in the development of expert.

AI505 Data mining

Data mining as finding associations, clustering, and concept learning. Basic issues of associations and selected concept representations. Introduction to data warehousing. Concept learning viewed as a search problem. Standard concept induction algorithms. The use of neural networks for representing and learning concepts. Knowledge-intensive concept learning. Introduction to the formal theory of concept learn ability. Instance-based learning. Selected applications of data mining and concept learning.

AI506 Pattern recognition

This course is designed to give a systematic account of some of the major topics in pattern recognition. This provides the required foundation for advanced applications such as speech recognition, signal classification, optical character recognition, lip reading, gesture recognition and data mining. Bayesian Decision Theory, Parameter Estimation, Non-parametric methods, Linear Discriminate Functions and Clustering

methods are some of the topics that will be studied in this class. Applications will be presented to motivate discussion

AI507 Fuzzy logic and systems

Traditional logic has not led to a significant better understanding of thought processes, concept formation and pattern recognition because classic logic has not successfully captured uncertainty and imprecision prevailing in the real world problems. This course introduces fuzzy logic as a method to model vagueness, uncertainty and imprecision, through structuring the input-output pairs as fuzzy if-then rules that relate to linguistic or fuzzy variables.

AI508 Artificial neural networks

Artificial neural network models are inspired by biological neural networks. The course begins with an overview of information processing principles in biological systems. The core of the course consists of the theory and properties of major neural network algorithms and architectures. The students will have a chance to implement and try out several of these models on practical problems. By the end of the course, students will be able to assess the applicability of neural networks for a given task, select an appropriate neural network paradigm, and build a working neural network model for the task.

AI509 High order logic

Introduction, Pure logic (relational) programming, The Prolog Language. Programming in Prolog. Efficient Prolog programming. Combining Logic Programming, Functional Programming, Higher Order, Objects. The Ciao Programming System, Review of first order predicate logic and resolution. Fundamental results. Semantics of logic programs.

AI510 Robotics and Control

The study of robotics concerns with the desire to synthesize some aspects of human function by the use of mechanisms, sensors, actuators and computers. The course on robotics will cover essential topics needed to perform such a synthesis. The topics that will be covered in this course are divided into two major modules. The first module will address the mathematical modeling aspect of robotics and will cover spatial transformations, forward and inverse kinematics, and dynamics. The second module pertains to application of AI paradigms to robotics. This module will cover hierarchical paradigms, reactive paradigms, hybrid paradigms, and path planning approaches such as topological and metric approach.

AI511 Image processing

Topics covered include; 2-D sequences and systems, separable systems, projection slice, reconstruction from projections and partial Fourier information, Z transform, different equations, recursive computability, 2D DFT and FFT, 2D FIR filter design; human eye, perception, psychophysical vision properties, photometry and colorimetric, optics and image systems; image enhancement, image restoration, geometrical image modification, morphological image processing, half toning, edge detection, image compression; scalar quantization, loss less coding, Huffman coding, arithmetic coding dictionary techniques, wave form and transform coding DCT, KLT,

Hadammard, multiresolution coding pyramid, sub-band coding, Fractal coding vector quantization, motion estimation and compensation, standards: JPEG, MPEG, H.xxx, pre- and post processing, scalable image and video coding, image and video communication over noisy channels.

AI650 Machine learning

Topics covered include: Algorithmic models of learning. Learning classifiers, functions, relations, grammars, probabilistic models, value functions, behaviors and programs from experience. Bayesian, maximum a posteriori, and minimum description length frameworks. Parameter estimation, sufficient statistics, decision trees, neural networks, support vector machines, Bayesian networks, bag of words classifiers, N-gram models; Markov and Hidden Markov models, probabilistic relational models, association rules, nearest neighbor classifiers, locally weighted regression, ensemble classifiers. Computational learning theory, mistake bound analysis, sample complexity analysis, VC dimension, Occam learning, accuracy and confidence boosting. Dimensionality reduction, feature selection and visualization. Clustering, mixture models, k-means clustering, hierarchical clustering, distributional clustering. Reinforcement learning; Learning from heterogeneous, distributed, data and knowledge. Selected applications in data mining, automated knowledge acquisition, pattern recognition, program synthesis, text and language processing, bioinformatics and computational biology.

AI651 Genetic algorithms

Introduction of the motivation and current implementations of advanced genetic algorithms. These algorithms are built on basic principles borrowed from biology. Illustrates how a novel, implicitly-parallel search is implemented to obtain solutions for combinatorial-difficult problems.

- تفاصيل المقررات في تخصص هندسة البرمجيات (Software Engineering)

SE501 Software engineering

This course follows the software life cycle from the requirements, specification, and design phases through the construction of actual software and its implementation. Topics includes: management of programming teams; programming methodologies; debugging aids; documentation; evaluation and measurement of software; verification and testing techniques, and the problems of maintenance, modification, and portability. Tools and techniques that can be applied at various stages of the life cycle are covered in detail. Students will also undertake a project involving design of a computer-based application.

SE502 Design and Analysis of Algorithms

This course builds upon fundamentals examined in Analysis of Algorithms course. It discusses different methodologies used to solve real world problems. Students are also exposed to the application of available resources on algorithms. Limitations on solving problems efficiently are also critically analysed, with emphasis on NP-Complete problems and the theory of complexity.

SE503 Analysis and design of databases

Review of the basic concepts of database. Database environment and terminology. Architecture of Database Management System (DBMS). Characteristics of the Database Approach. Advantages of Using a DBMS. Data Modeling. An Overview of the Network Data Model. Data Definition and Manipulation in the Network Model. Network Data Manipulation Language and currency Indicators. Relational Data Model. Relational Model Basic Concepts. Relational Model Notation and Constraints. Relational Algebra Operations. Set Theoretic Operations. ER to Relational Mapping Algorithm. Functional Dependency and Normalization. Bottom-up design vs. Top-down design.

SE504 Information systems modeling

The objectives of the course are to teach students how to investigate the current systems and setup new computerized systems. The course divided in two parts, the first part covers systems analysis techniques which includes business activity modeling, requirements definition, logical data modeling, entity life histories, data flow modeling, business system options, function definition, user interface design and relational data analysis. The second part covers systems analysis methodologies, structured approaches, feasibility study, requirements analysis, requirements specification, logical systems specification, physical design.

SE505 Agent systems

To learn about the theory and practice of building multi-agent systems. Specifically, we will cover the following major topics/perspectives: BDI architecture, agent properties,

system behavior, agent architecture, relationships, design methodologies, high-level design, future challenges, and open problems.

SE506 Object oriented Design
In this course, we will cover topics such as high- level design, static and dynamic modeling, physical diagrams, system views, and design patterns. For generalization UML will be used, and students will undertake a project involving the design of a computer based application.

SE507 Object oriented- programming
This course will revolve around compiling and running programs, utility classes, class variables and class methods, designing Java classes, class instances, instance variables, constructors and instance models. Other topics covered include benefits of data and method abstraction, inheritance and class hierarchies, abstract class and methods, polymorphism, use of interfaces in Java to impose requirements, creating input and output streams, arrays and arrays of objects, dynamic arrays, catching exceptions , and multithreading in Java, GUI design, Java applets and WWW.

SE508 Compilers construction
The objectives of the course are to study the principles of compiler construction. The topics covered in this course are Scanners and lexical analysis, Parsing techniques, Type checking, Syntax-directed translation, Symbol tables, Intermediate code generation, Error recovery, Compiler compilers and other tools

SE509 Computer programming languages

The objectives of the course are to study the principles and techniques of computer languages. The course covers the syntax and semantics of languages, translation, abstraction and generalizations, data and data structuring, logical programming, functional programming, imperative programming, concurrent programming, object-oriented programming and evaluation.

SE510 Operating systems
An operating system is an intermediary between the user programs and the computer hardware resources. By managing disparate hardware resources, an OS shields user programs from the complexities of individual hardware devices and issues such as concurrency and failure. The user gets an abstraction of hardware resources, which is convenient to use and allows for efficient utilization of these resources. This course provides an opportunity to learn about operating systems through: examination of theoretical concepts underlying various operating systems components; and a hands-on project involving design and implementation of these components.

SE511 Computer networks
This course will cover high speed LANs, WANs, ATM, and other TCP/IP networks. In particular the course will include several congestion controls and flow control techniques as well as deal with network design, provisioning, and management.

SE512 Internet programming

This module introduces web based applications and Graphical User Interfaces (GUI), by means of the Java programming language. In particular it explores browser scripting languages, applets, database connectivity, Web applications, servlets, Java Server Pages (JSP), JavaBeans, XML, Model-View-Controller (MVC) application design.

SE513 Multimedia systems

In this course, students will be introduced to principles and current technologies of multimedia systems and gain hands-on experience in this area. Issues in effectively representing, processing, and retrieving multimedia data such as sound and music, graphics, image and video will be addressed.

SE650 Mobile technology

Mobile computing is a fast-growing segment of computer networking. Increasingly, users access wireless LANs and ad hoc networks using PDAs, laptops and other mobile devices. The goal of this course is to acquaint participants with some of the fundamental concepts and state-of-the-art research in the areas of mobile and ubiquitous computing, and wireless networking. A brief overview of the wireless physical layer will be given but focus will be on the computer science issues in ubiquitous and mobile computing. Topics covered will include wireless network protocols (MAC, TCP, and mobile IP), disconnected file systems, power saving techniques, data replication and consistency, trace-based mobile user studies, indoor and outdoor wireless standards, application-aware adaptation, location sensing, sensor networks and wireless security. Prerequisites: computer networks, operating systems, distributed systems or consent of the instructor)

SE651 Software Project Management

In this course, we consider the management techniques required to plan, organize, monitor, and control software projects. We consider the key concepts that lead to effective software project management. Basic software project management concepts and principles. Process and project metrics, the basis for effective management decision making. The techniques that are used to estimate cost and resource requirements and establish an effective project plan. The management activities that lead to effective risk monitoring, mitigation, and management are presented. The activities that are required to define project tasks and establish a workable project schedule. Techniques for ensuring quality as a project is conducted and controlling changes throughout the life of an application.