جامعة الأمير سطام بن عبدالعزيز
PRINCE SATTAM BIN ABDULAZIZ UNIVERSITY

COLLEGE OF ARTS AND SCIENCES -WADI AL DAWASIR

DEPARTMENT OF COMPUTER SCIENCE

PROGRAM HANDBOOK

2023

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MESSAGE OF THE DEAN

College of Arts and Sciences is the oldest in the governorates of Wadi Al-Dawasir and Al-Sulai'yl. As a mother college, the College of Arts and Sciences has taken upon itself to work with all professionalism and a professional academic spirit to develop itself and improve its outputs, aiming at gaining new experiences in academic field and the relentless pursuit towards the application of comprehensive quality standards to serve its students. Moreover, this is to be reflected in the distinctive growth and advancement of the local and national community, under the umbrella of Prince Sattam bin Abdul-Aziz University.

During the past years, -praise be to Allah- the college has achieved many accomplishments represented in laying the infrastructure of the college in both the male's and female's wings. The college was able to graduate eight batches of male students, and six of the female students who have already started working according to their specializations in the service of their religion and country. During its course and since its establishment - with the support of the Rector of the University, their Excellences the Vice-Deans and the Vice-Rector of the branches - the College has been keen to adhere to the standards of quality and good performance in all its educational and academic processes. It is my honor to extend my sincere thanks to His Excellency the Rector of the University and his esteemed deputies for their unlimited encouragement and support for the development of the College and to achieve its mission and goals.

Dr. Sultan Musfer Ali Addossari

Dean of the College of Arts and Sciences

Department Head Message

Dear Students,

The large-scaled technical waves that have been occurring all over the world bringing along various major changes is largely influenced by The Department of Computer Sciences. Such changes emerged because of a plethora of research and applications of computer sciences, which positively affected our daily lives. Being a part of this science will open your mind to a variety of significant fields such as, artificial intelligence, cyber security, operating systems, databases and many other important fields that are relevant to new technologies. Our department, as a body of academia, always aims to develop its educational system and enrich the students' knowledge through the creation of a suitable environment for learning and research in accordance with the Saudi Arabian 2030 vision. We always aim to be a role model and pioneers in our field of study.

Finally, on behalf of our faculty members, I would like to extend a warm welcome to our visitors.

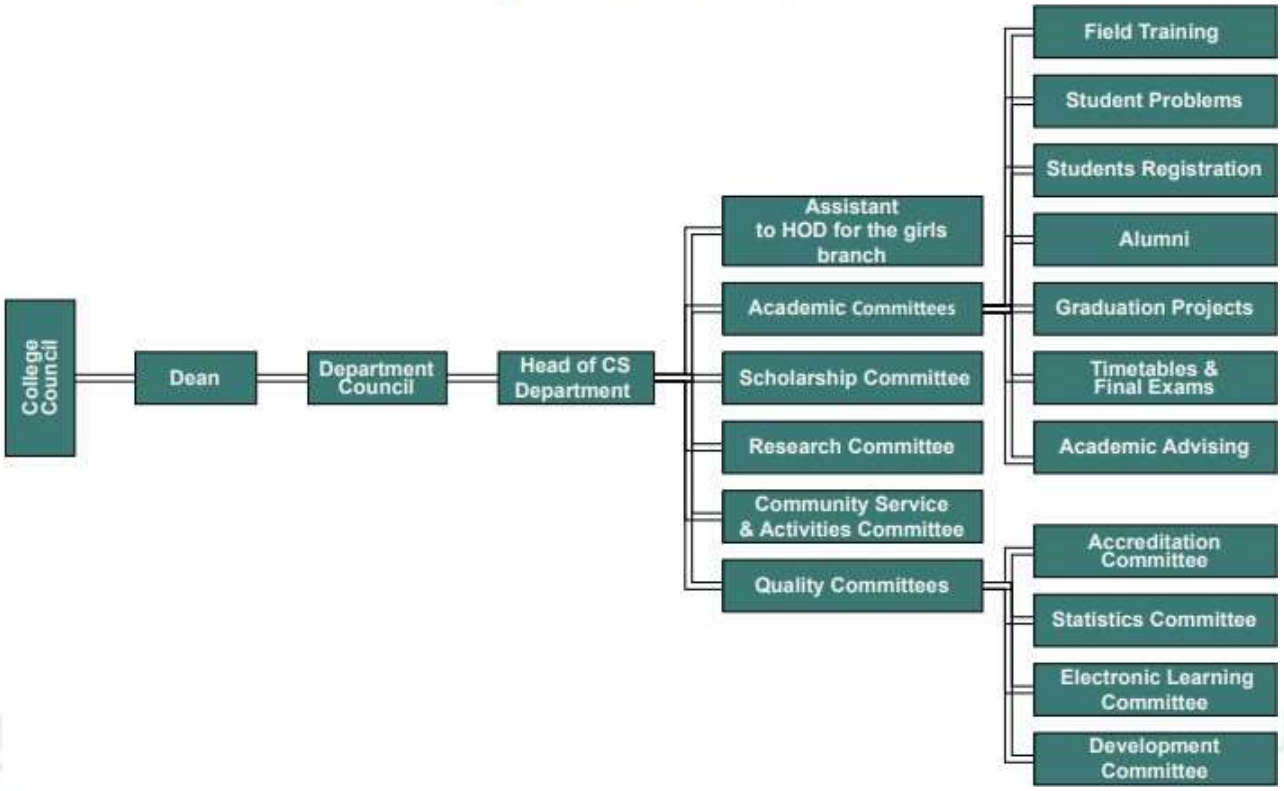
Head of Computer Sciences Department

Dr. Mohammed Mosfer Al-Rubea

Program Structure

جامعة الأمير سطام بن عبدالعزيز
PRINCE SATTAM BIN ABDULAZIZ UNIVERSITY

Organizational Structure



Program Mission and Goals

◊ Mission:

Provide an outstanding education in computer sciences to prepare qualified graduates through a stimulating environment that promotes innovative thinking, research, and social service.

◊ Goals:

PEO1: To enhance students computing capabilities by acquiring fundamental knowledge and concepts of computer science.
PEO2: To prepare students for the job market competition by strengthening their problem solving and professional skills.
PEO3: To contribute effectively towards the community as a part of a team or individually with accountable, legal, ethical, and responsible practices.

◊ Graduate Attributes

- Deep discipline knowledge in both computing and mathematics.
- Creativity, critical thinking, and problem solving
- Effective communication and teamwork
- Professionalism and leadership readiness
- Ethical competence

◊ Program learning Outcomes

Knowledge and Understanding	
K1	Define knowledge of computing and mathematics appropriate to the discipline.
K2	Define computer science theory and software development fundamentals to Produce computing-based solutions.
Skills	
S1	Design, implement and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline
S2	Use current techniques, skills, and tools necessary for computing practice
S3	Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions
Values	
V1	Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline
V2	Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles

◊ Total Credit Hours for Completing the Program:

(193)

◊ Professional Occupations/Jobs:

- IT Software Developers and Designers Jobs (7th rank)
- IT Project Management Jobs (7th rank)
- Support Technicians Jobs (7th rank)
- Provide a list of related program regulations, including their link to online version: admission, study
- and exams, recruitment, appeals and complaint regulations, etc.

POLICIES & PROCEDURES OF THE PROGRAM

◊ Admissions:

Students who want to be admitted to the Department of Computer Science, Prince Sattam Bin Abdul Aziz, should satisfy the following requirements:

1. The student shall only be admitted to the University upon the calculation of his/her average as follows:

30% general aptitude, 30% achievement test and 40% general secondary (academic) if the student wishes to enroll in Computer Science. For all the other specializations, the average shall be calculated as follows: 30% aptitude and 70% general secondary.

2. The student should have obtained the general secondary certificate or its equivalent from the Kingdom or abroad.
3. No more than two academic years should have elapsed from the date of his/her obtaining such certificate or its equivalent.
4. The student should have an ethical conduct and proper behavior.
5. The student should successfully pass any exam or personal interview (if found).
6. The student should be medically fit.
7. The student should obtain approval from his authority to pursue his/her studies if s/he works for any governmental or private body.
8. The student should not have been expelled from Prince Sattam Bin Abdul Aziz University or any other university for academic or disciplinary reasons.
9. After the student is admitted, if it turns out that he/she has already been expelled for disciplinary or academic reasons, his/her admission shall be considered as void.
10. The student meeting the requirements should present the documents stipulated by the Deanship of Admission and Registration at the University.
11. The student should not be enrolled for another university degree at the same university or at another university and should not have already obtained such a degree.
12. Files of students who are late for admission tests (if found) shall be ruled out.
13. Files of students who are late for personal interviews (if found) and do not present an acceptable excuse shall be ruled out.
14. Students who are late in carrying out the admission procedures within the deadline set by the University, and who do not present an excuse acceptable by the Deanship of Admission and Registration shall have cancelled their admission.

◊ Attendance and Completion Requirements:

For academic accomplishment at the Department of Computer Science, students should attend at least 75% of the lectures, tutorials, and practical and laboratory lessons in regular courses. Students failing to meet this requirement in any of his registered courses will be prohibited from attending the final examination of those courses and will have F grades thatare zero grades for those courses.

The Computer Science program is intended to provide broad background knowledge to its students in this area. Along with a strong theoretical component, the Computer Science program places special emphasis on the development of applied skills in design, implementation, and validation of computer systems.

All students acquire a common background in the fundamental areas of computer science such as computer systems, organization and architecture, algorithms and data structures, principles of software design, elements of the theory of computation, operating systems andother core courses. In addition, students obtain specialized backgrounds by conducting non-departmental courses like Mathematics. Along with these courses, other additional courses like Arabic, Islamic studies, give students an opportunity to expand their horizons and to prepare for multidisciplinary careers.

The Bachelor of computer science Program is designed for students who are interested to broaden their knowledge of computer science in order to further prepare themselves for a professional career in the computing industry. To achieve the Bachelor of Science in computer science Degree, a student must fulfil both College and Department degree requirements.

◊ Regulations for Student Assessment and Verification of Standards:

1. A dedicated faculty member assigned as a course coordinator.
2. Course is assigned to more than one instructor (Female and Male campuses) allowing them to share their experiences and ensuring equivalent levels of evaluation of students
3. Knowledge groups are responsible to review exams and the grading schemes and levels of complexities in assessment methods.
4. Periodic revision of the course learning outcomes and their alignment with student outcomes.
5. Ensure that the assessment methods are designed to know the achievement of each one of the course learning outcomes.
6. Assessing the course learning outcomes for each course.
7. Using rubrics to ensure unbiased evaluations for complex questions.
8. Course Assessment planning that shows the assessment methods for each one of Course Learning Outcomes (CLOs).
9. Direct and Indirect assessment methods are used to evaluate and improve the levels of student learning outcomes.
10. The program curriculum committee reviews all course files by the end of each semester.

◊ Student Academic Counselling:

- Academic advising unit of our program aimed to provide comprehensive guidance to our students through efficacious counselling regarding students' academic and personal difficulties. Students are formed in groups and each group has been assigned to an academic advisor to ensure that all students get academic counselling throughout the program.

- Allmost all faculty members of our program are playing a role as an academic advisor as a part of their job responsibilities by following the guidelines set by academic advising unit and being monitored by the coordinator of this unit. At present, separate time of 4 hours/week for student advising in academic advisors' timetable has been enforced to schedule.
- Each newly enrolled student is encouraged to meet his/her academic advisor and open a student which should be kept and maintained by academic advisor as that student's record. This file should reflect student progress mainly concerning on student's results.
- Academic advisors write a summary report on each student progress
- Counselling on career planning takes place mostly for the graduating/higher level (level,7,8) students depending on the students' necessity.

◊ Student Appeals:

- Students' academic appeals are mainly categorized by the form of 'Add/drop courses, Absent excuses, Rechecking of exams and Make up exams. Apart from these academic appeals, other appeals are also considered by the academic advising units by an adopted mechanism.
- Each student is accountable to place an appeal through his/her academic advisor using case specific appeal form.
- All appeal forms are available on the university's website from where students can fetch. These forms are also available with academic advisors.
- Academic advisors are accountable to consult with the student in detail to spot students' need and provide guidance to fill out the appeal form.
- During this consultation process, academic advisors are responsible to fetch necessary record from corresponding student file to support his/her opinion.
- When an appeal has been finalized and submitted by the student, academic advisors are accountable to attach necessary supporting documents such as student's transcript, medical excuses, add/drop form etc. with this appeal and forward this appeal to the academic advising unit through the University's correspondence tracking system for further processing.
- The coordinator of academic advising unit is accountable to check completeness and to verify the ground of each appeal based on university's regulations, college rules and program requirements. If an appeal complies with all requirements, it has been carrying forwarded to the decision-making authority (Dean of the college), else it has been returned to the correspondent academic advisor.
- All the appeals are automated and hence it facilitates the Advisee student to send their appeals through the system.
- Successful appeal for rechecking of exam is forwarded to the college coordinator. College coordinator is accountable to form an evaluation committee and send the review request to that committee.

◊ Guidance and Orientation Programs for New Students

- At the beginning of each semester, the College of Arts and Sciences arranges a comprehensive orientation program for prospective students to ensure a thorough understanding of program requirements, the range of services and facilities available for

them, and about their code of conduct and their rights & responsibilities. Each new student distributed with below items

- The Student Handbook
- The Student ID Card, with terms and conditions
- The Academic Calendar
- The Student Schedule
- IT guide including email account, Banner and blackboard account
- Welcome gifts and giveaways, pens and pads in an orientation bag.

- Student appeal and complaint procedures are made widely known at the time of orientation.
- The Prince Sattam Bin Abdul Aziz University developed different case-specific academic appeal templates to make clear ground of academic appeals .These appeal and complaint procedures protect against time-wasting on trivial issues, but still provide adequate opportunity for matters of concern to students to be fairly dealt with and supported by student counselling provisions.
- Appeal and complaint procedures guarantee impartial consideration by persons or committees independent of the parties involved in the issue, or who made a decision or imposed a penalty that is being appealed against. Procedures have been developed to ensure that students are protected against subsequent punitive action or discrimination following consideration of a complaint or appeal.
- Appropriate policies and procedures are in place to deal with academic misconduct, including plagiarism and other forms of cheating.

STUDENTS ADMISSION

Student admission for Computer Science (CS) program is performed electronically through the university EDUGATE , supervised by the Deanship of Admissions and Registration. Students who want to be admitted in the program of Computer Science (CS), should satisfy the following requirements:

- The student shall only be admitted to the University upon the calculation of his/her average as follows: 30% general aptitude, 30% achievement test and 40% general secondary (academic).
- Students of the natural sciences (the scientific section) who obtained balanced ratio not less than 80% will be admitted at the department of computer science according to the available seats. Those who obtained high rates will be admitted gradually until the end of seats.
- The student should have obtained the general secondary certificate or its equivalent from the Kingdom of Saudi Arabia or abroad.
- No more than two academic years should have elapsed from the date of his/her obtaining such certificate or its equivalent.
- The student should have a good conduct and proper behavior.
- The student should successfully pass any exam or personal interview (if found).
- The student should be medically fit.
- The student should obtain approval from his authority to pursue his/her studies, if s/he works for any governmental or private body.
- The student should not have been expelled from Prince Sattam Bin Abdul Aziz University or any other university for academic or disciplinary reasons.
- After the student is admitted, if it is turns out that he/she has already been expelled for disciplinary or academic reasons, his/her admission shall be considered as void.
- The student meeting the requirements should present the documents stipulated by the Deanship of Admission and Registration at the University.
- The student should not be enrolled for another university degree at the same university or at another university and should not have already obtained such degree.
- Files of students who are late for admission tests (if found) shall be ruled out.
- Files of students who are late for personal interviews (if found) and do not present an acceptable excuse shall be ruled out.
- Students who are late in carrying out the admission procedures within the deadline set by the University, and who do not present an excuse acceptable by the Deanship of Admission and Registration shall have cancelled their admission.

All admission information for Prince Sattam Bin Abdul Aziz University is described publicly in a clear and understandable way including admission requirements, policies andprocedures on this link https://dar.psau.edu.sa/ar.

EXAMINATION AND GRADING SYSTEMS

The examination assessment or evaluation system is based on theoretical and practical exams and homework, exercises, projects, and any other scientific activities. Full marks for each course of the curricula for computer science are equal to 100 (hundred) points and are divided into two main sections, namely: course work and final examination.

1. Coursework grade:

60 points are assigned for grading coursework. Methods of grading include two midterm exams, class tests, quizzes, homework, assignments, exercises, mini projects, report writing, presentation of projects, lab reports and lab exams, and any other scientific activities. Grades aredistributed on different parts by the course teacher depending on the nature of the course.

2. Final exam grade:

The total points for the final exam are 40 points. The method of grading for the final exam includes a theoretical exam and a practical exam.
The passing mark in each course is 60%.

Special Support

❖ Academic Advising Unit collaborates with Activities Unit in the College of Arts and Sciences to support gifted, creative, and talented, students. They offered extracurricular activities in variety of fields to develop their abilities and skills.

❖ The computer science program also takes appropriate actions to support and motivate their participation by encouraging them to participate through E-mails and announcements in advertisements board.

❖ In the end of term, College of Arts and Sciences honored its students who participating in Activities and others.

❖ Academic Advisors are responsible to deal with high and low achiever students and give them help and support. Each advisor must prepare a file for each student which contains a biography of the student during his studies at the university (student's behavior during the study, Student's activities, Student's marks and grades etc.), from where the College authority can make an assessment about the students and face their problems and find appropriate solutions. The most important contents of the file are: student's personal data, the student timetable for the semester, the student's academic transcript, student midterms marks, the student's follow up courses, the Drop/Add courses for the students, the attendance and absence sheet for students and their excuses and others.

❖ Advisors also study the irregular students' status to assist them to achieve the desired success and help them overcome the obstacles and problems they face and put the students on their plan.

❖ In the College of Arts and Sciences, we deem students with disabilities have equivalent right to take pleasure in both scholarly, academic and non-academic opportunities and prospects.

❖ Work together with faculties and supporting units, we endeavor to endow with a barrier-free learning environment and develop access to academic programs, campus activities and facilities for students with disabilities.

❖ The following structures are in place to facilitate the mobility of students with disabilities:

• All Lecture Theatres and classrooms are accessible by wheelchair
• Lifts are installed with Braille, low level buttons and audio provisions
• Tactile floor markings are made for visually impaired students
• Tables designed for wheelchair access are available at the Student Canteen.
• Staff of all catering outlets will assist students with disabilities by all means.
• Toilets designed for students with disabilities are conveniently located

❖ The computer science program as a part of College of Arts and Sciences employ all the human and material resources available to meet the needs of all students with special needs.

Average and Cumulative GPA

The Average and cumulative GPA are calculated every semester for the student automatically by the system.
The GPA is calculated considering the following points:

1. Determining the total points obtained in all courses of the semester.
2. Determining the total number of hours registered in the semester.

The average is calculated every semester according to the following equation:

$$GPA = \frac{Total\ Points\ (Item\ 1)}{Numbers\ of\ Hours\ registered\ in\ the\ semester\ (Item\ 2)}$$

A student's grade point average (GPA) is determined by dividing the cumulative point value of all courses attempted by the number of units in the student's semester schedule.
he cumulative grade point value is translated as follows:

Accumulative Points	Accumulative Grade
4.50 upwards	Excellent
3.75 - 4.50	Very Good
2.75 - 3.75	Good
2.00 - 2.75	Pass
Less than 2.00	Fail

Restrictions of the Final Examination

No student will be allowed to sit for a final examination after the lapse of 30 minutes from the beginning of the examination. Also, no student will be allowed to leave the examination venue less than 30 minutes after the beginning of the examination.

Curriculum Structure

Program Structure	Required/ Elective	No. of courses	Credit Hours	Percentage
Institution Requirements	Required	**6**	**12**	**6.2 %**
	Elective		**--**	**--**
College Requirements	Required	**21**	**44**	**22.8 %**
	Elective		**--**	**--**
Program Requirements	Required	**18**	**112**	**58%**
	Elective	**4**	**16**	**8.3 %**
Capstone Course/Project	Required	**2**	**6**	**3.1%**
Field Experience/ Internship	Required	**1**	**3**	**1.5%**
Others		**--**	**--**	**--**
Total		**52**	**193**	**100 %**

Program Study Plan

Level	Course Code	Course Name	Pre-Requisite Courses	Credit	Lecture	tutorial	La	Type of requirements
First	IC 101	Introduction of Islamic Culture	---	2	2	0	0	University
	MATH 1050	Differential calculus	---	4	2	2	0	Preparatory
	ENGL 1210	Reading Skills	---	5	2	3	0	Preparatory
	ENGL 1220	Writing Skills	---	5	2	3	0	Preparatory
				16	**8**	**8**	**0**	
Second	ARAB101	Language Skills	---	2	2	0	0	University
	ENGL 1230	Conversation and listening skills	---	5	2	3	0	Preparatory
	MATH 1060	Integral calculus	MATH 1050	4	2	2	0	Preparatory
	1101CS	Computer Skills	---	3	1	0	2	Preparatory
				14	**7**	**5**	**2**	
Third	MC 1400	Communication Skills	---	2	2	0	0	College
	PHYS 1010	General physics(I)	-----	5	3	1	1	Preparatory
	ENG 1604	English for Technical Purposes	---	5	4	0	1	Preparatory
	ENG 1606	English for Academic Purposes	---	4	2	2	0	Preparatory
				16	**11**	**3**	**2**	
Fourth	CS 1301	Computer Programming 1	---	5	3	0	2	College
	MATH 2220	Linear Algebra for Computer Students	---	4	4	0	0	College
	CS 1112	Discrete Mathematics	---	4	4	0	0	College
	IC 102	The Islam and Society Building	---	2	2	0	0	University
	SE 1010	Emerging Technology	---	2	2	0	0	College
				17	**15**	**0**	**2**	
Fift	CE 1111	Logic Design	---	4	4	1	0	College
	CS 2301	Computer Programming 2	CS 1301	5	3	0	2	College
	IS 2511	Fundamentals of Database Systems	---	4	3	0	1	College
	STAT 1050	Probability and Statistics for ComputerStudents	---	4	4	0	0	College
				17	**14**	**1**	**3**	
Sixth	CS 2311	Data Structures	CS 2301	4	3	0	1	Departmnt
	CE 2471	Computer Architecture and Assembly language	CE 1111	4	3	0	1	Departmnt
	PHYS 1040	General Physics(II)	MATH 1060	5	4	0	1	College

Level	Course Code	Course Name	Pre-Requisite Courses	Credit	Lecture	tutorial	La	Type of requirements
			SPHYS 1010					
	ARAB103	Arabic Editing	---	2	2	0	0	University
	IC 103	The Foundation Of the Economic System in Islam	---	2	2	0	0	University
				17	**14**	**0**	**3**	
Seventh	CS 3401	Algorithm Design and Analysis	CS 2311	4	4	0	0	Department
	CE 3761	Computer Network Systems	CE 2471	4	4	0	0	Department
	MATH 2540	Numerical Methods	MATH 2220	4	3	1	0	Department
	CS 3701	Operating Systems	CS 2311	4	4	0	0	College
				16	15	1	0	
Eight	CS 3501	Introduction to Artificial Intelligence	CS 2311	4	4	0	0	Department
	CS 2401	Computation Theory	CS 1112	4	4	1	0	Department
		Free Hrs.	---	2	2	0	0	Department
	CE 3791	Computer Network Systems Lab	CE 3761	2	0	0	2	Department
	CS 3801	Fundamentals of Cyber Security	IS 2511	4	4	0	0	Department
				16	**14**	**1**	**2**	
Ninth	CS 4552	Machine Learning	CS 3501	4	3	0	1	Department
	CS 3821	Web Applications Programming	IS 2511	4	3	0	1	Department
	SE 2111	Software Engineering Foundations	CS 2301	4	4	0	0	Department
	IC 104	Foundations of the politicalsystem in Islam	---	2	2	0	0	University
				4				
	CS 3001	Ethical and Professional Practices	---	3	3	0	0	College
				17	**15**	**0**	**2**	
	CS 4901	Field Training	Pass 130 Credit Hours	3	3	0	0	Department
				3	**3**	**0**	**0**	
Tenth	CS 4654	Digital Image Processing	CS 3401	4	3	0	1	Department
	CS 4311	Advanced Programming	CS 2301	4	2	0	2	Department
	CS 3101	Seminar in Undergraduate Advanced Research	125 Credit Hours	2	2	0	0	Department
	CS 4321	Programming languages & Compilers	CS 2401	4	3	0	1	Department
				14	**10**	**0**	**4**	
Ele	CS 4912	Graduation Project 1	CS 3101	3	3	0	0	Department

Level	Course Code	Course Name	Pre-Requisite Courses	Credit	Lecture	tutorial	La	Type of requirements
	CS 4961	**Advanced Database Systems**	IS 2511	4	4	0	0	Department
	SE 4141	**Advance Software Engineering**	CS 3101	4	4	0	0	Department
	CS 4731	**Systems Programming &Administration**	CS 3701	4	4	0	0	Department
				15	**15**	**0**	**0**	
Twelfth	**CS 4841**	**Parallel and Distributed computing**	CS 3701	4	4	1	0	Department
	CS 4921	**Graduation Project II**	CS 4912	3	3	0	0	Department
	CS 4531	**Neural Network**	CS 3501	4	4	0	0	Department
	CS 4821	**Cryptography**	CS 3801	4	4	0	0	Department
				15	**15**	**1**	**0**	

COURSES SYLLABUS

CS 1112 – DISCRETE MATHEMATICS

Course Catalog Description

Introduces the foundations of discrete mathematics as they apply to computer science, focusing on
providing a solid theoretical foundation for further work. Topics include introduction to logic and proofs, fundamental structures, relations, sets, Boolean algebra, propositional logic, elementary number theory, basics of counting, graphs, Tree and recurrence relations.

Course Requirements

- **Pre-requisite**: None
- **Credit Hours**: 4 CHs.
- **Contact Hours**: (4 hours lecture, 0 hours tutorial, 0 hours Lab)

References

Textbook:

Title: "Discrete Mathematics and its Applications"
Author(s): Rosen, Kenneth H.,

Publisher: McGraw/ Hill. **ISBN-10:** 0073383090

Edition / Year: 7th edition, 2011Topics

Topic	Week	Reference
1. Introduction to Sets, Special sets, Finite and infinite sets, Countable and Uncountable Sets, Venn Diagram, Operations on sets (Union, Intersection, Difference, Complements, Products and Power set), De-Morgan's laws, Symmetric Difference. Sequences and Subsequence,	1, 2 & 3	Chapter - 1
2. Relations between sets and Binary Relations. Operations on Binary Relations, Types of Relations. Basic Definitions of Functions, Types of Function, Operations on Functions, Graph, Types of Graph, Degree of Graph and Adjacency Matrix for Graph, Tree.	4, 5, 6 & 7	Chapter –2, 3, 4, 5
3. Introduction to Propositional Logic, Truth and Logical Truth, Predicates and Quantification. Mathematical Induction and Recursion, Number Theory	8 & 9	Chapter –6, 7,8
4. Counting Techniques, Principle of Inclusion-Exclusion, Finite Cardinality,Permutations, and Combinations	10	Chapter - 9
5. Binomial Theorem, Binomial Coefficients, Pascal's triangle and their uses	11	Chapter -10

CS1301 – COMPUTER PROGRAMMING I

Course Catalog Description

This course introduces the concepts of programming to students. It also introduces algorithms and
problem- solving techniques. Topics covered in this course include: overview of programming languages, data types and variables, operators, algorithms and problem-solving, control structures, functions and arrays.

Course Requirements

- **Pre-requisite**: None
- **Credit Hours**: 5 CHs
- **Contact Hours**: (3 hours lecture, 0 hour tutorial, 4 hours Lab)

References

- Textbooks:
  1. **Title (Main):** "Intro to Python for Computer Science and Data Science: Learning to Program with AI, Big Data and The Cloud"
  2. **Author:** Paul Deitel, Harvey Deitel
  3. **Year/Edition:** 2022
     ISBN-10: 0135404673
  4. **Title (Secondary-Recommended):** "Fundamentals of Python First Programs"
     Author: Kenneth A. Lambert

     Year/Edition: 2019

     ISBN-10: 9781337560092

Topics

Topic Covered	Week (Tentative)	Chapter
1. Introduction to Python Programming	1	Ch#1
2. Basic Elements of Python (variables, Data types, operators,…)	1	Ch#2
3. Input/ Output Statements	2	Ch#2
4. Control Statements (if.. else, for, while)	3	Ch#3

5. Functions	4, 5	Ch#4
6. Sequences: Lists and Tuples	6	Ch#5
7. Dictionaries, Sets, and Strings	7	Ch#6 , Ch#8
8. File and Exception	8	Ch#9
9. Introduction to Object Oriented Programming	9-11	Ch#10

CE1111 –LOGIC DESIGN

Course Catalog Description

History and overview, Numbers and conversions, Switching theory, Boolean Algebra, Combinational logic circuits, Function Optimization, Modular design of combinational circuits, Memory elements, Sequential logic circuits, Finite State Machines (FSMs) models, state diagrams, state tables, state reduction and state assignment.

Course Requirements

- **Pre-requisite**: None
- **Credit Hours**: 4 CHs
- **Contact Hours**: (4 hours lecture, 1 hour tutorial, 0 hours Lab)

References

- Textbooks:

Title (Main): "Digital Design"

Author: M. Morris Mano and Michael D. Ciletti
Publisher: Pentice Hall

Year/Edition: 4th edition, 2007

ISBN-10: 9781337560092

Topics

Topic Covered	Week	Chapter
1. Numbers and conversions (Decimal, Binary, Octal, Hexadecimal)	#1	Ch#1
2. Digital Arithmetic, Switching theory	#2	Ch#1, Ch#2
3, 4Boolean Algebra (Laws and Logic Gates) ,SOP, POS	#3,#4	Ch#2, Ch#3
5,6. Designing Combinational logic circuits using gates	#5,#6	Ch#4
7,8. Function Optimization, Decoder, Adder, Multiplexer	#7,#8	Ch#4
9. Sequential Circuit(Latches and Flip Flops)	#9	Ch#5
10. Design FSM(Designing State reduction, State tables, characteristics)	#10	Ch#5

CS 2301 – COMPUTER PROGRAMMING 2

Course Catalog Description

This course will introduce you to object oriented programming (OOP) using Java programming language.
Emphasis will be placed on understanding not only the syntactical features of thelanguage, but how to effectively use the design of the language to develop robust object-based software. This course provides a solid foundation of the syntax and semantics ofthe Java programming language used to develop real-world applications.

Course Requirements

- **Pre-requisite**: CS1301 – Computer Programming 1
- **Credit Hours**: 5 CHs
- **Contact Hours**: (3 hours lecture, 0 hours tutorial, 4 hours Lab)

References

- Textbook:

Title: "Java How to Program"
Authors: Harvey Deitel,Paul

Publisher: Pearson Education

Year/Edition: 2010, Late Objects Version

Topics

Topic	Week	Reference
1. Classes and Objects – Part 1 & Part 2	#1, #2	Ch#1, Ch#2, Ch#7, Ch#8
2. Methods: A Deeper Look	#3	Ch#5, Ch#7, Ch#8
3. Arrays: A Deeper Look	#4	Ch#6
4. Classes and Objects: A Deeper Look	#5	Ch#8
5. Exception Handling	#6	Ch#11
6. Inheritance – Part 1 & Part 2	#7	Ch#9
7. Polymorphism	#8	Ch#10
8. Interfaces	#9	Ch#10
9. Abstraction and Encapsulation	#9	Ch#7
10. Strings and characters	#10	Ch#14

CS2311 – DATA STRUCTURES

Course Catalog Description

This course aims to introduce basic data structures and performance measurement of algorithms which are to be used as tools in designing solutions to problems. Topics include methods of analysis of algorithms including asymptotic notations and empirical measurements of performance, pointers and recursion, abstract data type concepts, different data structures including concepts, implementation and operations for maintaining them; such data structures are: lists and linked-lists, stacks, queues, priority queues, trees andits traversal, binary search trees, heaps, hash tables and graphs and graphs' algorithms.

Also, important sorting and searching algorithms will be discussed including: bubble sort, insertion sort, selection sort, merge sort, heap sort and radix sort, sequential search and binary search.

Course Requirements

- **Pre-requisite**: CS2301 – Computer Programming 2
- **Credit Hours**: 4 CHs
- **Contact Hours**: (3 hours lecture, 2 hours Lab)

References

- Textbook:

Title: "Data Structures and Abstractions with Java"
Author: Frank M. Carrano

Publisher: Pearson 2015

Year/Edition: 2015

Topics

Topic	Week	Reference
1. Introduction, Algorithm analysis	1, 2	
2. Recursion	3	
3. Linked lists	4	
4. Stacks and queues	5,6	
5. Trees	7,8	
6. Graphs	9	
7. Hashing	10	
8. Sorting	11	
9. Searching	11	

CE2471 – COMP. ARCH. & ASS. LANG.

Course Catalog Description

Machine organization; assembly language: addressing modes, stacks, argument passing, arithmetic operations, decisions, performance metrics, instruction set design, instruction formats, control unit design, hardwired control, micro programmed control, instruction cycle, pipeline design techniques , memory hierarchy; cache memory and virtual memory, I/O fundamentals (handshaking and buffering) and Interrupt mechanisms, Buses (protocol arbitration, direct-memory access), super-scalar architecture, parallel architectures

Course Requirements

- **Pre-requisite**: CE1111
- **Credit Hours**: 4 CHs
- **Contact Hours**: (3 hours lecture, 2 hours Lab)

References

- Textbook:

  Title: "Computer Organization and Design"

  Author: David A. Patterson & John L. Hennessey

  Publisher: Morgan Kauffmann

  Year/Edition: 4th edtion

Topics

Topic	Week	Reference
Computer Organization & Architecture. **Sub topics:** Introduction to Basic Computer Organization with its peripherals, computer architecture & its functioning. General overview of programming languages & its compilations.	Week 1	
Organization of the IBM Personal computers **Sub Topics:** Intel X86 Architecture, Registers, memory organizations, Input/output addresses, instruction sets, addressing modes and interrupts. **Data Representation and Numbering Systems.** **Sub Topics:** Various numbers systems representations incomputers, compliments and Binary Arithmetic.	Week 2	
Number Systems & Compliments **Sub Topics:** Number conversions and various compliments	Week 3	
Over view of Assembly Language 8086 **Sub Topics:** Syntax, Program data, variables, program structure and sample programs.	Week 4	
Programs using Assembly Language **Sub Topics**: Review of Lab exercises and programs using instruction sets.	Week 5	
Processor Status, Flag registers, Addressing modes and **Sub Topics:** Flag Registers with architecture, various addressing modes used in representing data.	Week 6	
Stacks: Stack Applications **Sub Topics:** Stack representations and stack operations. Implementing stack operation with demonstration of anyapplication.	Week 7	

I/O Fundamentals Handshaking, Buffering **Sub Topics: synchronous and asynchronous bus transactions, hand shaking protocol, buffering**	Week 8	
Procedures, Word processing, interrupts. **Sub Topics: Define, Call, Return(Single & Multiple) using procedures,** Word Processing operations, software interrupts, hardware interrupts along with their architecture	Week 9	
Continued. And structural data Superscalar and parallel architectures Sub Topics : introduction to characteristics of superscalar and parallel architectures	Week 10	
CNN and String Operations **Sub Topics:** Slice coding interface with languages such as Supreme language CNN and various input & output operations.	Week 11	
Mini Project & Revision	Week 12	

CS 2401 – COMPUTATION THEORY

Course Catalog Description

This course is an introduction to the theory of computational complexity and standard complexity classes.
Topics include languages, finite and nondeterministic finite automata, Context-free grammar, Turing machines, computability, computational complexity, formal logic, and computational logic.

Course Requirements

- **Pre-requisite**: CS 1112 (Discrete Mathematics)
- **Credit Hours**: 4 CHs
- **Contact Hours**: (4 hours lecture, 2 hours tutorial

References

- Textbook:

  Title: "Introduction to the Theory of Computation"
  Author: Michael Sipser

  Publisher: Thomson Course Technology

  Year/Edition: 2012/3rd

Topics

Topic	Week	Reference
1. Introduction	#1	Ch#0
2. Regular Languages	#2-4	Ch#1
3. Context-Free Languages	#5-7	Ch#2
4. The Church-Turing Thesis	#8-9	Ch#3
5. Decidability	#10	Ch#4
6. Time Complexity	#11	Ch#7

CS3001 – ETHICAL AND PROFESSIONAL PRACTICES

Course Catalog Description

This course introduces students to the social and professional issues that arise in the context of computing. Topics include history of computing, social context, impact ofcomputing on society, analytical tools, professional ethics, governance and regulation, risks, security operations, intellectual property, privacy and civil liberties, computer crime,economics of computing, professional responsibility and philosophical frameworks

Course Requirements

- **Pre-requisite**: None
- **Credit Hours**: 3 hrs
- **Contact Hours**: (2 hours lecture, 0 hour tutorial, 0 hour lab)

References

- Textbook:

  Title: "Ethics in Information Technology"
  Author: George Reynolds

  Publisher: Course Technology Inc., (ISBN-10: 1285197151, ISBN-13: 978-1285197159)
  Year/Edition: 2015/5th Edition

Topics

Topic	Week	Reference
An Overview of Ethics	#1, #2, #3	Ch#1
Ethics for IT Workers and IT Users	#4, #5, #6	Ch#2
Computer and Internet Crime	#7, #8	Ch#3
Privacy	#9,	Ch#4
Intellectual Property	#10	Ch#6
Software Development	#11	Ch#7

CS3761 – COMP. NETWORK SYSTEMS

Course Catalog Description

Network architecture: network topologies, analog and digital transmission, modulation and demodulation, transmission media, data encoding, synchronous and asynchronous transmission, digital carriers, access methods and multiplexing, circuit and packet switching. OSI model, LANs, internetworking devices; high-speed bridged networks; WANs .Introduction to Internet and TCP/IP, client-server architecture, socket programming, TCP and UDP, congestion control, addressing, routing algorithms, framing, flow and error algorithms.

Course Requirements

- **Pre-requisite**: CE2471
- **Credit Hours**: 4 hrs
- **Contact Hours**: (4 hours lecture)

References

- Textbook:

  Title: "Computer Networks "

  Author: Andrew S. Tanenbaum & David J. Wetherall

  Publisher: Prentice Hall

  Year/Edition: 5th edition, 2010

Topics

Topic	Week	Reference
Digital transmission, modulation and demodulation	1.	Ch#1
Digital carriers, access methods and multiplexing,	2.	Ch#2
circuit and packet switching multiplexing,	3.	Ch#3
circuit and packet switching, OSI model: DNS,	4.	Ch#4
communication protocols, TCP and UDP,	5.	Ch#6
SMPT, FTP, wWW, socket programming	6.	Ch#7
Congestion control Internetworking, addressing	7.	Ch#8
Routing algorithms framing, flow and error algorithms,	8.	Ch#9
PPP, MAC local area networks;	9.	Ch#10
Internetworking devices;	10.	Ch#11
high-speed bridged networks	11.	Ch#12
wide area networks; Internet and TCP/IP, Client-server architecture	12.	Ch#13

CE 3791 – COMP. NETWORKS SYSTEMS LAB

Course Catalog Description

A set of experiments to design, apply, analyze, and evaluate communication network protocols. employ knowledge to identify a problem, propose alternative solutions, implement a prototype using available network protocols, and evaluate the results. troubleshooting different network issues, and final project is given that will be evaluated at the end of the laboratory.

Course Requirements

- **Pre-requisite**: CE 3761
- **Credit Hours**: 2 hrs
- **Contact Hours**: (4 hours lab)

References

- Textbook:

  Title: Lab Manual

  Author:
  Publisher:

  Year/Edition

CS 3101- SCIENTIFIC RESEARCH

Course Catalog Description

This course gives an introduction of research terminology, ethics, and techniques, this course will give
participants the chance to create or enhance their understanding of research. The research language, ethical concepts and issues, and the components of the research process using quantitative, qualitative, andmixed methods approaches are all covered in this course. These theoretical foundations will be used by participants to start reviewingliterature critically in their field or area of interest and figuring out how research findingsmay help them better understand their environment at work, in society, locally, and globally.

Course Requirements

- **Pre-requisite**: **Credit Hours**: 2 CHs
- **Contact Hours**: (2 hours lecture, 0 hours tutorial, 0 hours Lab)

References

- Textbook:
  1. **Title**: Projects in Computing and Information Systems A Student's Guide
     Author: Christian W. Dawson
     Publisher: Pearson
     Year/Edition: 2015

Topics

Topic	Week	Reference
2. Introduction to Research	1	Ch. 1
3. Definition and Methods of Research	2	Ch. 2
4. Choosing a project and writing a proposal	3-4	Ch. 3
5. Project planning and risk management	5-6	Ch. 4
6. Literature searching and literature reviews	7-8	Ch. 5
7. Controlling your project	9	Ch. 7
8. Presenting your project in written form	10	Ch. 8
9. Presentation skills	11	Ch. 9

CS 3401 – ALGORITHMS DESIGN AND ANALYSIS

Course Catalog Description

This course introduces formal techniques to support the design and analysis of algorithms, focusing on both
the underlying mathematical theory and practical considerations of efficiency. Topics include correctness of algorithms, asymptotic notation, recurrences and Master theorem, divide and conquer, transform and conquer (Balanced Trees), time-space trade-offs, median and order statistics, searching and sorting algorithms, dynamic programming, greedy algorithms, randomized algorithms, recursive backtracking, computational geometry, string matching. Optional material: NP-completeness, competitive analysis, branch-and-bound, amortized analysis and approximation algorithms.

Course Requirements

- **Pre-requisite**: CS 2311 (Data Structures)
- **Credit Hours**: 4 CHs

Reference

- Textbook:

Title: "Introduction to the Design and Analysis of Algorithms"
Author: Anany V.Levitin
Publisher: Pearson
Year/Edition: 2011/3rd

Topics

	Topic	Week	Reference
1.	Introduction and mathematical background	#1	Ch#1
2.	Asymptotic analysis	#2	Ch#2
3.	Brute Force & Exhaustive Search	#3,4	Ch#3
4.	Decrease & Conquer & Sorting and order statistics	#5	Ch#4
5.	Divide and conquer and Randomized algorithms	#6	Ch#5
6.	Transform & Conquer	#7,8	Ch#6
7.	Space-Time Trade-offs, String matching	#9	Ch#7,8
8.	Dynamic programming and Greedy algorithms	#10	Ch#9
9.	Optional Topics: NP-completeness,	#11	Sec# 11.3,
	backtracking, branch-and-bound, approximation algorithms and amortized analysis.		12.1-12.3, 2.1, 9.2

CS3501 – INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Course Catalog Description

This course introduces students to the fundamental concepts and techniques of artificial intelligence. Topics include
fundamental issues, agents, solving problems by searching, informed search and exploration, constraint satisfaction problems, knowledge representation and reasoning, advanced search, advanced knowledge representation and reasoning, production rule systems, planning, and uncertainty.

Course Requirements

- **Pre-requisite**: CS2311 – Data Structure
- **Credit Hours**: 4 CHs
- **Contact Hours**: (4 hours lecture, 0 hour tutorial, 0 hour Lab)

References

- Textbooks:
  1. **Title (Main):** "Artificial Intelligence: A Modern Approach"
     Author: Peter Norvig and Stuart J. Russell
     Year/Edition: 3rd
     ISBN-10: 0-13-604259-7

Topics Distribution (Tentative)

Topic Coveredd	Week (Tentative)	Chapter r
1. Introduction to AI and its Applications	1	Ch1
2. Intelligent Agents	2	Ch2
3. Problem solving by Search Techniques	3-4	Ch3
4. Knowledge Representation – First-Order Logic	5-6	Ch8
5. Knowledge Representation – Inference in First-Order Logic	7-8	Ch9
6. Adversarial Search and Game Playing	9	Ch5
7. Reasoning with Uncertainty (Bayes' Theorem)	10	Ch13

CS 3701 – OPERATING SYSTEMS

Course Catalog Description

This course aims to introduce the fundamentals of operating systems design and implementation. Topics include an overview of the modern operating system's basic concepts, the major components of an operating stem, process management and scheduling, thread Control and Signals, mutual exclusion and synchronization, deadlock, memory management and virtual machine.

Course Requirements

- **Pre-requisite**: CS2311 – Data Structures or CS2321 - Data Structures and Algorithms
- **Credit Hours**: 4 CHs
- **Contact Hours**: (4 hours lecture, 0 hour tutorial, 0 hours Lab)

References

- Textbook:

  Title: " Operating System Concepts "
  Author: Abraham Silberschatz , Peter Baer Galvin and Greg Gagne
  Publisher: John Wiley & Sons

  Year/Edition: 10th Edition - 2018

- Others:

  Progressively on the university E-learning system (blackboard)
  https://elearning.psau.edu.sa/
  https://www.os-book.com/OS10/

Topics

Topic	Week	Reference
1. Introduction to Modern Operating Sys.	1	Ch#1
2. System Structure	2	Ch#2
3. Process and threads	3	Ch#3
4. CPU Scheduling	4,5	Ch#4
5. Deadlocks	6,7	Ch#5
6. Memory management	8,9	Ch#6
7. Virtual memory	10,11	Ch#7

CS 3801 – FUNDAMENTALS OF CYBERSECURITY

Course Catalog Description

This course introduces the computer security principles and the basic threats and countermeasures of
security problems in computing environments. This module includes: Model and attacks, security services (confidentiality, integrity, non-repudiation, availability, accountability), Cryptography: symmetric-key and Asymmetric-key cryptography, authentication and digital signature, key management and cryptographic protocol, access control and authentication, security in computer networks, intrusion detection, viruses and other forms of malicious code.

Course Requirements

- **Pre-requisite**: CE3761 - Computer Network Systems
- **Credit Hours**: 4 CHs
- **Contact Hours**: (4 hours lecture, 0 hour tutorial, 0 hour Lab)

References

- Textbook:

  Title: "Computer Security Principles and Practice"
  Author: William Stallings and Lawrie Brown
  Publisher: **Pearson Education** Year/Edition**: 2014**
  Language: English
  ISBN-10: 0133773922**ISBN-13:** 978-0133773927

- Others:

  Title: "Cryptography and Network Security"
  Author: William Stallings
  Publisher: Pearson Education
  Year/Edition: 2010

Topics

Topic	Week	Reference
1. Introduction to Security.	#1	Ch#1
2. Classical Encryption Techniques.	#2,#3	Ch#2
3. Symmetric Encryption.	#3,#4	Ch#3
4. Public-key Cryptosystems.	#5	Ch#4
5. Message Authentication and Hash Functions.	#6	Ch#5
6. Digital Signature and Key Management.	#7, #8	Ch#6
7. User Authentication	#9	Ch#7
8. Access Control.	#10	Ch#8
9. Network Security	#11	Ch#9

CS-3821- WEB APPLICATIONS PROGRAMMING

Course Catalog Description

This course aims to provide students with knowledge and skills to develop web applications. Students will
learn the concepts of client-side and server-side programming, the fundamentals of the Web, implementation of web applications with database Interfaces. This course is designed to give the student the tools and the knowledge to program using the web programming language PHP as a server side language. Students will be able to use HTML, XHTML, CSS, JavaScript, XML, PHP, MYSQL to develop a dynamic web application.

Course Requirements

- **Pre-requisite**: IS 2511
- **Credit Hours**: 4 CHs
- **Contact Hours**: (3 hours lecture,2 hours Lab)

References

- Textbook:

  Title: "PHP and MySQL Web Development (5th Edition)"
  Author: Luke Welling and Laura Thomson
  Publisher: Addison-Wesley Professional

  Year/Edition: 2017 / 5th Edition |ISBN-13: 9780321833891

- Others:
  - Programming the World Wide Web, Robert W. Sebesta, University of Colorado, Colorado Springs **Pearson** 2015.
  - PHP and MySQL Web Development (5th Edition) (Developer's Library), Luke Welling and Laura Thomson, Addison-Wesley Professional, 2016.
  - W3Schools online web tutorial, www.w3schools.com
  - https://elearning.psau.edu.sa/ **Blackboard university portal**

Topics

	Topic	Week	Reference
1.	Introduction: Web Programming and Scripting	#1	Ch#1
2.	Web browsers, servers and HTTP	#2	Ch#2
3.	HTML basics and more advanced XHTML	#3	Ch#3,4
4.	CSS examples and HTML5 features	#4-5	Ch#5,6
5.	The Basics of JavaScript	#5-6	Ch#7
6.	JavaScript: DOM and Dynamic HTML	#7	Ch#7
7.	PHP Basics	#8-9	Ch#8
8.	More PHP: Form Handling, Files, Cookies, Session Tracking, Architectures for Database Access, The MySQLDatabase System, Database Access with PHP/MySQL	#10	Ch#9
9.	Web Application Frameworks, Introduction to webserver	#11	Ch#10

SE 1010 – EMERGING DIGITAL TECHNOLOGIES

Course Catalog Description

This course covers the concept of emerging digital technologies and its operational principles and its in and for the design of the built environment.
At the successful completion of this course, you will be able to:

- comprehend the technical and operational principles of emerging digital technologies.
- Demonstrate skills in operating emerging digital technologies.
- Identify application of emerging digital technologies.
- Apply emerging digital technologies in their own design projects and professional work.

Course Requirements

Co-requisite:
Credit Hours: 2 CHs

Contact Hours: (2 hours' lecture)

References

- Textbook:

Title: "Digital transformation using emerging technologies"
Author: Fawad A.khan and Jason M. Anderson
Publisher:
Year/Edition: Others: None

CS 4311 – ADVANCED PROGRAMMING

Course Catalog Description

It introduces students to the advanced object-oriented topics. Topics include graphical user interface
(GUI) components, event-driven programming (event-handling methods, event propagation, exception handling), application programming interfaces (APIs(, layout managers, graphics using 2D, applets, multimedia, threads, networking with sockets, and Java database connectivity (JDBC).

Course Requirements

Co-requisite: CS3821 – Web Applications Programming

Credit Hours: 4 CHs

Contact Hours: (2 hours' lecture, 4 hours Lab)

References

- Textbook:

Title: "Java How to Program"
Author: Paul Deitel, Harvey Deitel
Publisher: Pearson Education
Year/Edition: 10th Ed., 2014

Topics

Topic	Week	Reference
1. GUI components – Part I.	#1, #2	Ch#14
2. Event handling.	#3,	Ch#14
3. Graphics and Java 2D.	#4, #5	Ch#15
4. GUI components – Part II.	#6	Ch#14
5. Accessing Databases with JDBC.	#7, #8	Ch#28
6. Multithreading.	#9,	Ch#26
7. Networking.	#10,#11	Ch#27

CS4321 – PROGRAMMING LANGUAGES AND COMPILERS

Course Catalog Description

This course gives an introduction to programming languages features and design issues and the methods
used in compilers to translate high-level programming languages into machine code. This module include: Programming language features and design issues; Data, operands and operators, expressions, statements, and subprograms, lexical analysis, syntax analysis, syntax-directed translation, type checking, run-time environments, intermediate code generation, and code generation. The students are expected to write a complete compiler for a very simple high level programming language.

Course Requirements

- **Pre-requisite**: CS2401 – Computation Theory
- **Credit Hours**: 4 CHs
- **Contact Hours**: (3 hours lecture, 0 hour tutorial, 2 hours Lab)

References

- Textbook:
  1. **Title**: "Concepts of Programming Languages"
     Author: Robert W. Sebesta

     Publisher: Addison-Wesley, (ISBN-10: 013394302X, ISBN-13: 978-0133943023)
     Year/Edition: 2016/11th E

  2. **Title**: "Compilers: Principles, Techniques and Tools"
     Author: Aho A., R.Sethi, J.Ullman
     Publisher: Addison-Wesley, (ISBN-10: 0321486811, ISBN-13: 978-0321486813)
     Year/Edition: 2007/2nd E

- Others: None

Topics

Topic	Week	Reference
1. Programming languages - Syntax and Semantics	1	TB1 Ch1,3
2. Introduction to Compilers Construction	2	TB2 Ch1,2
3. Lexical Analysis	3,4	TB2 Ch3
4. Syntax Analysis	5-8	TB2 Ch4
5. Syntax-Directed Translation	9	TB2 Ch5
6. Intermediate-Code Generation	10-11	TB2 Ch8
7. Compiler construction tools	1-11	Lab Manual

CS4551- MACHINE LEARNING

Course Catalog Description

Definition and examples of machine learning, inductive learning, statistical based learning, reinforcement
learning, supervised learning, unsupervised learning, learning decision trees, neural networks, belief networks, nearest neighbor algorithm, clustering, learning theory, the problem of overfitting, and computational learning theory.

Course Requirements

- **Pre-requisite**: CS3501
- **Credit Hours**: 4 CHs
- **Contact Hours**: (3 hours lecture, 0 hour tutorial, 2 hours Lab)

References

- Textbook:

Title: Introduction to Machine Learning
Author: Ethem Alpaydin

Publisher: MIT

Year/Edition: 2014/3rd Edition

- Others:

Title: Machine Learning
Author: Tom Mitchell
Publisher: McGraw Hill
Year/Edition: 1997

Topics

Topic	Week	Reference
Introduction to ML (supervised, unsupervised)	1	
Linear Regression with One Variable	2	
Linear Regression with Multiple Variables	3	
Logistic Regression	4	
Regularization	5	
Support Vector Machines	6	
Decision Trees	7	
KNN	8	
Neural Networks: Representation, MLP	9	
Neural Networks: Learning, MLP	10	
Model Assessment and Comparison	11	
Unsupervised Learning, Clustering, k-means	12	

CS4654 - DIGITAL IMAGE PROCESSING

Course Catalog Description

This course covers the fundamentals of computer graphics and digital image processing. Course topics are the fundamentals of computer graphics, introduction of image sensing and acquisition, some basic gray level transformations for image enhancement, image contrast enhancement using histogram processing, image smoothing using spatial filters, image sharpening using spatial filters, point, line and edge detection, basic global and adaptive thresholding for image segmentation, optimal global and adaptive thresholding for image segmentation, region-based image segmentation and edge-based segmentation, image restoration in the presence of noise-spatial filtering, image enhancement.

Course Requirement

- **Pre-requisite**: CS3401
- **Credit Hours**: 4 CHs
- **Contact Hours**: **Contact Hours**: (3 hours lecture, 2 hours Lab)

References

- Textbook:

  Title: "Digital image processing"
  Author: Rafael C Gonzalez and Richard E Woods
  Publisher: New York, NY Pearson:
  Year/Edition: 2018 / 4th Edition |ISBN-13 978-0133356724

- Others:
  - Space Image Processing, Julio Sanchez, CRC Press, 2018.
  - Computing Colour Image Processing, Alan Parkin, Springer International Publishing, 2018.
  - Adaptive Image Processing, Kim-Hui Yap; Ling Guan; Stuart William Perry; Hau San Wong, CRC Press, 2018
  - Matlab: https://www.mathworks.com/products/matlab.html
  - https://elearning.psau.edu.sa/ **Blackboard university portal**

Topics

Topic	Week	Reference
1- Fundamentals of computer graphics	#1	Ch#1
2- Introduction to Image Processing	#2	Ch#1
3- Histograms	#2,3	Ch#2
4- Point Operations	#4	Ch#2,3
5- Filters	#5	Ch#3,4
6- Edges and Contours	#6	Ch#4,5
7- Corner Detection	#7	Ch#5
8- Morphological Filters	#8,9	Ch#6
9- Regions in Binary Images	#10	Ch#7,8
10- Color Images Processing	#11	Ch#8

IS2511- FUNDAMENTALS OF DATABASE SYSTEMS

Course Catalog Description

This course provides the students with an introduction to the core concepts in data and information management. It is centered around the core skills of identifying organizational information requirements, modeling them using conceptual data modeling techniques, converting the conceptual data models into relational data models and verifying its structural characteristics with normalization techniques, and implementing and utilizing a relational database using an industrial-strength database management system.

Course Requirements

Pre-requisite:
Credit Hours: 4 CHs

Contact Hours: (3 hours lecture, 0 hour tutorial, 2 hour Lab)

References

- Textbook:
  - **Title**: Fundamentals of Database Systems, Elmasri and Navathe
  - **Author**: Elmasri and Navathe
  - **Publisher**:
  - **Year/Edition**: Latest Edition
  - **Language:** English.

Topics

Topic	Week	Reference
• Fundamentals of Database systems & environment and Information Processing	1	
• Enterprise Data Model, Database Schema	2	
• E-R Model Constructs and SQL Introduction	3	
• Modeling Data in the Organization, SQL with DDL, DML and views commands	4	
• The Enhanced E-R Model	5	
• Entity clusters and universal data model, Logical Database Design	6	
• Data Normalization	7	
• Physical Database Design	8	
• Database File Organizations/ De-normalization and Partitioning	9	
• De-normalization and Partitioning	10	
• Introduction to SQL, select statements, View	11	

CS 4821 – CRYPTOGRAPHY

Course Catalog Description

Introduction to number theory: modular arithmetic, prime number, Fermat's and Euler's Theorems, testing for Primality, Chinese Remainder Theorem, Integer Factorization, Discrete logarithms, Set algebra and finite fields. Computations in finite fields using standard and non-standard bases. High performance algorithms and architectures for cryptographic applications. Cryptographic algorithms: Classical cryptography; Secret Key Encryption; Perfect Secrecy. Cryptanalysis; Block and Stream cipher; Data Encryption Standard (DES) and Advanced Encryption Standard (AES); Public Key Encryption; Diffie- Hellman Key Exchange; RSA, ElGamal and Rabin's Cryptosystems; Authentication and Digital Signatures; One-time signatures; Randomized Encryption; Rabin and ElGamal signature schemes; Digital Signature Standard (DSS)' Cryptographically. Identification and entity authentication. Hash algorithms, Message Authentication Codes. Key establishment protocols. Key management Techniques.

Course Requirements

Pre-requisite: CS-3801 - Computer Security

Credit Hours: 4 CHs

Contact Hours: (4 hours lecture, 0 hour tutorial, 0 hour Lab)

References

- Textbook:
  - **Title**: Cryptography and Network Security: Principles and Practices
  - **Author**: William Stallings,
  - **Publisher**: Prentice Hall
  - **Year/Edition**: 5th Edition, 2010 or latest available edition
  - **Language:** English
- Others:
  - **Title**: Handbook of Applied Cryptography,
  - **Author**: Menezes, Oorschot and Vanstone
  - **Publisher**: CRC Press
  - **Year/Edition**: 2014 (last update)
  - **Language:** English

Topics

Topic	Week	Reference
1. Introduction to number theory: Prime numbers, Euler's totient function, Modular arithmetic (divisors, operations, and prosperities of congruence), Euclidean algorithm: finding GCD, Finding inverse (Exhaustive search, Fraction, and Extended Euclidean algorithms)	1, 2	Textbook-Chapter 1,2
2. Cryptography, Classical Cryptosystems, Cryptanalysis, and Perfect secrecy	3, 4	Textbook -Chapter 3,4
3. Data Encryption Standard (DES) and Advanced Encryption Standard (AES)	5, 6	Online latest Information (Multiple Resources)
4. Public Key Encryption: RSA, Diffie-Hellman, ElGamal, ID system and Rabin's Cryptosystems	7, 8	Online latest Information (Multiple Resources)
5. Public Key Digital Signatures: Digital Signature Standard (DSS), Shamir Signature Knapsack and Fayoumi Signature	9	Online latest Information (Multiple Resources)
6. Secure hash, Security of Hash functions, Secure Hash algorithm (SHA)	10	Information (Multiple Resources)
7. Authentication applications: challenge-response mechanism	11	Information (Multiple Resources)

SE4141– ADVANCED SOFTWARE ENGINEERING

Course Catalog Description

Design patterns - Distributed systems architecture - Real-time software design – Dataacquisition systems – Data processing systems – Transaction processing systems – Event processing systems

Pre-requisite: SE 2111

Credit Hours: 4 CHs

Contact Hours: (4 hours lecture, 0 hour tutorial, 0 hour Lab)

ReferencesTextbook:

- **Title**: Software Engineering", 8th edition"
- **Author**: Ian Sommerville, Pearson Education
- **Publisher**:
- **Year/Edition**: Latest Edition
- **Language:** English

Topics

Topic	Week	Reference
Overview of Software Engineering	1	
• Introduction to Architectural Designs, Models Sub Topics: System structuring , Control models	2	
• Architectural Designs, Models (continued..) Sub topics: Domain-specific architectures, Modular decomposition	3	
• Design patterns- Design with Reuse Sub Topics: Component-based development	4	
• Design patterns- Design with Reuse Sub Topics: Application families, Design patterns	5	
• Distributed systems architecture Sub Topics: Multiprocessor architectures, Client-server architectures	6	
• Distributed systems architecture Sub Topics: Distributed object architectures Inter-organisational computing	7	
• Real-time software design: Introduction Real-Time Systems (RTS): A Characterization, RTS Design	8	
• Real-time software design: RT Operating Systems Generic RTS architectures	9	
• Monitoring and Control Systems	10	
• Real-time software design: Data Acquisition Systems	11	
• Application Architectures: • Data processing, Transaction processing, and Event processing systems	12	

CS4531– NEURAL NETWORKS

Course Catalog Description

In this course students will learn about the basics of deep neural networks, and their applications to various AI tasks. By the end of the course, it is expected that students will have significant familiarity with the subject, and be able to apply Deep Learning to a variety of tasks. They will also be positioned to understand much of the current literature on the topic and extend their knowledge through further study.

Pre-requisite: CS 3501

Credit Hours: 4 CHs

Contact Hours: (4 hours lecture, 0 hour tutorial, 0 hour Lab)

References

- Textbook:
  - **Title**: *Deep Learning*
  - **Author** Ian Goodfellow, Yoshua Bengio, and Aaron Courville
  - **Publisher**:
  - **Year/Edition**: Latest Edition
  - **Language:** English

Topics

Topic	Week	Reference
• Introduction, Syllabus, Machine Learningreview	1	• CH# DLB 1-5
• Deep FeedForward, Activation Functions	2	• CH# DLB 6
• Optimization, Training, Regularization	3	• CH# DLB 7,8
• Convolutional Neural Networks	4,5	• CH# DLB 9
• Recurrent Neural Networks	6,7	• CH# DLB 10
• Generative Adversarial Networks	8	• CH# DLB 20.10.4
• Reinforcement Learning	9	• --
• Transformers	10	• --
• Practical Methodology, Metrics, Hyperparameters • Deep learning applications and trends	11	• CH# DLB 11

CS4731– SYSTEM PROG AND ADMINISTRATION
Course Catalog Description

This course provides experience with the administration and programming of some popular OS, e.g. Linux or MS Windows. Topics include basic shell commands and utilities, shell scripting and GUI tools for user management, file system management, management of security policies, network services and background processes, web-based administration tools for remote administration.

Pre-requisite: CS 3701

Credit Hours: 4 CHs

Contact Hours: (4 hours lecture, 0 hour tutorial, 0 hour Lab)

References

Textbook:

Title: Advanced programming in the UNIX environment
Author: W. Richard Stevens, Stephen A.Rago. Addison Wesley
Publisher**: Year/Edition**: Latest Edition
Language: English

Topics

Topic	Week	Reference
Introduction to System Administration	1	
Introduction to Microsoft Windows -7 (Editions, Features, Architecture)	2	
File Management (Configuring File Systems,Configuring Disk Storage)	3	
File Management (Accessing and Managing the DiskManagement Utility, Managing Data Compression, Using Disk Maintenance Tools)	4	
Managing the Interface (Control Panel, System Icon,Registry Editor)	5	
Configuring Users and Groups (understanding windows 7 user accounts, Create, Disable, Renaming, Deleting)	6	
Configuring Users and Groups (Managing user properties,troubleshooting user authentication, Creating & ManagingGroups)	7	
Managing Security (Managing Security Configurations,Understanding Group Policy Objects and Active Directory)	8	
Managing Security (Managing File and Folder Security, Managing Network Access)	9	
PowerShell (commands, errors)	10	
Shell Scripts	11	

CS 4901 – FIELD TRAINING

Course Catalog Description

This course aims at allowing student to acquire experience in a public/private sector in the field of
computer science. This is accomplished in full time schedule for at least 8 weeks in summer. The ultimate aim of the training is that student will apply what he learned during previous years. This is done in a real life and in team work environment. The training is evaluated according to training advisor at the training field and the training committee at the department of computer science.
Courses, Professional Certificates, Technical Training Camps are all acceptable as alternative to Field Training during summer 2022.

Course Requirements

- **Pre-requisite**: Completion of 130CHs
- **Credit Hours**: 3 CHs.
- **Contact Hours**: 8 hours a day and 5 days a week for 8 weeks; 240 hours of training courses

References

- Textbook:

  Title: "Training Manual"

  Author(s): CCES Training Committee
  Publisher: CCES, PSAU
  Year/Edition: 2016-2017

CS 4912 – FINAL YEAR PROJECT 1

Course Catalog Description

The aim of the project is to integrate the theoretical and practical knowledge of thestudent across all of the
years of their study and provide a practical demonstration of their capability in executing a challenging and large-scale project.

Course Requirements

Pre-requisite: CS3101
Credit Hours: 3
Contact Hours: 3 hours

CS 4921 – FINAL YEAR PROJECT 2

Course Catalog Description

In this course, the student is expected to deliver a detailed report including all the software development
phases; the algorithms; or models. The student must be discussed in a seminar and in the presence of arbitrators.

Course Requirements

Pre-requisite: CS4912
Credit Hours: 3
Contact Hours: 3 hour

TQN 1400 – COMPUTER SKILLS

Course Catalog Description

This course serves as an introductory course for the engineering/Nursing/computer/science colleges. It includes topics such as: introduction to computing and information technology, networks, internet, and introduction to database; productivity skills: (word processing, spreadsheets, presentations, information, communications and networking); problem solving: (flow charts, introduction to algorithms, control structures); computer programming: (programming languages, compilers, Pseudo code examples).

Course Requirements

- **Pre-requisite**: None
- **Credit Hours**: 3 CHs
- **Contact Hours**: (2 hours lecture, 0 hour tutorial, 2 hours Lab)

References

- Textbooks:

  Maureen Sprankle and Jim Hubbard, "Problem Solving and Programming Concepts", 9th ed., Prentice Hall, 2012, ISBN-10: 0132492644 ISBN-13: 9780132492645

Topics

Topic Covered	Week (Tentative)	Chapter
1. Introduction to Computer and Programming	1	Ch#1
2. Introduction to Computer and Programming	2	Ch#2
3. Computer Block Diagram, Hardware devices, SystemSoftware and Application Software	3	Ch#3
4. Data representation- binary system	4	Ch#4
5. Software_System Software -Application Software - Operating System	5	Ch#5
6. INTRODUCTION TO COMPUTER NETWORKS	6	Ch#6
7. Introduction to the Internet and Web	7	Ch#7
8. Privacy_ Security and_ ethics	8	Ch#8
9. Information Technologie &Safety and health in dealing with the computer	9	Ch#9
10. Introduction to Database Systems	10	Ch#10
11. Introduction to Flowchart and Programming Languages.	11	Ch#11

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