



Jordan University of Science and Technology
Faculty of Computer and Information Technology
Department of Computer Information Systems

Study Plan of Bachelor Degree in Computer Information Systems

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Vision:

To stand among the pioneers in developing and creating transformational scholars and achievers who are qualified to create and maintain a successful business

Mission:

Our mission is to nurture a world-class society of faculty and scholars that are devoted to pioneering scientific education and research. A task done via the creation and dissemination of knowledge through collaborative associations

Objectives:

1. PEO1: (Applied Skills and Knowledge) apply knowledge, techniques, and skills in information systems in an effective way for solving business problems.
2. PEO2: (Continuity and Life-Long Learning) adapting with new technologies to keep up with technological advancements, proceed with graduate studies, deliver high quality theoretical and applied contributions.
3. PEO3: (Leadership and Teamwork) function effectively as a member or leader in a team engaged in activities appropriate to the program's discipline in professionalism.
4. PEO4: (Community) promotes strong relationship with the community and help in social and economic developments.

Outcomes:

The graduates of the Department of Computer Information Systems will have the ability to:

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
3. Communicate effectively in a variety of professional contexts.
4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
6. Support the delivery, use, and management of information systems within an information systems environment.

Study Plan of Bachelor degree in Computer Information Systems

Numbering and coding system of courses of the study plan.

Course Coding

The following codes are used to designate courses:

Department			Level/year	Field	Sequence
A	B	C	x	y	Z

The Department codes (A, B, C) are as follows:

Code	Department
CIS	Computer Information Systems
CPE	Computer Engineering
CS	Computer Science
NES	Network Engineering and Security
SE	Software Engineering

Course Numbering

- The Computer Information Systems courses are tabled and numbered in such a manner to recognize each course regarding its year or level, subject area, and sequence within subject area.
Ex. **CIS xyz**: The **CIS** symbol in the course number denotes **Computer Information Systems** and (xyz) is a 3-digits number:

A. The first digit denotes the year level of the course according to student’s study plan as follows:

Code	Level/year
1	First
2	Second
3	Third
4	Fourth

B. The second digit denotes the course field subject as follows:

Number	Specialization
0	Basic Principles
1	Programming
2	Database
3	-
4	Networks
5	Hardware
6	Artificial Intelligence
7	Systems and Systems Software
8	Miscellaneous
9	Special topics and training

C. The third digit denotes sequence of the course with subject area.

Example: CIS 421 **Database Application** means:

CIS	4	2	1
Computer Information Systems	Level (Fourth year)	Field (Database)	Sequence number

A Bachelor of Science (B.Sc.) degree in Computer Information Systems at JUST is awarded in accordance with the statute stated by JUST regulations for B.Sc. awarding issued by the Dean's Council based on the law for awarding scientific degrees and certifications at JUST after completing (132) credit hours successfully.

The study plan composed of the following:

Table 1: Credit Hours Distribution for Computer Information Systems Major

Requirement	Credit hours		
	Compulsory	Elective	Total
University requirement	16	9	25
Faculty requirement	24	0	24
Department requirement	71	12	83
Total	111	21	132

First. University Requirements (25 CHs):

A) University Compulsory Courses (16 CHs).

B) University Elective Courses (9 CHs).

Second. Faculty Requirements (24 CHs):

Table 2: Compulsory Faculty Requirements

Course Number	Course Title	Credit Hours	Lecture	Lab	Prerequisite	Teaching Mode
MATH 101	Calculus I	3	3	0	-	FACE TO FACE
MATH 102	Calculus 2	3	3	0	Passing MATH 101	FACE TO FACE
MATH 241	Discrete Mathematics	3	3	0	-	FACE TO FACE
CS 101	Introduction to Programming	3	2	0	CIS 99 or Concurrent	FACE TO FACE
CS 101	Introduction to Programming (practical)	0	0	2	Concurrent with CS 101	FACE TO FACE

SE 103	Introduction to Information Technology	3	3	0	Concurrent CS 101	Online
SE 112	Introduction to Object-Oriented Programming	3	2	0	Passing CS 101	Hybrid
SE 112	Introduction to Object-Oriented Programming (practical)	0	0	2	Concurrent with SE112	Hybrid
CS 211	Data Structures	3	3	0	MATH 241+ passing SE 112	Hybrid
CIS 221	Fundamentals of Database Systems	3	3	0	CS 211	FACE TO FACE

Third. Department Requirements (83 CHs) Classified as:

A) Department Compulsory Requirements (71 CHs):

Table 3: Department Compulsory Requirements

Course Number	Course Title	Credit Hours	Weekly Hours		Prerequisite	
			Lecture	Lab		
MATH 140	Elements Of Linear Algebra	3	3	0	-	FACE TO FACE
MATH 233	Probability & Statistics (for Computer Science Students)	3	3	0	MATH 102	FACE TO FACE
CS 284	Analysis and Design of Algorithms	3	3	0	CS 211	FACE TO FACE
SE 210	Java Programming	3	2	0	Passing SE 113	FACE TO FACE
SE 230	Fundamentals of Software Engineering	3	3	0	CS 211	FACE TO FACE
CIS 131	Fundamentals of Information Systems	3	3	0	-	FACE TO FACE
CIS 201	Introduction to Web Design	1	0	3	SE112	FACE TO FACE
CIS 203	Communication and Professional Ethics	2	2	0	-	Hybrid
CIS 271	Management Information Systems	3	3	0	CIS 131	Hybrid
CIS 321	Data Mining	3	3	0	CIS 221 + MATH 233	Hybrid

CIS 322	Data Warehousing and Big Data	3	3	0	CIS 221	FACE TO FACE
CIS 332	Systems Analysis and Design	3	3	0	CIS 271	Hybrid
CIS 335	IT Project Management	3	3	0	CIS 332	FACE TO FACE
CIS 338	Health Information Systems	3	3	0	CIS 221 + CIS 131	Online
CIS 341	Web Applications Development	3	3	0	CIS 201	FACE TO FACE
CIS 381	Mobile Application Development	2	2	0	CIS 341 + SE 112	FACE TO FACE
CIS 391	Practical Training	3	0	6	Completion of 90	Hybrid
CIS 421	Database Applications	3	3	0	CIS 221	FACE TO FACE
CIS 431	Decision Support Systems and Intelligent Systems	3	3	0	CIS 321	FACE TO FACE
CIS 433	Information Security	3	3	0	CIS 332	FACE TO FACE
CIS 435	Information Retrieval	3	3	0	CS 211	FACE TO FACE
CIS 441	Data Communication and Computer Networks	3	3	0	CS 211	FACE TO FACE
CIS 442	Network Security	3	3	0	CIS 441 + CIS433	Hybrid
CIS 471	Financial Accounting Analysis	3	3	0	CIS 321	Online
CIS 491	Graduation Project (1)	1	1	0	Completion of 90	Hybrid
CIS 492	Graduation Project (2)	2	2	0	CIS 491	Hybrid

B) Department Elective Requirements (12 CHs):

- Student must select at least (6 CHs) from the Department of Computer Information Systems.
- Student may select at most (6 CHs) from other CIT departments upon department approval.
- Student may be waived from up to (6 CHS) upon department approval If the student obtains international certificates.

Table 6: Department Elective Requirement

Course Number	Course Title	Credit Hours	Weekly Hours		Prerequisite	Teaching Mode
			Lecture	Lab		
CIS 401	Multimedia for Web Design	3	3	0	CIS 201 + CS 211	Hybrid
CIS 410	Selected Programming Languages	3	3	0	CIS 321	FACE TO
CIS 411	Advanced Web Application Development	3	3	0	CIS 341	FACE TO
CIS 412	Advanced Database	3	3	0	CIS 221	FACE TO
CIS 413	Advanced Mobile Application Development	3	3	0	CIS 381	FACE TO
CIS 414	Parallel programming	3	3	0	CIS 321	FACE TO
CIS 432	Enterprise Information Systems	3	3	0	CIS 271	FACE TO

CIS 434	Security Analytics	3	3	0	CIS 433	FACE TO
CIS 436	Privacy of Healthcare Information	3	3	0	CIS 338	FACE TO
CIS 437	Geographical Information Systems	3	3	0	CIS 131 + CIS 221	Online
CIS 438	Deep Learning	3	3	0	CIS 431	FACE TO
CIS 451	E-Business Applications	3	3	0	CIS 341	FACE TO
CIS 452	Business Planning and Control	3	3	0	CIS 271	FACE TO
CIS 453	Accounting Information Systems	3	3	0	CIS 131	FACE TO
CIS 454	Business Process Management	3	3	0	CIS 332 + MATH233	FACE TO
CIS 457	Digital Marketing	3	3	0	CIS 341	Hybrid
CIS 475	Principles of Modern Operating Systems	3	3	0	CS 211	Online
CIS 476	Cloud Computing	3	3	0	CIS 441	FACE TO
CIS 493	Special Topics in Computer Information Systems (1)	1	1	0	Department approval	FACE TO FACE
CIS 494	Special Topics in Computer Information Systems (2)	2	2	0	Department approval	FACE TO FACE
CIS 495	Special Topics in Computer Information Systems (3)	3	3	0	Department approval	FACE TO FACE
-	Any faculty course at level 400 or above	3	3	0	Department approval	FACE TO FACE

Guidance Study Plan
1st Year

Semester 1			
Course Number	Course Name	Credits Hours	Prerequisite
HSS110	Leader and Social Responsibility	3	-
CS 101	Introduction to programming	3	CIS 099 or Concurrent
CS 101	Introduction to programming (practical)	0	Concurrent with CS 101
SE 103	Introduction to Information Technology	3	Concurrent with CS 101
MATH 140	Elements Of Linear Algebra	3	-
LG 101	Communication Skills in English	3	Passing LG 99 or passing English exam with 50%
MATH 101	Calculus I	3	-
Total		18	

Semester 2			
Course Number	Course Name	Credits Hours	Prerequisite
CIS 131	Fundamentals of Information Systems	3	-
SE 112	Introduction to Object-Oriented programming	3	Passing CS 102
SE 112	Introduction to Object-Oriented programming (practical)	0	Concurrent with SE 112
HSS 119	Entrepreneurship And Innovation	2	-
MATH 102	Calculus 2	3	Passing MATH 101
MATH 241	Discrete Mathematics	3	-
LG 103	Life Skills	2	-

Total		16	
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2ndYear

Semester 1			
Course Number	Course Name	Credits Hours	Prerequisite
ARB 102	Communication Skills in Arabic	3	-
SE 210	Java Programming	3	Passing SE 113
CIS 271	Management Information Systems	3	CIS 131
CS 211	Data Structures	3	Passing SE 112 + MATH 241
CIS 203	Communication and Professional Ethics	2	-
	University Elective	3	
Total		17	

Semester 2			
Course Number	Course Name	Credits Hours	Prerequisite
CIS 201	Introduction to Web Design	1	SE 113
CIS 221	Fundamentals of Database Systems	3	CS 211
CS 284	Analysis and Design of Algorithms	3	CS 211
MATH 233	Probability & Statistics (for Computer Science students)	3	MATH 102
MS 100	Military Sciences	3	-
-	University Elective	3	-
Total		16	

3rd Year

Semester 1			
Course Number	Course Name	Credits Hours	Prerequisite
-	Department Elective	3	-
SE 230	Fundamentals of Software Engineering	3	CIS 211
CIS 321	Data Mining	3	CIS 221 + Math 233
CIS 322	Data Warehousing and Big Data	3	CIS 221
CIS 338	Health Information Systems	3	CIS 221+ CIS 131
CIS 341	Web Application Development	3	CIS 201
Total		18	

Semester 2			
Course Number	Course Name	Credits Hours	Prerequisite
-	Department Elective	3	-
CIS 332	System Analysis and Design	3	CIS 271
CIS 381	Mobile Application Development	2	CIS 341 + SE 112
CIS 421	Database Applications	3	CIS 221
CIS 441	Data Communication and Computer Networks	3	CS 211
CIS 435	Information Retrieval	3	CIS 211
Total		17	

Summer			
Course Number	Course Name	Credits Hours	Prerequisite
CIS 391	Practical Training	3	Completion 90 CHs
Total	3		

4th Year

Semester 1			
Course Number	Course Name	Credits Hours	Prerequisite
CIS 335	IT Project Management	3	CIS 332
CIS 471	Financial Accounting Analysis	3	CIS 321
CIS 433	Information Security	3	CIS 332
CIS 491	Graduation Project 1	1	Completion of 90 CHs
-	University Elective	3	-
Total		13	

Semester 2			
Course Number	Course Name	Credits Hours	Prerequisite
CIS 431	Decision Support Systems and Intelligent Systems	3	CIS 321
CIS 442	Network Security	3	CIS 441 + CIS433
-	Department Elective	3	-
CIS 492	Graduation Project 2	2	CIS 491
-	Department Elective	3	-
Total		14	

Computer Information System Description of Courses

CIS 99: Computer Skills **(3C=3H+0L)**

Prerequisite: None

This course provides the very basic computer skills to students who have failed in demonstrating such skills in their college admittance test. The course covers topics such as computer components, computer functions and benefits, computer viruses and measure of protection. Also, introduction to operating systems, application software (including word processing, spreadsheets and presentation applications), Internet, e-mail systems, e-learning systems, e-library systems.

CIS 131: Fundamentals of Information Systems **(3C=3H+0L)**

Prerequisite: None

This course is designed to introduce students to contemporary information systems and demonstrate how these systems are used throughout global organizations. The focus of this course will be on the key components of information systems - people, software, hardware, data, and communication technologies, and how these components can be integrated and managed to create competitive advantage. Though the knowledge of how IS provides a competitive advantage students will gain an understanding of how information is used in organizations and how IT enables improvement in quality, speed, and agility. This course also provides an introduction to systems and development concepts, technology acquisition, and various types of application software that have become prevalent or are emerging in modern organizations and society.

CIS 203: Communication and Professional Ethics **(2C=2H+0L)**

Prerequisite: None

Verbal and nonverbal forms of communication: speaking, listening, and technical writing, essential information to communicate effectively in a variety of business settings. This course also introduces students to the social context of the IT industry and its practices. These include professional and ethical responsibilities in the analysis and design of systems. Also, in ensuring the safety of work environments, risks and liabilities of computer-based systems, intellectual property, computer crimes, and economic issues in computing.

CIS 201: Introduction to Web Design **(1C=0H+3L)**

Prerequisite: CS 113

This course introduces students to the Internet as an infrastructure to many services. The course then focuses on the WWW as a major Internet-based service. Working in a Lab, students will learn to create and maintain web pages and construct them in web sites. For this end, the students will learn HTML, XHTML and DHTML. Additionally, a brief introduction to XML is provided.

CIS 221: Fundamentals of Database Systems **(3C=3H+0L)**

Prerequisite: CS 211

This course introduces the basics of database systems, as well as the modeling, design and manipulation of relational databases. At the end of this course, a student will be able to understand and apply the fundamental concepts required for the use and design of database systems. Topics include basic concepts and terminology of the database approach, data modeling (the entity relationship model, relational data model), database design theory (entity relationship to relational mappings, normalization using functional dependencies), data definition and manipulation languages (relational algebra, SQL). The course will enable the students to create and manipulate databases on the Oracle database management system.

CIS 271: Management Information System **(3C=3H+0L)**

Prerequisite: CIS 131

This course introduces the essential of Management Information Systems (MIS). All phases from long-range or strategic management information systems planning to development and operation (maintenance) are addressed from a management point

of view. Impact that MIS has on management decision making, managing computing and communication resources, security of information systems, enterprise applications. Students will learn the terminology used in the field of IT and how IT can help in achieving a competitive advantage and increasing the return on investment. Tools and applications will be used to master management skills on a live project assignment. Information services will be studied as a separate topic.

CIS 321: Data Mining **(3C=3H+0L)**

Prerequisite: CIS 221 + MATH 233

An introduction to machine learning, statistics, intelligent systems, and methodologies for the automatic discovery of knowledge from large high-dimensional databases. The course covers basic concepts and techniques, including data cleaning, clustering, classification, association rules mining. Finally, the course surveys data mining tools and applications.

CIS 322: Data Warehousing and Big Data **(3C=3H+0L)**

Prerequisite: CIS 221

This course covers basic topics related to data warehousing including ETL Process, DW architectures, star schema, cube and multi-dimensional analysis, and OLAP. The course will also discuss data management techniques for storing and analyzing very large amounts of data. The emphasis will be on columnar databases and on Map Reduce as a tool for creating parallel algorithms that can process very large amounts of data. In addition the discussions will focus on applications of Big Data in internet advertising, healthcare and social network analysis. Topics in this line include: Introduction to the Big Data problem. Current challenges, trends, and applications, Columnar stores, distributed databases, Map-Reduce paradigm and the Hadoop ecosystem, Locality Sensitive Hashing (LSH), Dimensionality reduction, Data streams, unstructured data processing, NoSQL, and NewSQL.

CIS 332: Systems Analysis & Design **(3C=3H+0L)**

Prerequisite: CIS 271

An introduction to the system development life cycle. Emphasis on strategies and techniques of systems planning, analysis and design, documentation, implementation and evaluation. Students are expected to carry out group projects using the system development life cycle.

CIS 335: IT Project Management **(3C=3H+0L)**

Prerequisite: CIS 332

This course discusses the processes, methods, techniques and tools that organizations use to manage their information systems projects. The course covers a systematic methodology for initiating, planning, executing, controlling, and closing projects. This course assumes that project management in the modern organization is a complex team based activity, where various types of technologies (including project management software as well as software to support group collaboration) are an inherent part of the project management process. This course also acknowledges that project management involves both the use of resources from within the firm, as well as contracted from outside the organization.

CIS 338: Health Information Systems **(3C=3H+0L)**

Prerequisite: CIS 221 + CIS 131

This course covers the sources of health information systems and their relation to health agencies. A study is made of the origin and purpose, content, assembly, analysis and use of medical records. The course will introduce software applications used in HCIS. The student will develop an understanding of the implications of integrated versus interfacing disparate HCIS application, database management and patient privacy issues. The course will examine emerging technology in the areas of rural health care, access to Electronic Medical Records, and Regional Health Information Organizations. Methods of compiling, numbering, filing and retention of health information.

CIS 341: Web Applications Development **(3C=3H+0L)**

Prerequisite: CIS 201

This course is a continuation to what students have learned in the Introduction to Web Design course (CIS 201). In this course, students learn to construct robust and highly interactive web sites using the latest features of CSS and HTML5 and scripting languages. In this course students should be able to master client-side and sever-side scripting languages. For example, HTML5, JavaScript, Active Server Pages (ASP), DHTML, Ajax, and XML and PHP. A set of laboratory experiments will provide hands-on experience in the forementioned topics (CIS 342).

CIS 381: Mobile Application Development **(2C=2H+0L)**

Prerequisite: CIS 341 + SE 112

This course teaches how to start developing a simple application for Android mobile devices such as Samsung and Huawei. It will discuss the fundamental concepts needed to develop application using Android SDK We will go through the process of building a mobile application from start to end using the Android Studio SDK design tools. we will review and learn the basics of the Java programming languages, how to use the libraries to build applications that have the proper look and feel, how to design and handle user input, and important software design. Topics will include memory management; user interface design; user interface building; input methods and data handling. Course work will include project conception, design, implementation, and pilot testing of mobile phone software applications.

CIS 391: Practical Training **(3C= 0H, 6L)**

Prerequisite: Completion of 90 Credits hours

This course provides students with the chance to experience the work environment before graduation. Students are required to spend a period of 60 working days as an intern in an institution approved by the CIS department. During this period, students need to get engaged in business practices with their mentors and observe and experience the business conduct of these institutions.

CIS 401: Multimedia for Web Design **(3C=3H+0L)**

Prerequisite: CS 211 + CIS 201

This course introduces students to the basic elements of multimedia. These include text, sound, images, video and animation. The course, in particular, focuses on the creation of an interactive Webpages using Image, Audio and Video editing tools by engaging students to create, enhance, customize, share and publish multimedia and/or graphic designs, image design, animation, and games all in webpage design. Students will learn the basic concepts and software that is currently available to produce and publish web pages on the Internet. Course topics include: HTML graphics; (SVG, Canvas, Google Map); HTML Game, HTML media, CSS animation; CSS animatable; jQuery; jQuery Effects - Animation

CIS 410: Selected Programming Languages **(3C=3H+0L)**

Prerequisite: CIS 321

This course introduces students to advanced programming in Python. Topics include machine learning in Python, natural language processing in Python, text mining, sentiment analysis, text generation, and deep learning for NLP, web mining, computer vision. The following python packages are covered: numpy, pandas, tweepy, BeautifulSoup, Matplotlib, Seaborn, and scikit-learn

CIS 411: Advanced Web Application Development **(3C=3H+0L)**

Prerequisite: CIS 341

This course provides a solid foundation for the concepts of server-side programming, using a current server-side programming/scripting language(s). The course provides a comprehensive coverage of a server-side scripting language, sessions, security, and considerations related to implementing efficient and maintainable server-side applications. The course includes communicating with databases, file servers, and other types of servers. creating actual (live) web sites and enhancing their basic programming skills, students will learn to embed PHP in HTML, to interact with MySQL databases both at the command prompt and through the PHP engine, accessibility issues, the basics of (secure) file transfers, file management, and web server (Apache) configuration. As a junior/senior level course, the emphasis on you 'learning how to learn' will be even greater. We will also explore some other web technologies as seem applicable to our shared interests, related to our focus on PHP/MySQL.

CIS 412: Advanced Database **(3C=3H+0L)**

Prerequisite: CIS 221

The aim of this course is to provide students with knowledge and skills related to the internal components of the DBMS such as query processing and optimization, indexing, concurrency control, recovery, and backup.

CIS 413: Advanced Mobile Application Development **(3C=3H+0L)**

Prerequisite: CS 381

This course introduces students to the basic elements of multimedia. These include text, sound, images, video and animation. For each element the students will learn about the required hardware and software and the effective utilization of the element in information communication. Laboratory sessions will enable the students to practice the theories and the software they learn in class.

CIS 414: Parallel Programming **(3C=3H+0L)**

Prerequisite: CIS 321

This course covers programming techniques for Graphics Processing Units (GPU). The course will introduce NVIDIA's parallel computing language, CUDA. Beyond covering the CUDA programming model and syntax, the course will also discuss GPU architecture, high-performance computing on GPUs, parallel algorithms, CUDA libraries, and applications of GPU computing including neural networks.

CIS 421: Database Applications **(3C=3H+0L)**

Prerequisite: CIS 221

This course is an overview of the use of automated information systems in the management system and its various settings. Object relational model, large objects (multimedia objects, large text objects), SQL99, procedural extensions of SQL, Dynamic SQL, language interfaces with databases, XML and databases. Students will work on a team project to design, implement, and develop an IS application.

CIS 431: Decision Support Systems and Intelligent Systems **(3C=3H+0L)**

Prerequisite: CIS 321

Advanced Data mining and Machine learning methods including Logistic Regression, Naïve Bayes, Support Vector Machines, Artificial Neural Networks, and Belief networks with application to real-world data. Also, the course discusses techniques for text and image representation and advanced methods to evaluate the performance of Data mining techniques. Emerging topics will be discussed such as intelligent agents, web analytics, optimization and simulation, and expert systems.

CIS 432: Enterprise Information Systems (3C=3H+0L)

Prerequisite: CIS 271

This course is designed to provide students with an understanding of the theoretic and practical issues related to the application of enterprise systems within organizations. The main focus of this course is to demonstrate how enterprise systems integrate information and organizational processes across functional areas with a unified system comprised of a single database and shared reporting tools. Enterprise systems, by their multi-dimensional integrative nature, offer the depth of functionality and breadth of integration to demonstrate how global operations of organizations are managed. Thus, students will gain an appreciation of the scope of enterprise systems and the motivation for implementing them. Several issues are discussed including business process integration, acquisition and implementation of ES, challenges associated with the implementation of ES, organizational change and change management, governance of processes and data. Hands-on lab training on an ES will support the learned concepts.

CIS 433: Information Security (3C=3H+0L)

Prerequisite: CIS 332

This course covers an introduction about classic security topics, such as applied cryptography, authentication, access controls, intrusion prevention and detection, database security, web security, systems security and malware. Moreover, it covers topics related to ethics and laws in cybersecurity.

CIS 434: Security Analytics (3C=3H+0L)

Prerequisite: CIS 433

This course aims at monitoring and documentation networks, locking down networks, thwart malware, prevent hacks by improving visibility into the environment, using the power of data and security. In addition, the course covers topics such as how to monitor computer networks, acquire and prepare security data, correlate security events, use simple statistical methods to detect malware and predict rogue behavior. Furthermore, this course consists of a set of laboratory experiments that provides hands-on experience in this topic.

CIS 435: Information Retrieval **(3C=3H+0L)**

Prerequisite: CS 211

The main objective of this course is to provide students with the basic concepts of information retrieval systems, their types and different techniques in storing, manipulating and retrieving data. It covers a range of topics including: Functional view of information retrieval, types of IRS, design issues of IRS (keyword-based retrieval, file structures, thesaurus construction, etc.), IR data structures and algorithms (lexical analysis, stemming, term weighting, associative indexing, Boolean operations, string searching and matching techniques, etc.), relevance feedback and query modification, applications and case studies. The practical part includes applications and exercises that suit the concepts and techniques covered in this course.

CIS 436: Privacy of Healthcare Information **(3C=3H+0L)**

Prerequisite: CIS 338

This course covers several concepts such as, an introduction to privacy and security of healthcare information systems, how to protect the confidentiality of patient information, types of access and the appropriate availability of healthcare information to health care providers, concepts of limiting unauthorized access, standards and specifications that help keeping patient medical information secure in an electronic environment, common data protection issues, and exchanging clinical information between healthcare organizations need to be addressed. Related case studies will be used and administrative issues will be researched and presented by students as the course project.

CIS 437: Geographic Information Systems **(3C=3H+0L)**

Prerequisite: CIS 231 + CIS 221

This course provides students the concept and technology of Geographic Information Systems (GIS). GIS science focuses on ways to describe and explain geographical patterns and processes. This includes spatial data, GIS data structure, spatial relationships, data acquisition, and quality. In addition, this course covers geographic database and inventory operations, basic geographic data analysis, and geographic systems output.

CIS 438: Deep Learning (3C=3H+0L)

Prerequisite: CIS 431

An introduction to deep learning methods including Deep Neural Networks, Recurrent neural networks, Convolutional neural networks, and Unsupervised deep learning with applications to computer vision and natural language understanding.

CIS 441: Data Communication and Computer Networks (3C=3H+0L)

Prerequisite: CS 211

This course is an introduction to principles of data communications and networking. It covers the telecommunication systems and different protocols and computer networks required to know by business organizations. The coverage extends to communication concepts, transmission media, signal representation and modulation, packet switching and routing, network topology and architecture, network management and Internet protocols TCP/IP. Finally, basic concepts of security in networks are discussed.

CIS 442: Network Security (3C=3H+0L)

Prerequisite: CIS 433 + CIS 441

This course covers principles and techniques for network and communication security. Basically, it explains many network attacks such as DoS and DDoS, MAC flooding and DHCP spoofing. In addition, the course covers different types of networks countermeasures such as firewalls and NIDS that are used prevent and detect network attacks. Moreover, the course discusses in details how security protocols such as SSL/TLS, SSH and IPsec works.

CIS 451: E-Business Applications (3C=3H+0L)

Prerequisite: CIS 341

The course will primarily focus on e-business technologies. Course will be heavily oriented towards practical implementations of web applications for e-business. Students will gain basic practical knowledge for development of their own e-business ideas. Students will have opportunity to carefully elaborate their own business plan in order to create effective e-business solution in business environment of their choice. Students will learn to analyze modern concepts, practices and modern web e-business applications. During course students will create their own web domain, they will install, customize and learn to manage main free web e-business applications and adopt them to the needs of their businesses or project ideas. This course will also give students understanding of major e-business trends present at the market today and them understanding of expected development in the future.

CIS 452: Business Planning and Control **(3C=3H+0L)**

Prerequisite: CIS 271

This course is designed to introduce students to Integrating Strategy, Accounting and People. It presents the core areas of management accounting and business planning. It also explores relationships between strategy, management accounting information, and the design of control systems, taking into account the needs of both people and organizations. It includes an integrative approach to business planning and control, specific focus on the design of planning and control systems, key techniques of strategic management, management accounting techniques for operational, managerial and strategic purposes.

CIS 453: Accounting Information Systems **(3C=3H+0L)**

Prerequisite: CIS 251 + CIS 231

This course covers the impact of computerized information systems on accounting and finance, and their effects on daily business operations. People, technology, procedures and controls that together: maintain essential channels of communication, process and control routine business activities, and alert management and others to significant internal and external accounting events.

CIS 454: Business Process Management **(3C=3H+0L)**

Prerequisite: CIS 332 + MATH 233

In this course, students will be introduced to key concepts and approaches to business process management and improvement. The main focus of this course is both understanding and designing business processes. Students will learn how to identify, document, model, simulate, assess, and improve core business processes. Students will be introduced to process design principles. The discussed issues include as-is model development and simplification, model verification, business process preparation for simulation, business processes performance assessment, design business process improvements, understand the role and potential of IT to support business process management, understand different approaches to business process modeling and improvement. The course lab will allow the students to use a modeling and simulation tool to model and simulate simple business processes and use simulation results in business process analysis.

CIS 457: Digital Marketing **(3C=3H+0L)**

Prerequisite: CIS 341

This course introduces students to the multiply elements of E-Marketing. Emphasis is on tools and techniques appropriate for designing and running an actual E-Marketing campaign. Over time, digital technologies have become much more important to marketing. For example, digital advertising currently makes up nearly half of all global advertising spending, and both e-marketing and e-commerce continue to grow quickly. This course encourages an applied understanding of digital technologies available for e-marketing and how they should be used, such as social media and video marketing. Topics include: Strategy and Context; Understanding Customer Behaviour; Search Engine Optimization (SEO); Search Advertising; Online Advertising; Social Media Advertising; Content Marketing Strategy; Social Media Strategy; Direct Marketing; Email and Mobile; Video Marketing.

CIS 471: Financial Accounting Analysis **(3C=3H+0L)**

Prerequisite: CIS 321

This course introduces students to the fundamental concepts of accounting. Students will learn procedures of collecting financial data and how to process such collections according to the generally accepted accounting principles. Students will also learn the accounting of a service firm, and accounting for purchase and sales of merchandise, the recording in the general journal (and the

various specialized journals), and how to post data to the ledgers. Finally, the course covers the preparation of the trial balance and financial statements, including the study of the closing entry and adjusting entry.

CIS 475: Principles of Modern Operating Systems **(3C=3H+0L)**

Prerequisite: CS 211

Introduction to fundamental issues in design and development of parallel programs for various types of parallel computers. Various programming models according to both machine type and application area. Cost models, debugging, and performance evaluation of parallel programs with actual application examples. Emphasis will be on MPI parallel programming language.

CIS 476: Cloud computing **(3C=3H+0L)**

Prerequisite: CIS 441

This course gives an introduction to cloud computing and its techniques, issues, ecosystem and case studies. This course covers a series of current cloud computing technologies, including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), Business Process as a Service (BPaaS), Cloud security and privacy. For different layers of the cloud technologies, practical solutions such as Google, Amazon, Microsoft, Salesforce.com, etc. solutions as well as theoretical solutions are introduced.

CIS 491: Graduation Project 1 **(1C=1H, 0L)**

Prerequisite: Completion of 90 credit hours

This course requires students to gather in groups and decide on a project that needs to be carried out under the supervision of a faculty member. The “Graduation Project Guidelines” set by the department council regulates the steps and the time frame for starting and completing this course.

CIS 492: Graduation Project 2 **(2C=2H, 0L)**

Prerequisite: CIS 491

This course is a continuation of CIS 491 and is also subject to the regulations in the “Graduation Project Guidelines”.

CIS 493: Special Topics in Computer Information Systems 1 (1C=1H+0L)

Prerequisite: Department Approval

This course grants the CIS department flexibility in offering courses not included in the curriculum at basic levels.

CIS 494: Special Topics in Computer Information Systems 2 (2C=2H+0L)

Prerequisite: Department Approval

This course grants the CIS department flexibility in offering courses not included in the curriculum at intermediate levels.

CIS 495: Special Topics in Computer Information Systems 3 (3C=3H+0L)

Prerequisite: Department Approval

This course grants the CIS department flexibility in offering courses not included in the curriculum at advanced levels.