Program for Bachelor of Science in Computer Science and Information

Introduction

The department of Computer Science and Information was established in the academic year 1427/1428 h, in coincidence with the establishment of the faculty of science in Zolfi, to meet the needs of different sectors in the Kingdom of this discipline, and to develop qualified and expertise required. The Department seeks to qualify the student to be after his graduation a specialist in the field of computer science in terms of study and analysis of computer system and methods of construction, as well as assisted software tools, such as operating systems, various programming languages and computer networks. The curriculum has prepared to provide the student with the knowledge and skills necessary for him to be proficient in this field. The department staff is continuously working on updating the B.Sc. program to meet the latest technologies in computer science and the fast changing society needs. As so, it was found that it is necessary to revise the curriculum that has been used for more than 5 years.

CSI Department Vision

The academic plan of the department has been developed to comply with the scientific and technical requirements for graduate students. With the possibility of developing such a plan to suit with the scientific development, and the needs of the labor market in this area. Therefore, the graduate will armed with both theoretical and practical knowledge that enable him to work efficiently in the fields of computers in various areas of life in the Kingdom such that he will cope with the rapid development in the areas of the computer science and information.

CSI Department Mission

Providing high-quality education that leads to a distinguished graduate able to compete and qualify the student scientifically and practically in the field of computer science and information to meet the requirements of the labor market in various fields of life. Moreover, the program will aims at qualify students for graduate studies and scientific research in the field of Computer and Information Sciences.

CSI Department Objectives

The most important objectives of the department are to consolidate scientific knowledge in the field of computer science and information, and to enable the student to cope with the latest developments in this field that is being rich in new knowledge.

The following are the main objectives of the department:

1 - Prepare the student in the field of computer science and information and qualify him to enter the professional field.

2- Enable the students to apply their gained knowledge and skills in identifying the needs of the local society and solving the problems of the social issues related to the computer.

3- Acquire the students different professional skills for graduate studies and scientific research in computer science.

Computer Science and Information (CSI) Program

The department staff proposed a new revised curriculum which offers a B.Sc. in computer science and information (CSI) in three tracks. This new curriculum leads to a program which fosters diversification through offering a wider selection of courses that is in tune with the market requirements and provides the necessary specialization by offering a set of new concentrations (tracks).We believe this will render our graduates more marketable. The proposed program satisfies and fulfills the IEEE/ACM Computing Curricula guidelines for computer science curriculum and meets the Computing Accreditation Criteria (CAC). Moreover, it takes into account the community needs and the labor market in KSA.

Students of the CSI program have 12 hours of department elective courses. The following set of concentration tracks within the Bachelor of Science major in Computer Science and Information is offered which allows three tracks for students to choose from:

Track I-Computer Graphics and Multimedia: In this track the students will be allowed to choose four courses from the following five courses which may lead them to work in the field of Computer Graphics & Multimedia:

1. **Computer Vision**
2. **Interactive Computer Graphics**
3. **Digital Photography**
4. **Digital Image Processing**
5. **Multimedia Technology**

Track II-Computer Networks: In this track the students will be allowed to choose four courses from the following five courses which may lead them to work in the field of computer networks:

1. **Advanced Computer Networks**
2. **Network Security**
3. **Wireless & Mobile Computing**
4. **Network Programming**
5. **Cloud Computing**

Track III-Individual Track: It is a general elective courses track that allow students to choose any four courses either from of the last two tracks or from the following courses:

1. **Computer Vision**
2. **Interactive Computer Graphics**
3. **Digital Photography**
4. **Digital Image Processing**
5. **Multimedia Technology**
6. **Advanced Computer Networks**
7. **Network Security**
8. **Wireless & Mobile Computing**
9. **Network Programming**
10. **Cloud Computing**
11. **Machine Learning**
12. **Introduction to Robotics**
13. **Expert Systems**
14. **Computational Methods**
15. **Operational Research**
16. **Information System Management**
17. **Information Security**
18. **Project Management**
19. **Geographic Information System (GIS)**

The concentrations are structured in a manner that meets the following general objectives. In the first six semesters, all B.Sc.-CSI students will experience a streamlined introduction to Computer Science &Information with an emphasis on conceptual, theoretical, and programming aspects. The intent of this common foundations to provide a solid basis for all CSI majors and the ultimate pursuit of the specialty majors. The mathematical and science requirements are kept consistent with what is expected for computer science and information majors.
Students have the opportunity to start focusing on a specific concentration of their choice after their 6th semester. During the third and fourth years, the program is structured to emphasize the choice and exploration of a concentration in depth.

CSI Program Educational Objectives

The Educational Objectives of the Computer Science & Information undergraduate Program are:
1. Prepare graduates, who are entering immediately into professions upon graduation, to be capable of performing duties on an entry-level computing-related position.
2. Enable graduates to pursue graduate studies to successfully complete an advanced degree.
3. Enhance graduates to work as individuals with minimum guidance and as leaders or members of a team.
4. Encourage graduates to follow appropriate practices within a professional, legal, and ethical framework.
5. Prepare graduates to recognize the need for and be capable of pursuing life-long learning.

CSI Program Learning Outcomes

The CSI program enables students to acquire, by the time of graduation, the following learning outcomes which allows graduates to be able to:

- apply knowledge of computing and mathematics appropriate to the discipline including simulation and modeling.
- analyze a problem to identify and define the computing requirements appropriate to its solution.
- design, implement, develop and evaluate complicated computer-based system, process, component, or program to meet desired needs.
- function effectively on teams to accomplish a common goal.
- understand professional, ethical, legal, security and social issues and responsibilities.
- communicate effectively with a range of audiences.
- analyze the local and global impact of computing on individuals, organizations, and society.
- Recognize the need for and an ability to engage in continuing professional development.
- use current techniques, skills, and tools necessary for computing practice.
- use and apply current technical concepts and practices in the core information technologies of human computer interaction, information management, programming, networking, web systems and technologies.
- identify and analyze user needs and take them into account in the selection, creation, evaluation and administration of computer-based systems.
- effectively integrate IT-based solutions into the user environment.
- understand of best practices and standards and their application.

Curriculum for the Computer Science& Information Program (CSI)

The Bachelor Degree of Science in Computer Science and Information is awarded at the College of Science in Zolfi, Majmaah University after the successful completion of 161 credit hours and after fulfilling the terms and conditions for awarding the bachelor degree at the faculty of Science. These 161 credits are distributed as follows:-

Requirements	Mandatory	Elective	Total
University Requirements	2	10	12
College Core Requirements	29	0	29
Mathematics and Sciences Requirements	23+9 (from college core Req.)	0	23
Department Core Requirements	81	12	93
Summer Training Requirements	1	0	1
Free Elective Course	0	3	3
Total	**136**	**25**	**161**

1. Foundation Year Core Requirements (College core Requirements) (29 Credits):

Course Number	Course Title	Credit Hours	Weekly Hours			Prerequisite
			Lecture	Lab	EX	
PENG 111	Preparatory English (1)	8	20	0	0	-
PMTH 112	Introduction to Mathematics (1)	2	2	0	1	-
PCOM 113	Computer Skills	2	1	2	0	-
PSSC 114	Learning and Communication Skills	2	1	2	0	-
PENG 121	Preparatory English (2)	6	14	0	0	PENG 111
PENG 123	English for Science and Engineering	2	2	0	0	PENG 111
PMTH 127	Introduction to Mathematics (2)	4	4	0	1	PMTH 112
PPHS 128	General Physics	3	2	2	0	-
	Total	**29**	**48**	**2**	**0**	

2.University Requirements (12 Credits):

Course Number	Course Title	Credit Hours	Weekly Hours		Elections	Total Credits
			Lecture	Lab		
ZPSY 211	Educational & Thinking Skills	2	2	**0**	**Mandatory**	2
SALM 101	Introduction to Islamic Culture	2	2	0	**Students choose 3 courses**	6
SALM 102	Islam and Society Building	2	2	0		
SALM 103	Economic System in Islam	2	2	0		
SALM 104	Fundamentals of Political System in Islam	2	2	0		
ARAB 101	Arabic Language Skills	2	2	0	**Students choose 1 course**	2
ARAB 103	Arabic Writing	2	2	0		
ELEC 101	Principles of Health and Fitness	2	2	0	**Students choose 1 course**	2
ELEC102	Business Entrepreneurship	2	2	0		
SOCI 101	Societal Issues	2	2	0		
LHR 101	Human Rights Systems	2	2	0		
FCH 101	Family and Childhood	2	2	0		
VOW 101	Volunteering Systems	2	2	0		
		Total				**12**

3. Mathematics and Sciences Requirements (31 Credits):

Course Number	Course Title	Credit Hours	Weekly Hours			Prerequisite
			Lec.	Lab.	EX.	
PMTH 112	Introduction to Mathematics (1)	2	2	0	1	
PMTH 127	Introduction to Mathematics (2)	4	4	0	1	PMATH 112
PPHS 128	General Physics	3	2	2	0	
PHYS 217	Physics 2	3	2	2	0	PPHS 128
CHEM 225	General Chemistry	2	2	0	0	-
MATH 212	Calculus I	3	3	0	1	PMTH 127
MATH 220	Calculus II	3	3	0	1	MATH 212
MATH 310	Linear Algebra & Differential Equations	4	3	0	2	MATH 220
Stat 320	Probability & Statistics	3	3	0	1	MATH 220
CSI 212	Discrete Math for Computer Science 1	3	2	0	2	PMTH 127
CSI 222	Discrete Math for Computer Science 2	2	2	0	0	CSI 212
	Total	**32**	**28**	**4**	**8**	

4.Department Requirements (93 Credits):

4-a) Mandatory Department Courses (81 CHs):

Course Number	Course Title	Credits Hours	Weekly Hours			Prerequisite
			Lec	Lab	Ex	
ENG 210	**Technical English**	**2**	**2**	**0**	**0**	**PENG 121**
CSI 211	**Programming 1**	**3**	**2**	**2**	**0**	**PCOM 113**
CSI 221	**Programming 2**	**3**	**2**	**2**	**0**	**CSI 211**
CSI 223	**Digital Logic Design**	**3**	**2**	**2**	**0**	**PHYS 217**
CSI 224	**Fundamentals of Information Systems**	**3**	**3**	**0**	**0**	**---**
CSI 311	**Visual Programming**	**3**	**2**	**2**	**0**	**CSI 221**
CSI 312	**Data Structure**	**3**	**2**	**2**	**0**	**CSI 221, CSI 212**
CSI 313	**Computer Organization and Assembly Language**	**3**	**2**	**2**	**0**	**CSI 223**
CSI 314	**Database**	**3**	**2**	**2**	**0**	**CSI 211**
CSI 321	**Design & Analysis of Algorithms**	**3**	**2**	**0**	**2**	**CSI 312**
CSI 322	**Computer Networks**	**3**	**2**	**2**	**0**	**CSI 313**
CSI 323	**Computer Architecture**	**3**	**3**	**1**	**0**	**CSI 313**
CSI 324	**Advanced Database**	**3**	**1**	**4**	**0**	**CSI 314**
CSI 325	**Software Engineering 1**	**3**	**2**	**2**	**0**	**CSI 221**
CSI 411	**Artificial Intelligence**	**3**	**2**	**2**	**0**	**CSI 321**
CSI 412	**Operating Systems**	**3**	**2**	**2**	**0**	**CSI 313**
CSI 413	**Compiler Design**	**3**	**2**	**2**	**0**	**CSI 221, CSI 222**
CSI 421	**Distributed Systems & Parallel Processing**	**3**	**2**	**2**	**0**	**CSI 321**
CSI 422	**Software Engineering 2**	**3**	**2**	**2**	**0**	**CSI 325**
CSI423	**Cryptography and Information Security**	**3**	**3**	**1**	**0**	**CSI 321**
CSI 425	**Computer Graphics**	**3**	**2**	**2**	**0**	**Math 310**
CSI 510	**Graduation Project 1**	**2**	**2**	**0**	**0**	**120 Cr. Hrs**
CSI 511	**Web Programming & Internet Technology**	**3**	**2**	**2**	**0**	**CSI 322**
CSI 512	**Data Mining**	**3**	**2**	**2**	**0**	**CSI 314**
CSI 513	**Concepts of Programming Languages.**	**3**	**2**	**2**	**0**	**CSI 222**
CSI 520	**Graduation Project 2**	**3**	**3**	**0**	**0**	**CSI 510**
CSI 522	**Human Computer Interaction**	**3**	**2**	**2**	**0**	**CSI 511**
CSI 525	**Professional Ethics**	**2**	**2**	**0**	**0**	**CSI 422**
	Total	**81**	**59**	**44**	**2**	

4-b) Department Elective Courses (12 Credit Hrs):

- Student must select 4 courses from either of the next three tracks:-

Track I: Computer Graphics and Multimedia

Course Number	Course Title	Credits Hours	Weekly Hours		Prerequisite
			Lecture	Lab	
CSI 414	Digital Image Processing	3	2	2	MATH 310
CSI 424	Computer Vision	3	2	2	CSI 414
CSI 514	Interactive Computer Graphics	3	2	2	CSI 425
CSI 521	Multimedia Technology	3	2	2	CSI 425
CSI 530	Digital Photography	3	2	2	MATH 220

Track II: Computer Networks

Course Number	Course Title	Credits Hours	Weekly Hours		Prerequisite
			Lecture	Lab	
CSI 431	Advanced Computer Networks	3	2	2	CSI 322
CSI 432	Network Security	3	2	2	CSI 431
CSI 531	Wireless & Mobile Computing	3	2	2	CSI 322
CSI 532	Network Programming	3	2	2	CSI 431
CSI 533	Cloud Computing	3	2	2	CSI 322 , CSI 321

Track III: Individual Track: Student should select his courses from the above two tracks or from the following table

Course Number	Course Title	Credits Hours	Weekly Hours		Prerequisite
			Lecture	Lab	
CSI 441	Machine Learning	3	2	2	CSI 411
CSI 442	Introduction to Robotics	3	2	2	CSI 411
CSI 443	Expert Systems	3	2	2	CSI 411
CSI 444	Computational Methods	3	2	2	Math 310
CSI 445	Operational Research	3	2	2	STAT 320, MATH 310
CSI 446	Information System Management	3	2	2	CSI 314
CSI 447	Information Security	3	2	2	CSI 423
CSI 448	Project Management	3	2	2	CSI 422
CSI 449	Geographic Information Systems (GIS)	3	2	2	CSI 324

Curriculum Plan

Preparatory Year

Course Code	Course Name	Le	Lb	Ex	Cr	Prerequisite	Course Code	Course Name	Le	Lb	Ex	Cr	Prerequisite
PENG 111	Preparatory English (1)	20	0	0	8	--	PENG 121	Preparatory English (2)	14	0	0	6	PENG 111
PMTH 112	Introduction to Mathematics (1)	2	0	1	2	--	PENG 123	English for Science and Engineering	2	0	0	2	PENG 111
PCOM 113	Computer Skills	1	2	0	2	--	PMTH 127	Introduction to Mathematics (2)	4	0	1	4	PMTH 112
PSSC 114	Learning & Communication Skills	1	2	0	2	--	PPHS 128	General Physics	2	2	0	3	--
Total		14				--	Total		15				29

First Year

Course Code	Course Name	Le	Lb	Ex	Cr	Prerequisite	Course Code	Course Name	Le	Lb	Ex	Cr	Prerequisite
CSI 211	Programming 1	2	2	0	3	PCOM 113	CSI 221	Programming 2	2	2	0	3	CSI 211
CSI 212	Disc. Math for CS 1	2	0	2	3	PMTH 127	CSI 222	Disc. Math For CS 2	2	0	0	2	CSI 212
MATH 212	Calculus 1	3	0	1	3	PMTH 127	MATH 220	Calculus 2	3	0	1	3	MATH 212
PHYS 217	Physics 2	2	2	0	3	PPHS 128	CSI 223	Dig. Logic Design	2	2	0	3	PHYS 217
ENG 210	Tech. English	2	0	0	2	PENG 121	CSI 224	Fund. of Inf. Systems	3	0	0	3	--
ZPSY 211	Educational & Thinking Skills	2	0	0	2	--	CHEM 225	General Chemistry	2	0	0	2	--
Total		16					Total		16				32

Second Year

Course Code	Course Name	Le	Lb	Ex	Cr	Prerequisite	Course Code	Course Name	Le	Lb	Ex	Cr	Prerequisite
CSI 311	Visual Programming	2	2	0	3	CSI 221	CSI 321	Design & Analysis of Algorithms	2	0	2	3	CSI 312
CSI 312	Data Structure	2	2	0	3	CSI 221, CSI 212	CSI 322	Computer Networks	2	2	0	3	CSI 313
CSI 313	Computer Organization and Assembly Language	2	2	0	3	CSI 223	CSI 323	Computer Architecture	3	1	0	3	CSI 313
CSI 314	Database	2	2	0	3	CSI 211	CSI 324	Advanced Database	1	4	0	3	CSI 314
MATH 310	Linear Alg. & Diff. Eq.	3	0	2	4	Math 220	CSI 325	Software Engineering 1	2	2	0	3	CSI 221
ISL ***	Elective Islamic Course 1	2	0	0	2	--	STAT 320	Probability & Statistics	3	0	1	3	MATH 220
Total		18					Total		18				36

Third Year

Course Code	Course Name	L	Lb	Ex	Cr	Prerequisite	Course Code	Course Name	Le	Lb	Ex	Cr	Prerequisite
CSI 411	Artificial Intelligence	2	2	0	3	CSI 321	CSI 421	Distributed Systems & Parallel Processing	2	2	0	3	CSI 321
CSI 412	Operating Systems	2	2	0	3	CSI 313	CSI 422	Software Engineering 2	2	2	0	3	CSI 325
CSI 413	Compiler Design	2	2	0	3	CSI 222, CSI 221	CSI 423	Cryptography and Information Security	3	1	0	3	CSI 321
***	Elective Course 1	*	*	*	3	***	CSI 425	Computer Graphics	2	2	0	3	Math 310
ARAB ***	Elective Arabic Course	2	0	0	2	--	***	Elective Course 2	*	*	*	3	***
ISL***	Elective Islamic Course 2	2	0	0	2	--	ISL ***	Elective Islamic Course 3	2	0	0	2	--
CSI 400	Summer Training	1	0	0	1	72 Cr. Hrs							
Total		17					Total		17				34

Fourth Year

Course Code	Course name	Le	Lb	Ex	Cr	Prerequisite	Course Code	Course	Le	Lb	Ex	Cr	Prerequisite
CSI 510	Graduation Project 1	2	0	0	2	120 Cr. Hrs	CSI 520	Graduation Project 2	3	0	0	3	CSI 510
CSI 511	Web Programming & Internet Technology	2	2	0	3	CSI 322	CSI 522	Human Computer Interaction	2	2	0	3	CSI 511
CSI 512	Data Mining	2	2	0	3	CSI 314	CSI 525	Professional Ethics	2	0	0	2	CSI 422
CSI 513	Concepts of Prg. Lang.	2	2	0	3	CSI 222	***	Elective Course 4	*	*	*	3	***
***	Elective Course 3	*	*	*	3	***	***	Free Elective Course	*	*	*	3	***
***	Elective Prereq. Univ.	2	0	0	2	***							
Total		16					Total		14				30

Courses Description

Level 3

Course Code	Course Name	Le	Lb	Ex	Cr	Prerequisite
CSI 211	Programming 1	2	2	0	3	PCOM 113
CSI 212	Disc. Math for CS 1	2	0	2	3	PMTH 127
Math 212	Calculus 1	3	0	1	3	PMTH 127
PHYS 217	Physics 2	2	2	0	3	PPHS 128
ENG 210	Tech. English	2	0	0	2	PENG 121
ZPSY 211	Educational & Thinking Skills	2	0	0	2	--
Total		**16**				

Programming 1	Code & No	CSI 211
	Credits	3(2+2+0)
	Pre-requisite:	PCOM 113
	Co-requisite:	N/A
	Level:	3

Module Description:
This course introduces the students to basic programming concepts and constructs. Topics include: control structures, functions, recursion, arrays, pointers and strings of the C++ programming language. The course introduces students to structured, top-down programming design and implementation. This course should serve as a foundation for programming to the students in the program.

Text Book

Deitel and Deitel, " C++: How To Program ", 2010, Prentice Hall, ISBN 978-007351725.

Essential References

1. De D. S. Malik, " C++ Programming: From Problem Analysis to Program Design ", Course Technology, ISBN 061916042X.

Discrete Mathematics for Computer Science 1	Code & No	CSI 212
	Credits	3(2+0+2)
	Pre-requisite:	PMTH 127
	Co-requisite:	N/A
	Level:	3

Module Description:

The current course introduces the basic concepts of logic and its tools. This enables problem formulation in a logical manner, so logical way of thinking can be applied to the real life. These objectives can be successfully achieved through the conduction of the following topics:
Propositional Logic; Set Theory; Proofs; Functions, Sequences, and Relations; Methods of Counting; Recurrence Relations; Graph Theory and Introduction to Trees.

Text Book

Richard Johnsonbaugh, "Discrete Mathematics" , Prentice Hall, 7th Edition, 2009.

Essential References

1- Steven Roman, "An Introduction to Discrete Mathematics", HBJ Publishers and its subsidiary, Academic Press, 2nd Edition, 1989.

2- Steven G. Krantz; "The Elements of Advanced Mathematics", Chapman & Hall/CRC, 2nd Edition, 2002.

3- W. D. Wallis, "A Beginner's Guide to Discrete Mathematics", Birkhauser, 2003

Calculus 1	Code & No	MATH 212
	Credits	3(3+0+1)
	Pre-requisite:	PMTH 127
	Co-requisite:	N/A
	Level:	3

Module Description:

The current course aims to provide a language for working with ideas relevant to computer science. The course is concerned with two main topics: Differential and Integral Calculus. The 1st topic is covered completely including basic concepts of the function as: Domain, Range, Mathematical Modeling, Composition, Boundness, Equality, Intervals of Increase and Decrease, Piecewise-definition, Symmetry and Homogeneity. Classification, Important types, Graphs and Related Properties, Algebraic Operations on the graph. The Inverse: Conditions and Tests of Existence, Principal Branches, Analytical and Graphical Determination of the inverse. Indeterminate Forms (0*∞, ∞-∞): Definitions, Concepts, Related Theorems, and Evaluations, Definitions of Continuity and Discontinuity. The Derivatives of all standard functions: Power Function, Trigonometric Function and their Inverse, Hyperbolic Functions and their Inverse, considering : Graph, Domain, Range, Symmetry, and Periodicity. Applications of the Derivatives regarding: General derivatives, Implicit Differentiation, Parametric Differentiation and the Chain Rule, Important theorems as: Roll's, Mean Value, Maclurin's, Taylor's and L'Hopital Theorems, Geometric applications: Curve tracing, Polar Coordinates, Famous polar curves.

The 2nd topic covers all the essential requirements of integral Calculus, starting with Indefinite Standard Integration including all the Basic Concepts and Properties, Notable Remarks, Tables Of Standard Integration (All Elementary Functions), Basic Forms, Various Skills Using Algebraic Relations to obtain different forms of the solution of the same problem. Also, the student will have robust study of Techniques of Evaluation of Indefinite Non-standard Integration: Completing a perfect square, Using Partial Fractions, By Parts, By Substitutions.

Text Book

David J. Ellenbogen, "Calculus And Its Applications" , Addison Wesley, 2007.

Essential References

1- James Stewart,"Calculus" , Brooks/Cole Publishing Company, 2007.
2- Margaret L. Lial, "Calculus with Applications", Addison-Wesley, 2004.
3- James Stewart,"Calculus with Analytic Geometry", Houghton Mifflin Company, 7th Edition, 2002.

Physics 2	Code & No	PHYS 217
	Credits	3(2+2+0)
	Pre-requisite:	PPHS 128
	Co-requisite:	N/A
	Level:	3

Module Description:

This course includes two parts;

Part A: general physics

Electric fields, Coulomb's law, Gauss' Law, electric potential, capacitance and dielectric, currents and resistance, electrical energy and power, direct current circuits, Kirchhoff's rules, magnetic fields, motion of charged particle in a magnetic field, sources of the magnetic field, Faraday's law of induction, Ampere's law, mutual inductance, alternating current circuits, the RLC series circuit(a resistor, an inductor, and a capacitor connected in series), power in an A.C. circuit, resonance in RLC services circuit.

Part B Basic Electronics:

The P-N junction diode and Zener diode with their applications, Junction Field effect transistor, Bipolar junction transistor (Bias and amplifiers: JFET & BJT)

Text Book

Arthur Beiser, Physics, 5th Ed., The Benjamin/Cummings Publishing Co., 2005.

Essential References

1- Raymond A. Serway - Emeritus, Physics for Scientists and Engineers, 6th Edition,2004
2- R. Boylestad and L. Nashelsky, Electronic devices and circuit theory, 11 Edition, 2012, Prentice Hall.

Technical English	Code & No	ENG 210
	Credits	2(2+0+0)
	Pre-requisite:	PENG 121
	Co-requisite:	N/A
	Level:	3

Module Description:

In this course students learn to read various computer science related materials. Use of the internet both for research and communication is an integral part of the course experience. Most of the course activities are student centered and they learn to cooperate with their friends and partners. Also student-teacher interactions become more frequent in the lecture room.

This course will also offer students a broad introduction to English in the context of Information Technology assuming a general English base. It is essentially a functional course that builds IT- related vocabulary with a strong emphasis on reading skills, for finding, understanding and utilizing information.

Use of the computer dictionary is an essential part of this course.

Text Book

Eric H. Glendinning and John McEwan, **"Oxford English for Information Technology"**, 2006, Oxford University Press, Oxford. Student's Book, ISBN 019457492X.

Essential References

1. Eric H. Glendinning and John McEwan, **"Basic English for Computing"**, REVISED EDITION, Oxford University Press, Oxford. Student's Book, ISBN 978-0-19-457470-9
2. Keith Boeckner and P Charles Brown, **"Oxford English for Computing",** Oxford University Press, Oxford. Student's Book, ISBN 978-0-19-457470-0
3. **"Oxford Dictionary of Computing for Learners of English",** 1996, Oxford University Press, Oxford. ISBN 978-0-19-431441-1.

Level 4

Course Code	Course Name	Le	Lb	Ex	Cr	Prerequisite
CSI 221	Programming 2	2	2	0	3	CSI 211
CSI 222	Disc. Math For CS 2	2	0	0	2	CSI 212
MATH 220	Calculus 2	3	0	1	3	MATH 212
CSI 223	Dig. Logic Design	2	2	0	3	PHYS 217
CSI 224	Fund. of Inf. Systems	3	0	0	3	---
CHEM 225	General Chemistry	2	0	0	2	---
Total		**16**				

Programming 2	Code & No	CSI 221
	Credits	3(2+2+0)
	Pre-requisite:	CSI 211
	Co-requisite:	N/A
	Level:	4

Module Description:
This course is an introductory course in object oriented programming. The fundamental concepts of object oriented programming will be studied using the C++ programming language. Topics to be covered: 1) Functions 2) Classes and Objects 3) Inheritance 4) Polymorphism 5) Operator Overloading 6) File processing and Streams.

Text Book

Joyce Farrell Object-Oriented Programming Using C++, Fourth Edition , 2009, ISBN-13: 978-1-4239-0257-7.

Essential References

1. De D. S. Malik, C++ Programming: From Problem Analysis to Program Design, 2006, Course Technology.
2. Robert Lafore, Object-Oriented Programming in C++,4th ,2001, Sams Publishing.

Discrete Mathematics for Computer Science 2	Code & No	CSI 222
	Credits	2(2+0+0)
	Pre-requisite:	CSI 212
	Co-requisite:	N/A
	Level:	4

Module Description:

This course covers the mathematical topics that are mostly directed to computer science. Students may need them in courses like cryptography, compiler, and programming design. Topics include:

Introduction to number theory, concepts of abstract algebra, and formal languages.

Number Theory: Divisibility and Euclidean algorithms. Modular arithmetic, Fermat's and Euler's theorems, Chinese remainder theorem.

Concepts of Abstract Algebra: groups, rings, fields, Homomorphisms, Lagrange's theorem, Finite fields.

Automata Theory: Finite state machine, Regular expressions, DFA, NDFA, and their equivalence, Grammars and Chomsky hierarchy.

Text Book

Kenneth H. Rosen : Discrete Mathematics and Its Applications, 2011, McGraw-Hill College.

Essential References

Ronald L. Graham, Donald E. Knuth, and Oren Patashnik, Concrete Mathematics: A Foundation for Computer Science, 1994, Addison-Wesley Professional

Calculus 2	Code & No	MATH 220
	Credits	3(3+0+1)
	Pre-requisite:	MATH 212
	Co-requisite:	N/A
	Level:	4

Module Description:

The current course aims to abstract the essentials of problems and formulate them mathematically and in symbolic form so as to facilitate their analysis and solution. The course is a firm continuation of Math110 with important strongly interrelated topics that furnish robust basis for the other materials in computer science.

The 1st topic is The definite integration: Introduction & Basic Concepts and Properties of Definite Integrals, Theorems Facilitating Evaluation of Definite Integrals, Improper Integrals of First And Second Kinds, Case Study: Special Functions Defined As Definite Integrals. Applications of definite integration: Using Cartesian, Parametric, and Polar coordinates in: Area between two curves, Length of plan curves.

The 2nd topic isThe Partial Differentiation:Basic Concepts: of Functions of several variables, Partial derivatives of order one and higher orders, Chain rule for one parameter and more. Applications: Rates, Exact differential expression, Del operator: Gradient & Divergence & Curl.

The 3rd topic is The Analytic Geometry: Two Dimensions: The different forms of equations of straight line, The conic sections: equations and geometric properties.Three Dimensions: The Cartesian, Cylindrical, and Spherical Coordinates and their interrelations. The Directional Cosines and Ratios. The Plane, The Straight Line, The Quadric Surfaces.

The 4th topic is The Multiple Integral and Vector Calculus: Double Integral: The Cartesian coordinates, Change of order, Polar coordinates. Line Integral: Opened/Closed paths in different coordinate systems. Green's Theorem, Path independence.

The 5th topic is The sequences and Infinite Series: Definition: Sequence, Series, Convergence, Divergence.

Tests for Convergence And Divergence For Positive Series: Nth term test, Polynomial test, Comparison test, Nth root test, Ratio test, Integral test. Alternating Series: Leibnitz theorem for Absolute and conditional convergence. Power Series: Formation, Interval of convergence.

Text Book

Soo T. Tan, "Calculus", Books/Cole Cengage Learning, 2010.

Essential References

1- Robert T. Smith, "Calculus", McGraw Hill, 3rd Edition, 2009.
K. A. Stroud, "Engineering Mathematics", Palgrave Macmillan, 6th Edition, 2007.
2- R. Larson, "Calculus with Analytic Geometry", Houghton Mifflin Company, 7th Edition, 2002.

Digital Logic Design	Code & No	CSI 223
	Credits	3(2+2+0)
	Pre-requisite:	PHYS 217
	Co-requisite:	N/A
	Level:	4

Module Description:
The course provides students with basic knowledge in: Binary Numbers, Octal and Hexadecimal Numbers, Number Base Conversions, Complements, Signed Binary Numbers, Binary Codes; Boolean Algebra and Logic Gates, Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms. Digital Logic Gates, Integrated Circuits, Transistor equivalent of Digital Logic Gates; Gate-Level Minimization, The Map Method, Four-Variable Map, Five-Variable Map, Product of Sums Simplification, Don't-Care Conditions, NAND and NOR Implementation, Exclusive-OR Function; Combinational Logic, Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers; Sequential circuits: Latches and Flip flops, Sequential circuits analysis and design, Finite state machines, Registers and Counters.

Text Book

M. Morris Mano & Michael D. Ciletti: Logic Design with an Introduction to the Verilog HDL, 5th Ed. 2013, Pearson Education.

Essential References

1- J. Wakerly, Digital Design: Principles and Practices, 2000, Prentice-Hall
2- C. H. Roth, Fundamentals of Logic Design, 2004**,** Thomson Brooks / Cole

Fundamentals of Information Systems	Code & No	CSI 224
	Credits	3(3+0+0)
	Pre-requisite:	-
	Co-requisite:	N/A
	Level:	4

Module Description:

The current course furnishes an overview of the fundamentals of data and information processing as they relate to meeting the needs of an organization in immediate and long run operations. Also, it provides an understanding of how information systems are used in organizations
. These objectives can be successfully achieved through the conduction of the following topics:
Basic Concepts of systems: What is it, Why we need it, How it is constructed, When and Where it is used?, Components of Information Systems, Levels and Types of Information Systems, Important illustrative examples of Real-life practical Information Systems: DSS, ERP, Expert Systems, GUI, and Internet Portals . Introduction to Database.

Text Book

O'Brien and MaraKas, George Marakas ; Introduction to Information Systems (16th Ed.) McGraw Hill, Business and Economics, 2012.

Essential References

1- V. Rajaman; Analysis and Design of Information Systems; 2nd Edition; PHI Learning Pvt Ltd; Aug. 2004.

2- Ralph Stair and George Reynolds, “Fundamentals of Information Systems”, Course Technology, 3rd Edition2005, ISBN 1423901134.

General Chemistry	Code & No	CHEM 225
	Credits	2(2+0+0)
	Pre-requisite:	-
	Co-requisite:	N/A
	Level:	4

Module Description:
General chemistry course should be studied in the first levels. It describes atomic theory, chemical bonding, chemical reactions, gases, liquids, chemical equilibrium, thermochemistry and chemical kinetics.

Text Book

Thomson, Principles of modern Chemistry, 6thed, 2008

Essential References

1- Peter Atkins and Julio de Paula, The Elements of Physical Chemistry, 2005
2- Peter Atkins and Julio de Paula, Physical Chemistry, 2006
3- Robert J. Silbey, Robert A. Alberty, and Moungi G. Bawendi, Physical Chemistry, 2004

Level 5

Course Code	Course Name	Le	Lb	Ex	Cr	rerequisite
CSI 311	Visual Programming	2	2	0	3	CSI 221
CSI 312	Data Structure	2	2	0	3	CSI 221, CSI 212
CSI 313	Computer Organization and Assembly Language	2	2	0	3	CSI 223
CSI 314	Database	2	2	0	3	CSI 211
MATH 310	Linear Alg. & Diff. Eq.	3	0	1	3	Math 220
ISL ***	Elective Islamic Course 1	2	0	0	2	--
Total		**17**				

Visual Programming	Code & No	CSI 311
	Credits	3(2+2+0)
	Pre-requisite:	CSI 221
	Co-requisite:	N/A
	Level:	5

Module Description:

This course offers comprehensive coverage of C#, explaining the core of the language including the basics of LINQ vocabulary (Language Integrated Query). You also gain fundamental experience in how C# is used as part of the .NET Framework, including implementation and deployment of .NET components and the use of C# in mixed language and data access situations.

Text Book

Jesse Liberty: Programming C# Building.Net Applications with C#, 4th Edition, 2005, O'Reilly Media.

Essential References

Herbert Schildt : C# 4.0 The Complete Reference , McGraw Hill Professional, Apr 27, 2010.

Data Structures	Code & No	CSI 312
	Credits	3(2+2+0)
	Pre-requisite:	CSI 212, CSI 221
	Co-requisite:	N/A
	Level:	5

Module Description:

The purpose of this course is to provide the students with solid foundations in the basic concepts of computer science: Time and Space. The main objective of the course is to teach the students how to select and design data structures and algorithms that are appropriate for problems that they might encounter.
This course is also about introducing the student to the basic concepts of studying algorithms, their correctness and computational complexity. This course offers the students a mixture of theoretical knowledge and practical experience using C++. Topics includes:

1. Review of Basic concepts: Definition of an algorithm, asymptotic analysis of upper and average complexity bounds. Identifying differences among best, average and worst case behaviors. Big O, little o, omega, and theta notations. Time and space tradeoffs in algorithms. Algorithms strategies.
2. Basic algorithms: Sorting (insertion sort, merge sort), searching (linear search, binary search).
3. Basic data structures: Lists, linked lists, double linked lists, stacks, queues.
4. Advanced data structures: Graphs, trees, heaps, dynamic sets, and has tables.

Text Book

Robert Sedgewick: Algorithms in C++, Parts 1-4: Fundamentals, Data Structure, Sorting, Searching, 2011, Addison-Wesley.

Essential References

Thomas Cormen, Charles Leiserson, Ronald Rivest, and Clifford Stein**:** Introduction to Algorithms**,** MIT Press, 2009.

Computer Organization and Assembly Language	Code & No	CSI 313
	Credits	3(2+2+0)
	Pre-requisite:	CSI 223
	Co-requisite:	N/A
	Level:	5

Module Description:
This course introduces topics related to computer organization and architecture in two paradigms: "what", and "how". To answer “what”, the course presents the fundamental principles of computer organization and architecture. This leads to an understanding of the design of processors, the structure and operation of memory and virtual memory, cache, storage, and pipelining, system integration, and peripherals. The course also provides an introduction to issues of system performance evaluation and the relationship of architecture to system software. Regarding the “how”, the course provides basic programming in assembly language. This leads to a direct and practical understanding of the inner working stages of a processor in relation to the rest of the system, including memory and cache management, interrupt processing and pipelining. Execution of software via assembly language and high level languages is explained in terms of system software tools which include assemblers, compilers, linkers, and loaders.

Text Book

William Stallings, Computer Organization and Architecture: Designing for Performance, 9th Edition, Prentice Hall, 2012

Essential References

1- Mazidi, Muhammad Ali, and Janice Mazidi. 80x86 IBM PC and Compatible Computers: Assembly Language, Design and Interfacing. Prentice Hall PTR, 2000.

Database	Code & No	CSI 314
	Credits	3(2+2+0)
	Pre-requisite:	CSI 211
	Co-requisite:	N/A
	Level:	5

Module Description:
This course aims to discuss the basic concepts and design of database. It covers topics such as: data model, levels of abstraction, data independence, and concurrency control. Focuses on how to design databases for given problems, and how to use database effectively, these including ER model, key and participation constraints, weak entities, class hierarchies, aggregation and conceptual DB design using the ER model. Relational model: creating and modifying relation using query language, enforcing integrity constrains, ER to relational and view. Schema refinement and normal forms: Functional dependencies, reasoning about functional dependencies, normal forms, decompositions and normalization. Relational Queries: Relation algebra and calculus and commercial query languages. Object database systems: User defined abstract data type, structured types, objects; object identity; and reference type, inheritance, and database design for an ORDBMS. Students will be trained on some software tools such as: Oracle, Sybase, DB2, and Informix.

Text Book

Elmasri, R., Navath,S., and Navath, B.,"Fundamentals of Database Systems" , Addison-Wesley, 6th Ed., 2010, ISBN 0136086209.

Essential References

1- Raghu, R. and Johannes, G., "Database Management Systems" , McGraw-Hill,3rd ed., 2002,ISBN 0072465638.

2- Date, C. J., "Introduction Database Systems", Addison-Wesley, 8th ed.,2003, ISBN 0321197844.

Linear Algebra and Differential Equations	Code & No	MATH 310
	Credits	3(3+0+1)
	Pre-requisite:	MATH 220
	Co-requisite:	N/A
	Level:	5

Module Description:

The current course provides a systematic understanding of important core areas through the study of advanced topics in mathematics, and its wide-ranging applications. The course has two basic tracks. The 1st track is concerned with the Linear Algebra where the student will study the theory and applications of arrays, mainly vectors and matrices through the subjects: Basic Concepts of Arrays, Important frequent types of matrices, Echelon Form, Important algebraic operations on matrices, The simple row operations and the Inverse of a matrix, Linear dependence and independence of vectors: Rank of a set of vectors, rank of a matrix, methods to find this rank, how to represent a vector in terms of a given set of vectors, Solutions of Linear Systems of Equations: General solution (Unique, Infinite, and no Solution). Abstract and geometric representation of vectors: Scalar/Inner product, Vectorial Product, Triple Scalar Product, Triple Vectorial Product, Basis and dimensions of space, Orthogonal Vectors, The Gram-Shmiditt Process, The Grammian, Orthogonal and Orthonormal Matrices, **The Eigen Value Problem:** The characteristic polynomial, the Eigen Vectors, the Model matrix; Orthogonal, Orthonormal, and Unitary matrices. Diagonalization, and Similarity properties, Caley_Hamilton theorem and its Applications, The minimal polynomial. Functions of matrices, Positive and negative definite matrices.

The 2nd Track is devoted for the Differential Equations: Basic Concepts: First Order and First Degree Differential Equations: Separable & reducible to separable, Homogeneous & reducible to homogeneous, Exact & reducible to exact (integrating factor), Linear & reducible to linear (Bernoulli), High Order and First Degree Differential Equations: (with constant coefficients): Independent Solutions and the Wronskian, D-operator & Inverse D-operator, Method of undetermined coefficients, Complementary and Particular solutions, Simultaneous high order differential equations, Shift rule and its application for the particular solution.

Text Book

- Peter J. Oliver, "Applied Linear Algebra" , Prentice Hall, 2006.
- James R. Brannan, "Differential Equations with Boundary Value Problems" , John Wiley & Sons, 2010.

Essential References

1- D. W. Jordan**,** "Mathematical Techniques: An Introduction for the Engineering, Physical, and mathematical Sciences", Oxford University Press**, 2002.**

Level 6

Course Code	Course Name	Le	Lb	Ex	Cr	Equisite
CSI 321	Design & Analysis of Algorithms	2	0	2	3	CSI 312
CSI 322	Computer Networks	2	2	0	3	CSI 224
CSI 323	Computer Architecture	3	1	0	3	CSI 313
CSI 324	Advanced Database	1	4	0	3	CSI 314
CSI 325	Software Engineering 1	2	2	0	3	CSI 221
STAT 320	Probability & Statistics	3	0	1	3	MATH 220
Total		**18**				

Design and Analysis of Algorithms	Code & No	CSI 321
	Credits	3(2+0+2)
	Pre-requisite:	CSI 312
	Co-requisite:	N/A
	Level:	6

Module Description:

Algorithms are fundamental to computer science and software engineering. Good algorithm design is therefore crucial for the performance of all software systems. Moreover, the study of algorithms provides insight into the intrinsic nature of the problem as well as possible solution techniques independent of programming language, programming paradigm, computer hardware, or other implementation aspects.

This course is continuing to provide students with the ability to select algorithms appropriate to particular purpose and to apply them, recognizing the possibility that no suitable algorithm may exist. This relies on understanding the range of algorithms that address an important set of well-defined problems, recognizing their strengths and weaknesses, and their suitability in particular contexts. Efficiency is a pervasive theme throughout this area. A new range of paradigms and techniques to design algorithms and to solve problems is considered.

1. Review of Basic Analysis: Definition of an algorithm, asymptotic analysis of upper and average complexity bounds. Identifying differences among best, average and worst case behaviors. Big O, little o, omega, and theta notations. Time and space tradeoffs in algorithms. Algorithms strategies.
2. Solving Recursions: Using recurrence relations to analyze recursive algorithms, substitution method, recursion-tree method, and the master theorem method.
3. Sorting and Searching: Insertion sort, Selection sort, Bubble sort, Merge Sort, Quick sort, linear search, Binary search.
4. Dynamic Programming: Elements of dynamic programming, Matrix chain algorithm.
5. Advanced data structures: Binary search tree. Optimal Binary search tree.
.

Text Book

Thomas Cormen, Charles Leiserson, Ronald Rivest, and Clifford Stein, Introduction to Algorithms, MIT Press, 2009.

Essential References

Michael T. Goodrich and Roberto Tamassia,Algorithm Design: Foundation , Analysis, and Internet Examples**,** John Wiley & Sons Inc, 2002.

Computer networks	Code & No	CSI 322
	Credits	3(2+2+0)
	Pre-requisite:	CSI 313
	Co-requisite:	N/A
	Level:	6

Module Description:

This course is an introduction to computer networks, stressing the logical organization of the three networking features architecture, algorithms, and implementations with focus on performance. Topics include:

- Introduction: overview of computer networks
- Fundamentals of data transmission: wired/wireless media, digital vs. analog transmission, data coding.
- Multi-user communication and multiplexing
- LAN technology and data link protocols: point-to-point links and sliding window flow control, Ethernet and CSMA/CD, switched and carrier Ethernet, Wireless LAN and CSMA/CA, cellular networks and advanced multi-user communication

Text Book

Computer Networks 5th Ed. Andrew S. Tanenbaum, Pearson Prentice Hall, 2010

Essential References

Data and Computer Communication 9th Ed., William Stallings. Pearson Prentice Hall, 2011

Computer Architecture	Code & No	CSI 323
	Credits	3(3+1+0)
	Pre-requisite:	CSI 313
	Co-requisite:	N/A
	Level:	6

Module Description:
This course provides students with basic knowledge in: Fundamentals of computer design, Performance evaluation, Instruction set principles, Processor organization and design, Pipelining, Instruction and arithmetic pipelines, Dynamic and speculative execution, Precise exception, CISCS, RISC, and VLIW processors, Memory Hierarchy, Virtual memory, Multilevel caches, Storage and I/O, Introduction to Multicore, multiprocessors, and clusters, New trends in computer architecture.

Text Book

William Stallings, Computer Organization and Architecture: Designing for Performance, 9th Edition, Prentice Hall, 2012

Essential References

M. Morris Mano, Computer System Architecture, 2nd Custom Edition, Pearson, 2005.

Advanced Database	Code & No	CSI 324
	Credits	3(2+2+0)
	Pre-requisite:	CIS 314
	Co-requisite:	N/A
	Level:	6

Module Description:

This course introduces the concepts and principles of database management systems (DBMS). It focuses on terminology and fundamental concepts of relational databases and database management systems. Students will learn SQL and PL/SQL including, triggers and transaction processing. They will understand performance issues and optimization strategies through query rewriting, secondary storage characteristics, and access strategies. This course also exposes student to some of the current challenges facing database professionals (e.g. semi-structured data management, XML databases, information extraction, data integration) as well as some DBMS design and management issues.

Major topics include:

- Transaction management,
- Recovery, concurrency control.
- PL/SQL Programming,
- Indexing and Hashing
- Parallel Databases, Distributed Databases
- File organization and access,
- Buffer management,
- Performance analysis and storage management.
- Database system architecture,

Query processing and optimization, Reliability, protection, and integrity.

Text Book

Silberschatz, Korth, and Sudarshan, Database System Concepts, 5th edition , 2005, McGraw-Hill.

Essential References

1- RamezElmasri ,Fundamentals of Database Systems, 6th edition , 2010, ShamkantNavathe.

2- Gillenson ,Fundamentals of Database Management Systems, 2004, Wiley.

Software Engineering 1	Code & No	CIS 325
	Credits	3(2+2+0)
	Pre-requisite:	CSI 221
	Co-requisite:	N/A
	Level:	6

Module Description:

The main objective of this course is to provide students with an overall foundation of software engineering to effectively and efficiently design and implement systems. Topics to be covered include: system development tools, cost benefit analysis, prototyping, alternate system design strategies, designing human interface, software development life cycle, rapid application development and CASE tools, systems planning and selection, system analysis, system design, and system implementation and operation.

Text Book
Modern System Analysis and Design, Jeffrey Hoffer, Joey George, and Joseph Valacich ,Prentice Hall,2008
Essential References
Systems Analysis and Design, Shelly and Rosenblatt, Delmar Learning,2013

Probability & Statistics	Code & No	STAT 320
	Credits	3(3+0+1)
	Pre-requisite:	Math 220
	Co-requisite:	N/A
	Level:	6

Module Description:

Discrete Probability Distributions,Continuous Probability Densities, Combinatorics, Conditional Probability, Random Variables, Joint Distribution:Expectation, Variance, Covariance, Correlation Coefficient, Law of Large Numbers, Central Limit Theorem, Generating Functions, Markov Chains, Random Walks.

Statistics: Towards Statistical, Thinking for Decision Making, Descriptive Sampling Data , Analysis, Probability for Statistical Inference and Modeling , Necessary Conditions for Statistical Decision Making, Estimators and Their Qualities,Hypothesis Testing: Rejecting a Claim, Hypotheses Testing for Means and Proportions, Tests for Statistical Equality of Two or More Populations, Applications of the Chi-square Statistic, Regression Modeling and Analysis, Index Numbers with Applications.

Text Book

Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying E. Ye, "Probability and Statistics for Engineers and Scientists", Pearson; 9 edition (January 6, 2011).

Essential References

1- William Mendenhall, Introduction to Probability and Statistics , 2008,Brooks/Cole
2- Douglas C. Montgomery and, George C. "Applied Statistics and Probability for Engineers", Wiley; 5 edition (March 03, 0212).

Level 7

Course Code	Course Name	Le	Lb	Ex	Cr	Prerequisite
CSI 411	Artificial Intelligence	2	2	0	3	CSI 321
CSI 412	Operating Systems	2	2	0	3	CSI 313
CSI 413	Compiler Design	2	2	0	3	CSI 221, CSI 222
***	Elective Course 1	*	*	*	3	***
ARAB ***	Elective Arabic Course	2	0	0	2	--
ISL***	Elective Islamic Course 2	2	0	0	2	--
CSI 400	Summer Training	1	0	0	1	72 Cr. Hrs
Total		**17**				

Artificial Intelligence	Code & No	CSI 411
	Credits	3(2+2+0)
	Pre-requisite:	CSI 321
	Co-requisite:	N/A
	Level:	7

Module Description:

The course provides an introduction to the types of problems and techniques in Artificial Intelligence. Problem-Solving methods and major structures used in Artificial Intelligence programs, constraint satisfaction problems.
Study of knowledge representation techniques such as predicate logic, non-monotonic logic, and probabilistic reasoning. Application areas of AI such as game playing, expert systems, Machine learning and natural language processing.
Project: cover some course areas using a logic programming tool (Prolog language for example).

Text Book

Artificial Intelligence A Modern Approach, Stuart Russell & Peter Norvig, Prentice Hall, Published Date: Dec 1, 2009.

Essential References

1- George F. Luger, Artificial Intelligence: structures and strategies for complex problem solving, Addison-Wesley; 6 edition, (March 9, 2011).
2- David Poole and Alan Mackworth**,** Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.

Operating Systems	Code & No	CIS 412
	Credits	3(2+2+0)
	Pre-requisite:	CIS 313
	Co-requisite:	N/A
	Level:	7

Module Description:
Fundamental concepts of operating-systems, principles of modern operating systems, including operating systems structures, system performance and models, systems with multiprogramming, process and thread management, processor scheduling, synchronization, basic concepts of deadlock, memory management, File-System Interface ,Storage Structure ,Data Storage on Disks ,File-Systems : Fat ، Fat32 ، NTFS, Hardware Protection.

Text Book

Modern Operating Systems (third edition), Andrew S. Tanenbaum, Prentice Hall Publishers, 2007, ISBN-10: 0-13-600663-9, ISBN-13: 978-0136006633

Essential References

Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, 8th edition, John Wiley & Sons, 2008.

Compiler Design	Code & No	CSI 413
	Credits	3(2+2+0)
	Pre-requisite:	CSI 221, CSI 222
	Co-requisite:	N/A
	Level:	7

Module Description:
This course introduces the student to the design and implementation of compilers. Topics include: compiler organization, algorithms for lexical, syntactic and semantic analysis, top-down and bottom-up parsing (e.g., recursive descent, LL, LR, LALR parsing), symbol table organization, error detection and recovery, intermediate and object code generation, and code optimization. Student has to implement a compiler for a simple high level language (like mini C) as a project .

Text Book

R Sethi , J D Ullman & Addison-Wesley : Compilers: Principals, Techniques, and Tools, 3rd , 2007, Addison-Wesley.

Level 8

Course Code	Course Name	Le	Lb	Ex	Cr	Prerequisite
CSI 421	Distributed Systems & Parallel Processing	2	2	0	3	CSI 321
CSI 422	Software Engineering 2	2	2	0	3	CSI 325
CSI 423	Cryptography and Information Security	3	1	0	3	CSI 321
CSI 425	Computer Graphics	2	2	0	3	Math 310
***	Elective Course 2	*	*	*	3	***
ISL ***	Elective Islamic Course 3	2	0	0	2	--
Total		**17**				

Distributed Systems & Parallel Processing	Code & No	CSI 421
	Credits	3(2+2+0)
	Pre-requisite:	CSI 321
	Co-requisite:	N/A
	Level:	8

Module Description:

The objective of this course is to introduce students to the fundamentals and techniques of distributed computing and provide them with the basic skills of how to write distributed programs. Topics to be covered include: distributed computing, distributed programming, distributed systems, concurrency, distributed computing paradigms, inter-process communications, group communications, operating system support, distributed objects, application programming interfaces (RMI, RPC), client server model, the socket API, security issues and Internet applications.

In this course also, student will study an introduction to parallel processing. Models of parallel machines. Parallel programming paradigms and models. Performance analysis of parallel systems. Parallel programming languages and frameworks. Students are expected to develop distributed applications using latest technologies.

Text Book

Distributed Systems: Concepts and Design by G. Coulouris, J. Dollimore and T. Kindberg 2009

Essential References

Distributed Systems: Principles and Paradigms (2nd Edition) by Andrew S. Tanenbaum and Maarten Van Steen (Oct 12, 2006)

Software Engineering 2	Code & No	CSI 422
	Credits	3(2+2+0)
	Pre-requisite:	CSI 325
	Co-requisite:	N/A
	Level:	8

Module Description:
This course covers the main concepts of software engineering concepts. Topics include: Software processes: Software process models, process iteration, process activities, the Rational Unified Process, Computer-Aided Software Engineering System Models: Context models, Behavioral models, , Data models, Object models, CASE workbenches Architectural Design: Architectural design decisions, System organization, Modular decomposition styles, Control styles :Object Oriented Concepts: Object approach Unified Modeling Language (UML): Class Diagram, Object Diagram, Use Case Diagram, Collaboration Diagram, Sequence Diagram, Component Diagram, Deployment Diagram

Text Book
SOFTWARE ENGINEERING, 9th Ed , by Ian Sommerville, Addison-Wesley, 2011.
Essential References
Software Engineering: A practitioner's Approach, by Roger S. Pressman, McGraw-Hill Science, 6 edition,2009.

Cryptography and Information Security	Code & No	CSI 423
	Credits	3(3+1+0)
	Pre-requisite:	CSI 321
	Co-requisite:	N/A
	Level:	8

Module Description:

The aim of this course is to facilitate understanding of the inherent strengths and limitations of cryptography, especially when used as a tool for information security. Armed with this knowledge, student should be able to make more informed decisions when building secure systems.

The course covers various aspects of symmetric and asymmetric cryptography. While some topics will be dealt with in more detail, the course will attempt to provide a broad coverage of possibly all the core areas of cryptography. The students will be expected to implement and analyze some simple cryptographic schemes and read various articles. To understand the principles of encryption algorithms; conventional and public key cryptography. To have a detailed knowledge about authentication, hash functions and application level security mechanisms. Topics include:

Overview: computer security concepts, the OSI security Architecture, Security attacks, Security mechanisms, Model of network security.

Classical Encryption Techniques: Symmetric cipher model, substitution techniques, Transposition techniques, Rotor machines.

Block ciphers and DES: Block cipher principles, DES, the strength of DES, Differential and linear cryptanalysis, Block cipher design principles.

Review of Mathematical concepts: Divisibility, Division algorithm, the Euclidean algorithm, Modular arithmetic, Groups, rings, fields. Finite Fields.

Advanced Encryption Standard: Finite Field Arithmetic, AES structures, AES transformation, AES key expansion.

Block cipher operation: Multiple and triple DES, ECB, CBC, CFB, OFB, Counter, and XTS mode of encryptions.

Review of Number theory concepts: prime numbers, Fermat's and Euler's theorem, primalitytesting, Chinese remainder theorem, Discrete logarithms.

Public key Cryptography and RSA: principles of public key cryptosystems, The RSA algorithm.

Other public key cryptosystem: DH scheme, ElGamal cryptosystem.

Cryptographic Hash functions: Applications of Cryptographic hash functions, simple hash functions, SHA-3, Digital signatures.

Text Book

W. Stallings, Cryptography and Network Security: Principles and Practice, Prentice Hall, 2011.

Essential References

C. Kaufman, R. Perlman, and M. Speciner, Network Security**,** Private Communication in a Public World. Prentice Hall, 2002.

Computer Graphics	Code & No	CSI 425
	Credits	3(2+2+0)
	Pre-requisite:	MATH 310
	Co-requisite:	N/A
	Level:	8

Module Description:

Computer Graphics Applications Survey. Color models (chromaticity diagram, RGB, CMY, YIQ, HSV, and HLS color models). Graphics Output Primitives (coordinate frames, DDA, Bresenham's algorithm, circle-drawing, fill-area primitives algorithms). 2D Graphics (2D cartesian coordinates, curves and parametric equations, functions and transformations, inverse functions. 3D Graphics (vectors in 3D, dot and cross product, homogeneous coordinates, correlation between cartesian and homogeneous coordinates). Geometric transformations (2D geometric transformations, matrix representation and homogeneous coordinates, inverse transformations, 2D composite transformations).Geometric Representation (Lagrange polynomials of degree n, Hermite cubic polynomial, Bernstein polynomial, interpolation problem, Spline interpolation, problem of approximation, Bezier-Bersnstein approximation, Bezier-B-Spline approximation, quadric surfaces). Graphics Lab: modeling, rendering, animation using 3D Studio Max™ from Autodesk™.

Text Book

Computer Graphics with Open GL, 3rd Ed D. Hearn and M. Baker. , Prentice Hall, 2004

Essential References

OpenGL Programming Guide: The Official Guide to Learning OpenGL, Versions 3.0 and 3.1 (7th Edition)

Level 9

Course Code	Course name	Le	Lb	Ex	Cr	Prerequisite
CSI 510	Graduation Project 1	2	0	0	2	120 Cr. Hrs
CSI 511	Web Programming & Internet Technology	2	2	0	3	CSI 322
CSI 512	Data Mining	2	2	0	3	CSI 314
CSI 513	Concepts of Prg. Lang.	2	2	0	3	CSI 222
***	Elective Course 3	*	*	*	3	***
***	Elective Prerequisite Univ.	2	0	0	2	***
Total		**17**				

Graduation Project 1	Code & No	CSI 510
	Credits	2(2+0+0)
	Pre-requisite:	120 hours
	Co-requisite:	N/A
	Level:	9

Module Description:

This course is the first of a two-course sequence in which the students will develop a completesoftware system. The second stage will be carried out in CSI420. Students will work in groups of up to four students, each group will have a supervisor to guide them through the system development process usinga specific methodology.

In this first part, each group must identify a problem domain, define the problem, identify andspecify the requirements, document the current system, analyze it, propose alternative systems, anddesign a solution. The design must include the definitions of all the required system models, such as thedata model and the functional model. At the end of the course, each group must submit a formal reportdocumenting the complete process.

Web Programming and Internet Technology	Code & No	CSI 511
	Credits	3(2+2+0)
	Pre-requisite:	CSI 322
	Co-requisite:	N/A
	Level:	9

Module Description:
This course presents number of powerful software technologies that will enable the student to build systems to integrate Internet, web components, and remote databases. It presents the "client-side" and "server-side" of web programming. For the client side it presents a carefully paced introduction to using the popular JavaScript language and the closely related technologies of XHTML (Extensible HyperText Markup Language), CSS (Cascading Style Sheets). Novices will find that the material in the JavaScript chapters presents a solid foundation for the deeper treatment of scripting. The third class concentrates on using technologies such as web servers, databases (integrated collections of data), PHP, ASP.NET, to build the server side of web-based applications.

Text Book

David R. Brooks, G., "An Introduction to HTML and JavaScript: For Scientists and Engineers" , Publication Date: July 5, 2007 | ISBN-10: 1846286565 | ISBN-13: 978-1846286568 | Edition: 2007

Essential References

1- Programming the World Wide Web, 6/E, Robert W. Sebesta, University of Colorado, Colorado, Springs, ISBN-10: 0132130815, ISBN-13: 9780132130813, Addison-Wesley, 2011
2- Perry, Schneider: New Perspectives on The Internet Course Technology, 6th Edition ISBN 1-4188-6071-9

Data Mining	Code & No	CSI 512
	Credits	3(2+2+0)
	Pre-requisite:	CSI 314
	Co-requisite:	N/A
	Level:	9

Module Description:
Thiscourse equips students with the knowledge and skills necessary to design and implement a data warehouse/ a data mining algorithm. Students are expected to become familiar with the common data mining tasks and techniques, principles of dimensional data modeling, techniques for extraction of data from source systems, data transformation methods, data staging, data warehouse architecture and infrastructure. Issues such as preprocessing the data, discretisation, rule pruning, cross validation, inductive bias, and prediction are included. Students will design and develop a simple data mining prototype.

Text Book

Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Introduction to Data Mining, Addison-Wesley, 2006.

Essential References

1- David Hand, HeikkiMannila and Padhraic Smyth, Principles of Data Mining, The MIT Press, 2001

Concepts of programming languages	Code & No	CSI 513
	Credits	3(2+2+0)
	Pre-requisite:	CSI 222
	Co-requisite:	N/A
	Level:	9

Module Description:
Brief history of programming languages. Formal grammars. BNF notation. Principles of modern programming languages: features, design and evaluation. Imperative vs. declarative language styles. General-purpose language features, such as types, operators, expressions, subprograms, recursion, and object-orientation. Special purpose language features, such as support for graphical interface, concurrency, and non-determinism. Relationship between language design and implementation.

Text Book

Robert W. Sebesta , Concepts of Programming languages, Addison-Wesley edition 7, 2006.

Essential References

1- David A. Watt, Programming Language Design Concepts, Wiley (May 31, 2004).

Level 10

Course Code	Course	Le	Lb	Ex	Cr	Prerequisite
CSI 520	Graduation Project 2	3	0	0	3	CSI 510
CSI 522	Human Computer Interaction	2	2	0	3	CSI 511
CSI 525	Professional Ethics	2	0	0	2	CSI 422
***	Elective Course 4	*	*	*	3	***
***	Free Elective Course	*	*	*	3	***
Total		**14**				

Grad. Project 2	Code & No	CSI 520
	Credits	3(3+0+0)
	Pre-requisite:	CSI 510
	Co-requisite:	N/A
	Level:	10

Module Description:

In this course, each group will continue developing the software systems started in CSI 410. Each group must use a particular tool to implement its system in a good programming practice. This implementation tool is preferably new –i.e. not taken in previous courses. Furthermore, students must generate a user manual for their information system in an appropriate format. At the end of the term, each group must submit a final report, which documents completely the information system from the problem definition phase to the implementation phase and contains a user manual for the information system.Team work, leadership, communication and writing skills are all important ingredients for a successfulproject.

Human Computer Interaction	Code & No	CSI 522
	Credits	3(2+2+0)
	Pre-requisite:	CSI 511
	Co-requisite:	N/A
	Level:	10

Module Description:

Human-Computer Interaction (HCI) is a rapidly expanding research and development area that has transformed the way we use computers in the last thirty years. The course introduces fundamental methods, principles and tools for designing, programming and testing interactive systems. It also introduces students to the design, implementation, and evaluation of human-computer interfaces, with emphasis on user-centered design and graphical user interfaces (GUI). The course covers topics such as usability and affordances, user-centered design, human cognitive and physical ergonomics, information and interactivity structures, interaction styles, interaction techniques, and user interface software tools with a special focus on mobile user interfaces.

Text Book

Dix, A., Finlay, J., Abowd, G., & Beale, R., "Human-computer interaction" , 3rd edition Prentice Hall Europe. ISBN: 0130461091 | Edition: 2003

Essential References

1- Galletta, Dennis & Zhang, Ping," Human Computer Interaction and Management Information Systems :Applications", M. E. Sharpe Inc., ISBN-10: 0765614871 Edition: 2006

Professional Ethics	Code & No	**CSI 525**
	Credits	2(2+0+0)
	Pre-requisite:	**CSI 422**
	Co-requisite:	N/A
	Level:	10

Module Description:

This course will examine the ethical issues that arise as a result of increasing use of computers, and the responsibilities of those who work with computers, either as computer science professionals or end users. The course will stress the ways in which computers challenge traditional ethical and philosophical concepts, and raise old issues in a new way.

By the end of this course:

Students will be expected to: read and understand the ideas in the readings; explain the ideas; analyze issues and see them from diverse perspectives; and formulate and critique arguments. The readings will include technical issues in computer science and may focus on a particular area such as software design as well as more traditional topics such as philosophical theories (e.g. ethical relativism, utilitarianism, deontological theories, rights, and virtue ethics), privacy, intellectual property rights and proprietary software, security, accountability, liability, the digital divide, hacking, and viruses.

Text Book:

Computer Ethics, Fourth Edition, by Deborah Johnson

Essential References:

Readings in CyberEthics, 2nd Edition, Edited by Richard Spinello and Herman Tavani.

Elective Courses Descriptions

Track I: Computer Graphics & Multimedia

Course Number	Course Title	Credits Hours	Weekly Hours		Prerequisite
			Lecture	Lab	
CSI 414	Digital Image Processing	3	2	2	MATH 310
CSI 424	Computer Vision	3	2	2	CSI 414
CSI 514	Interactive Computer Graphics	3	2	2	CSI 425
CSI 521	Multimedia Technology	3	2	2	CSI 425
CSI 530	Digital Photography	3	2	2	MATH 220

Digital Image Processing	Code & No	CSI 414
	Credits	3(2+2+0)
	Pre-requisite:	MATH 310
	Co-requisite:	N/A
	Level:	elective

Module Description:

The current course aims to provide an introduction to basic concepts and methodologies for digital image processing in both theoretical and practical aspects. Therefore the course topics are selected to provide a good understanding and design principles for several effective techniques used for image enhancement and to provide the necessary knowledge for further study in Computer Vision, Scientific Visualization and Image Pattern Recognition. These topics are:

- Introduction: Image Models, Image Acquisitions and digitization, Terminologies.
- Image Transformations: Manipulation & Processing by (Fourier, Discrete Cosine, Hoteling, Wavelet transforms).
- Image Enhancement: Spatial & Frequency Domain Filters methods.
- Image Compression methods and Restoration.
- Image Segmentation

Text Book

Rafael Gonzalez, “Digital Image Processing” , Prentice Hall, 2008.

Essential References

4- Maria Petrou, " Image Processing: The Fundamentals" , John Wiley and Sons, 2010.

5- Wilhelm Burger, Mark Burge, “Principles of digital image processing: Fundamental Techniques”, Springer, 2009.

Computer Vision	Code & No	CSI 424
	Credits	3(2+2+0)
	Pre-requisite:	CSI 414
	Co-requisite:	N/A
	Level:	8

Module Description:

This course covers fundamental topics in computer vision. The course will provide an introduction to image formation, image processing, feature detection, segmentation, multiple view geometry and 3D reconstruction, motion, face detection, object recognition and classification.

As such, after completing this course, students:
learn the basics of computer vision and some of the state-of-the-art techniques. They will be able to write programs that can perform image segmentation, image matching, object detection or recognition, and applications such as content-based image retrieval or construction of panoramas. Upon completion of the course they should be able to take an internship or job with a vision company or research lab doing vision or to participate in undergraduate research leading to potential graduate level research.

Text Book:

Computer Vision: A Modern Approach by D. A. Forsyth and J. Ponce, Prentice Hall, Upper Saddle River, N.J., 2003.

Essential References:

1. Digital image processing. by Willian K. Pratt. 2007.
2. Handbook of Computer Vision Algorithms in Image Algebra by Gerhard X. Ritter; Joseph N. Wilson CRC Press, CRC Press LLC.

Interactive Computer Graphics	Code & No	CSI 514
	Credits	3(2+2+0)
	Pre-requisite:	CSI 425
	Co-requisite:	N/A
	Level:	9

Module Description:

This course is a study of principles and techniques of interactive computer graphics, display processors And device, graphics programming languages and algorithms for managing graphics data.

As such, after completing this course the student should be:

- Upon completion of this course the student should be familiar with all aspects of 2-dimensional computer graphics. The student will also be introduced to certain topics in 3-dimensional computer graphics.

.

Text Book:
Interactive Computer Graphics, Edward Angel & D. Shreiner, Addison-Wesley, 2012.

Essential Reference:
OpenGL Programming guide, 6th Edition, Addison-Wesley, 2007.

Multimedia Technology	Code & No	CSI 521
	Credits	3(2+2+0)
	Pre-requisite:	CSI 425
	Co-requisite:	N/A
	Level:	elective

Module Description:

This course covers the design and implementation of the technologies used to implement interactive multimedia applications such as streaming video playback, video conferencing, interactive television, video editing, and hypermedia authoring. Fundamentals of human perception, digital media representations, compression and synchronization are covered. Implementation technologies including hardware architectures for media processing (e.g., processor, bus, and input/output devices), OS support, multimedia systems services, network architectures and protocols, and distributed programming services are also discussed.

- Introduction to Multimedia, Graphics for Multimedia and the World Wide Web ,Desktop Video Production ,Multimedia Authoring Software: Using Macromedia Director® ,Writing for Interactive Media ,Digital Imaging and Photography: Photoshop® ,Computer Graphics & Illustration ,Introduction to Graphic Design ,3D Computer Animation ,Advanced Animation: After Effects®
- Website Design ,Advanced Website Design and Development ,Streaming Media for the Web ,
- Introduction to Audio for Multimedia and the World Wide Web ,Developing Interactive Help Systems: Macromedia® RoboHelp® ,Designing and Developing Interactive Media ,Instructional Design for Interactive Media ,Website Development: FrontPage® ,Multimedia Scripting Using Macromedia Director's Lingo ,Web Authoring: Flash " MX ,Developing IT Training for the Web E-Commerce on the Web ,Introduction to DHTML ,Introduction to XML ,Rich Web Development with Flash" MX (Advanced)

Text Book

McGloughlin, S (2001): *Multimedia Concepts and Practice.*

Essential References

1- Chun,Garaffo (2003): Macromedia Flash MX 2004 for Windows and Macintosh: Visual QuickStart Guide
2- Niderest, J (2001): Web Design in a Nutshell
3- Lynch & Horton (2002): Yale Style Guide
4- *Roselli, Gibbons (2002):* Web Graphics for Non-Designers

Digital Photography	Code & No	CSI 530
	Credits	3(2+2+0)
	Pre-requisite:	MATH 220
	Co-requisite:	N/A
	Level:	9

Module Description:

This course is intended to introduce students to the basic concerns in digital photography *as a fine art medium,* and the computer as a darkroom. Includes digital imaging techniques of scanning, color correction, retouching, composition, content and more. Hardware, image input and output processes, and software are also discussed

As such, after completing this course:
The student should demonstrate a basic knowledge of fundamental digital photographic theory and make images which correspond to basic photographic design and communication principles. Students will also demonstrate proficiency in the use of image manipulation software and digital imaging applications in addition to utilizing major computer hardware components and accessories, including scanners, printers, CD recorders and storage devices while managing the color digital workflow through all production stages from image capture to final output. Students will also be able to demonstrate an awareness of contemporary aesthetic, legal and ethical considerations in digital imaging.

Text Book:

Introduction to Digital Photography – Joseph Ciaglia

Essential References:

Real World Digital Photography, 2nd edition, Eismann, Duggan, Grey, ISBN 0-321-22372-1

Photography 8th edition, London/Upton/Kobre/Brill, Prentice Hall (2002).

Track II: Computer Networks

Course Number	Course Title	Credits Hours	Weekly Hours		Prerequisite
			Lecture	Lab	
CSI 431	Advanced Computer Networks	3	2	2	CSI 322
CSI 432	Network Security	3	2	2	CSI 431
CSI 531	Wireless & Mobile Computing	3	2	2	CSI 322
CSI 532	Network Programming	3	2	2	CSI 431
CSI 533	Cloud Computing	3	2	2	CSI 322 , CSI 321

Advanced Computer Networks	Code & No	CSI 431
	Credits	3(2+2+0)
	Pre-requisite:	CSI 322
	Co-requisite:	N/A
	Level:	Elective

Module Description:

This course is an advanced topic in design and analysis of computer networks. It comes as a second level module of the curricula which includes:
-Modeling, performance evaluation and queuing theory applied to computer networks.
-Traffic flow management and error control.
- Routing algorithms and protocols.
-Switch and router architectures.
-Selected issues in high-speed network design.
-Optical networks.

Text Book

Computer Networks 5th Ed. Andrew S. Tanenbaum, Pearson Prentice Hall, 2010

Essential References

3- *Wireless Communications & Networks,* 2nd edition, William Stallings, Prentice-Hall Pearson

Network Security	Code & No	CIS 432
	Credits	3(2+2+0)
	Pre-requisite:	CSI 431
	Co-requisite:	N/A
	Level:	Elective

Module Description:
This course provides an introduction to the field of network security. Specific topics to be examined include Security attacks, mechanisms, and services. Network security and access security models. Network security practice. Email security. IP security and web security. Intrusion detection and prevention systems. Firewalls and virtual private networks. Cellular and wireless network security.

Text Book

William Stallings, Network Security Essentials Applications and Standards (5th Edition), Printice Hall, March 16, 2013.

Essential References

1- Douglas Jacobson, Introduction to Network Security, Taylor & Francis, 11/14/2008

Wireless and Mobile Computing	Code & No	CSI 531
	Credits	3(2+2+0)
	Pre-requisite:	CSI 322
	Co-requisite:	N/A
	Level:	Elective

Module Description:

- This course is offered for those who are interested in understanding and building systems support mechanisms for mobile computing and wireless systems including client-server web/database/file systems, and mobile ad hoc and sensor networks for achieving the goal of anytime, anywhere computing in wireless mobile environments. The technologies involved to realize such a system will be covered and the fundamental concepts of mobile computing are introduced. These include mobility and service management, data management, routing in mobile ad hoc and sensor networks, and security issues for mobile systems. While mobile computing covers many topics, in this course the main focus will be on *mobility, data and service management, and security issues in mobile computing environments*. Students are expected to be familiar with basic concepts in Operating Systems and Networks in this class.

Text Book

Amjad Umar, "Mobile Computing And Wireless Communications: Applications, Networks, Platforms, Architectures and Security", NGE Solutions (July 15, 2004), ISBN-10: 0975918206

Essential References

F. Adelstein, S.K.S. Gupta, G.G. Richard III and L. Schwiebert," Fundamentals of Mobile and Pervasive Computing", McGraw Hill, 2005, ISBN: 0-07-141237-9.

Mohsen Guizani, "Wireless Networks and Mobile Computing", Wiley Communications Technology Online ISSN: 1530-8677.

Network Programming	Code & No	CIS 532
	Credits	3(2+2+0)
	Pre-requisite:	CIS 431
	Co-requisite:	N/A
	Level:	Elective

Module Description:
Introduction to various aspects of computer network programming. Fundamental concepts are covered, including host TCP/IP configuration, TCP/IP addressing, socket programming, data presentation issues, the client/server programming model, and HTTP. This course is directed at developing traditional and multithreaded client/server applications in both the TCP/IP and UDP/IP domains.

Text Book

Fiach Reid," Network Programming in .NET", Elsevier Digital Press: ISBN: 1-55558-315-6. (2004).

Essential References

Bob Quinn, David K. Shute , "Windows Sockets Network Programming: Text", Addison-wesley Advanced Windows Series, Prentice Hall, 2011, ISBN: 0768682320, 9780768682328

.

Cloud Computing	Code & No	CSI 533
	Credits	3(2+2+0)
	Pre-requisite:	CSI 322, CSI 321
	Co-requisite:	N/A
	Level:	Elective

Module Description:
Cloud Computing uses Internet as the platform for the development and delivery of computing technologies. Topics discussed in this course include: cloud computing concepts, cloud computing architecture, Infrastructure as a Service (IaaS), Platform-as-a-Service (PaaS), Software as a Service (SaaS), cloud computing access and implementation, and cloud computing with MapReduce.

Text Book

Cloud Computing Explained: Implementation Handbook for Enterprises, Recursive Press, ISBN 0956355609, 2009

Essential References

Cloud Computing Explained: Implementation Handbook for Enterprises **by John Rhoton (Nov 2, 2009)**

Track III: Individual Track :

Student should select his courses from the above two tracks or from the following table

Course Number	Course Title	Credits Hours	Weekly Hours		Prerequisite
			Lecture	Lab	
CSI 441	Machine Learning	3	2	2	CSI 411
CSI 442	Introduction to Robotics	3	2	2	CSI 411
CSI 443	Expert Systems	3	2	2	CSI 411
CSI 444	Computational Methods	3	2	2	Math 310
CSI 445	Operational Research	3	2	2	STAT 320, MATH 310
CSI 446	Information System Management	3	2	2	CSI 314
CSI 447	Information Security	3	2	2	CSI 423
CSI 448	Project Management	3	2	2	CSI 422
CSI 449	Geographic Information Systems (GIS)	3	2	2	CSI 324

Machine learning	Code & No	CSI 441
	Credits	3(2+2+0)
	Pre-requisite:	CSI 411
	Co-requisite:	N/A
	Level:	Elective

Module Description:
Machine learning is the science of getting computers to act without being explicitly programmed. This course provides a broad introduction to machine learning. Topics include: (i) Supervised learning (parametric/non-parametric algorithms, support vector machines, kernels, neural networks). (ii) Unsupervised learning (clustering, dimensionality reduction, recommender systems, deep learning). (iii) Best practices in machine learning (bias/variance theory; innovation process in machine learning and AI).

Text Book

EthemAlpaydin, Introduction to Machine Learning, ISBN-10: 026201243X | ISBN-13: 978-0262012430, MIT press, 2009.

Essential References

1. Christopher Bishop, Pattern Recognition and Machine Learning. Springer, 2006.
2. Tom Mitchell, Machine Learning. McGraw-Hill, 1997.

Introduction to Robotics	Code & No	CSI 442
	Credits	3(2+2+0)
	Pre-requisite:	CSI 411
	Co-requisite:	N/A
	Level:	Elective

Module Description:
Introductory historical development of robotics, robot arm kinematics, inverse kinematics, dynamics and control, trajectory planning, use of software packages, sensors, image acquisition and processing, control architectures, applications of mobile robots, autonomous mobile robots (navigation and localization), computer vision, vision-based control. Topics will include how to interface a computer with the real world, different types of sensors and their use, different types of actuators and their use, and forward and inverse kinematics of simple two link robotic manipulators.

Text Book

John J. Craig, Introduction to Robotics: Mechanics and Control (3rd Edition), 2004, Prentice Hall.

Essential References

1- Saeed B. Niku, SaeedNiku- Introduction to Robotics: Analysis, Control, Applications, 2010, Wiley.

Expert Systems	Code & No	CSI 443
	Credits	3(2+2+0)
	Pre-requisite:	CSI 411
	Co-requisite:	N/A
	Level:	Elective

Module Description:
This course introduces students to expert systems in general and to rule-based systems in specific. Students learn how to build a rule-based expert system in a variety of application areas. They also learn advanced programming techniques which include topics of inexact reasoning, intelligent database management methods, and how to develop a community of expert systems which cooperate over a blackboard structure. Students are also given the opportunity to demonstrate their understanding of the technology by building a rule-based expert system that addresses a real-world problem. The course prepares students for graduate research in the area of expert systems.

Text Book
Expert Systems -- Principles and Programming, J. Giarratano and G. Riley, PWS Publishing Company, 2004
Essential References
Introduction To Expert Systems, Peter Jackson, Addison-Wesley, 1998

Computational Methods	Code & No	CSI 444
	Credits	3(2+2+0)
	Pre-requisite:	Math 310
	Co-requisite:	NA
	Level:	Elective

Module Description:
The current course provides powerful understanding and manipulation of what is called approximate/numerical solutions. The exact solution, in many practical cases, is not only difficult to be reached, but it may be impossible to find it. Therefore it was the need to look for effective algorithms to establish these stable, and convergent approximate solutions. These algorithms will handle important several topics concerned with: Numerical Differentiation, Root location (Bracketing Methods, Opened Methods), Numerical Integrations, Numerical Solution of Linear Systems of Equations, Curve Fitting, Interpolation, Numerical Solution of Ordinary and Partial Differential Equations.

Text Book

Steven C. Chapra**,** "Numerical Methods For Engineers" , McGraw Hill, 2002.

Essential References

1- Michelle Schalzman**,** "Numerical Analysis: A Mathematical Introduction", Clarendon Press**,** 2002**.**

2- J. Douglas Fairs**,** "Numerical Analysis",PWS-KENT Publishing Company, 1989.

Operational Research	Code & No	CSI 445
	Credits	3(2+2+0)
	Pre-requisite:	STAT 320 MATH 310
	Co-requisite:	N/A
	Level:	Elective

Module Description:
The current course introduces the basic concepts of Optimization and its tools and how can this be applied to problems of the real life. This objective can be successfully achieved through the conduction of the following topics: Basic concepts of Optimization, Operations Research and the art of Problem Solving, Linear Programming: Convexity, Extreme Points, Formulation and Graphical Solution, Analytical Solution of Linear Programming : the Simplex-Tableau, Theorem Of Duality .

Text Book

Hamdy A. Taha; "Operations Research: An Introduction"; Printice Hall, 9th Edition, 2010.

Essential References

1- Ali Emrouznejad, William Ho; "Applied Operational Research with SAS", Chapman and Hall/CRC, December 2011.

2- P. Rama Murthy; "Operations Research", New Age International Publishers, 2nd Edition, 2007.

Information System Management	Code & No	CSI 446
	Credits	3(2+2+0)
	Pre-requisite:	CIS 314
	Co-requisite:	N/A
	Level:	Elective

Module Description:
This course aims to develop the students' ability to plan, analyze, design, implement, validate, and maintain computerized information systems using software processes. Specifically, the course will: Develop the students' skills of selecting a suitable process model (for better project management and better quality software) for a specific software project, introduce frameworks and quality standards for software development and management, highlight and integrate new process models for new environments (e. g. the WWW), introduce software metrics for better quality management.

Text Book

Barbara McNurlin , Ralph Sprague , Tung Bui , Information Systems Management (8th Edition), Publication Date: September 15, 2008 | ISBN-10: 0132437155 | ISBN-13:978-0132437158 | Edition: 8

Essential References

1- Business Information Systems: Technology, Development & Management for the E-Business, 3rd ed. Paul Bocij, Dave Chaffey, Andrew Greasley (editor) & Simon Hickie, Prentice-Hall Pearson 2006

Information Security	Code & No	CIS 447
	Credits	3(2+2+0)
	Pre-requisite:	CIS 423
	Co-requisite:	--
	Level:	Elective

Module Description:
This course is to make students familiar with the basic concepts of information systems security. The course aims to the security goals, security functions, and security mechanisms. The content is: Introduction to information Security, Information security and risk management, Access control, Security architecture and design, Physical environmental security, Telecommunications and network security, Business continuity and disaster recovery, Application security and Operation security.

Text Book

Michael E. Whitman, Herbert J. Mattord, "Principles of information security";Delmar Learning; 4 edition (February 1, 2013), ASIN: B00B7MW1WU

Essential References

1- Mark Merkow, James Breithaupt,"Information Security: Principles and Practices", Prentice Hall (August 29, 2005)

2- Cryptography and network Security*:* Principles and Practice*;* William Stallings, Prentice Hall 2002

Project Management	Code & No	CIS 448
	Credits	3(2+2+0)
	Pre-requisite:	CIS 422,
	Co-requisite:	N/A
	Level:	Elective

Module Description:

- The course introduces the students to the various concepts and methodologies of Project Management.
- The course describes the actual procedures and techniques used in planning, monitoring and controlling projects.
- The course introduces a number of exercises and case studies (Workshops) within the learning scope of the course to help students to acquire basic and advanced concepts of project management fundamentals
- This course enriches the students' understanding of best practices and the advantages of using project management skills to increase their productivity and enable them reach higher returns from investments in Information Technology (IT).

As such, after completing this course the student should be able to:

- Understand the basic familiarity (literacy) of Project Management.
- Demonstrate an understanding of the basic concepts of Project Management, thus, enabling him/her to functionally utilize these skills in his/her future practices.

.

Text Book

Project Management: A Managerial Approach, 5th Edition, Jack R.Meredith, Samuel J. Mantel, Jr., ISBN: 0-471-07323-7, John Wiley 2003..

Essential References

Modern erp: select, implement & use today's advanced business systems by Marianne Bradford (Oct 21, 2010

Geographic Information Systems	Code & No	CIS 449
	Credits	3(2+2+0)
	Pre-requisite:	CIS 324
	Co-requisite:	N/A
	Level:	Elective

Module Description:

- Fundamental Geographic Information Systems concepts to create, edit, and query spatial data.
- An introduction to map projections, coordinate systems, data capture, attribute tables,
- Data manipulation, remote sensing, aerial and satellite imagery and using Global Position Systems (GPS).
- Transferring data to GIS data models.
- Spatial relationships analysis and making decisions from presented information through
- Various geo-processing techniques.
- Applications of GIS in many fields.
- Development of GIS systems.

Text Book

Bolstad Paul V., “GIS Fundamentals", Book, Eider Press, 2nd edition, ISBN 0-971-76471.2005،

Essential References

Chang Kang-tsung, “Introduction to geographic information systems", Book, Mc-Graw Hill companies, 3rd edition, ISBN 0-07-060629-3, 2006.