كلية
الحاسب الآلي
وتقنية المعلومات

جامعة شقراء
Shaqra University

Bachelor of Computer Science (BCS)
Program Handbook - V6

Computer Science Department (CSD)

College of Computing and Information Technology (CCIT)

Shaqra University (SU)

Assoc. Prof. Dr. Munif Alotaibi
Dean
College of Computing and Information Technology
Shaqra University
Shaqra 11961, Saudi Arabia
E-mail: munif@su.edu.sa

The field of Computing is one of the most advanced scientific fields that has influenced all aspects of modern life. Continuous development has become one of the most important features of this field in which all scientific and applied efforts are focused. As the computer stands at the top of the knowledge pyramid in this age due to the rapid technological development, it becomes important for all the institutes to adapt to this particular curriculum. Therefore, the College of Computing and Information Technology (CCIT) in Shaqra University (SU) intends through the available programs and disciplines to meet the increasing needs of requirements in the field of computer science and information technology by graduating their students with good knowledge in the field of computer science. The main emphasis is given on providing theoretical and practical knowledge to compete in the labor market in light of the strong competition and rapid development witnessed by Saudi Arabia and the world at a major level. The CCIT also seeks to qualify graduates to complete their higher studies and join the elite researchers interested in the field of technology and computer science. As a newly established college, the prime focus is to identify the potential of the organization. In order to achieve this, we are working on the continuous development of the science curriculum and developing students' learning skills and attracting outstanding faculty members so that we can move towards achieving the goals of the College at a confident pace.

Assist. Prof. Dr. Saeed Alshahrani
Vice Dean for Educational Affairs
College of Computing and Information Technology
Shaqra University
Shaqra 11961, Saudi Arabia
E-mail: salshahrani@su.edu.sa

Technology is a real force of change that stands behind most of the rapid developments in all aspects of life. As a result, the demand for highly skilled graduates has increased. To meet these requirements, the Agency for Educational Affairs at the College of Computing and Information Technology (CCIT) at Shaqra University seeks to provide modern, effective and sophisticated curriculum similar to those offered by other major educational institutions around the world who are able to keep pace with the rapid development of information technology. Currently, the CCIT offers a bachelor's degree in computer science, computer and network Engineering and information systems. The College's Educational Affairs Agency is also on the way to complete the requirements of local academic accreditation by the National Center for Assessment and Accreditation (NCAAA) and international academic accreditation by the Engineering Accreditation Council (ABET). In order to improve the educational process and provide it in an organized manner and based on high-quality international standards the educational affairs are trying hard to acquire such international level certificates. Thus, we can ensure that the college student shall be of immense importance. The College also strives to promote scientific research at the College, where we work to achieve leadership and excellence in both quantitative and qualitative terms, and to encourage joint research work and promote the exchange of scientific expertise and research among faculty members at the College. In view of the university's tendency to encourage graduate studies and scientific research, the college is in the process of opening two master's programs in cybersecurity and assurance, and in data science and artificial intelligence, and shall be applying for the opening of a doctoral program.

Assoc. Prof. Dr. Raed Shujaa Alotaibi
Head of Computer Science Department
College of Computing and Information Technology
Shaqra University,
Shaqra 11961, Saudi Arabia
E-mail: alhafi@su.edu.sa

No one can imagine living today without computers. It dominates all of our daily activities, starting from very simple to very complicated activities. The need for computer scientists appears clearly in all fields including artificial intelligence and software development projects. The contribution of computer scientists can also be seen in the development web and mobile applications, artificial intelligence solutions, game design, and so on. Indeed, it is very rare today to see a device or a piece of equipment that is not entirely or at least partially designed by computer scientists. In the Kingdom of Saudi Arabia, most of the various infrastructure projects have been developed during the last three decades. Computer scientists have been part of executing these projects. However, there is still a lack of computer scientists to contribute and push the wheel of development in the Kingdom of Saudi Arabia. Since the establishment of the Computer Science at Shaqra University, the department has been/will be committed to providing qualified computer scientist with valuable skills that should participate in the attainment of the vision of the Kingdom of Saudi Arabia 2030.

Contents

BCS Program 8
CCIT Vision 9
CCIT Mission 9
BCS Program Vision 9
BCS Program Mission 9
CCIT Strategic Goals 10
BCS Program Strategic Goals 11
BCS Program Learning Outcomes (PLOs) 12
Admission and Registration Rules 13
1. Student Admissions 13
1a. Admission of Fresh students 13
1b. Admission of International Students 14
2. Transfer of Students 14
2a. Transfer from Other Universities 14
2b. Transfer from College to Other within the University 15
2c. Transfer from One Specialization to Another within the College 15
3. Transfer of Courses 16
4. Visiting Students 16
5. Attendance and Apology from Study 17

5a. Attendance Rules 17
5b. Apology Rules 17
6. Withdrawal from University 18
7. Graduation Requirements 18
7a. First Year 18
7b. Course Requirements 19
7c. Graduation Project Requirements 19
7d. Field Training Requirements 19
BCS Program Curriculum Structure 20
BCS Program Study Plan 21
Elective Courses 25
BCS Course Description 26
1. Level One 26
2. Level 28
3. Level 3 30
4. Level 4 35
5. Level 5 41
6. Level 6 47
7. Level 7 53
8. Level 8 55

BCS Program Laboratories 60
1. Male Branch Laboratories 61
2. Female Branch Laboratories 64

BCS Program

The College of Computing and Information Technology (CCIT) has been established in 1434 H (2014 G), and in turn, it emphasizes the provision of the best means of education and research that serve the community and become an effective partner in the industry. The Bachelor of Computer Science (BCS) program was implemented since the establishment of the college. Since then, seven batches of students have graduated from the program during the academic years (1438 H, 1439 H, 1440 H, 1441 H, 1442 H, 1444 H, 1445 H, 1446 H), given that admission to new students is only given at the first semester of the academic year. In terms of education, the program provides a broad knowledge in the field of different computer science branches such as artificial intelligence and software development sectors. The College and the Computer Science department aim to establish a close relationship between professors and students and provide a university atmosphere that helps creativity, performance, acquisition of advanced knowledge, and practical skills in many important computer science fields. Through the program with a team of highly experienced instructors (i.e., associate professors, assistant professors, and lecturers) and qualified students, the college seeks to play an active role in the community and serve the national vision of Saudi Arabia (Vision 2030) as we believe that the graduates of the computer science field will play a leading role in many aspects of the vision. Furthermore, the program graduates are expected to acquire the knowledge and skills that enable them to effectively perform in the technical fields of computer science whether in governmental organizations or private sectors.

CCIT Vision

“To be a nationally distinguished college in the fields of computing, scientific research, and community service”.

CCIT Mission

“Preparing distinguished cadres to keep pace with the requirements of the job market through competitive programs in the fields of computing through an environment that encourages scientific research and community service”.

BCS Program Vision

“To be a leading program nationally and internationally in the fields of education, scientific research, and community service in computer science specialization”.

BCS Program Mission

“Preparing qualified scientific cadres in the various fields of computer science through innovative education and scientific research, which develops creative and analytical abilities that can serve the community”.

CCIT Strategic Goals

	CCIT Goals
1	Develop the college's organizational structure and academic programs.
2	Raise the efficiency of the college's academic and administrative human resources.
3	Achieve competitive educational outcomes for academic programs in keeping with job market changes.
4	Provide scientific research in the fields of computing in line with development and societal priorities.
5	Strengthen partnership with the community and effectively contributing to its development and service in the fields of computing.
6	Provide an enticing educational environment and improve teaching and learning methods.

BCS Program Strategic Goals

	BCS Program Goals
1	Graduate competent professionals to meet the growing needs for a well-qualified workforce specialized in computer science.
2	Provide program staff with opportunities for professional development.
3	Contribute significantly to scientific research and discovery of new knowledge and methods in computer science.
4	Provide a safe, healthy and enticing educational environment.
5	Offer computing consultations and community services to those in need of such services.
6	Provide students with life-long learning capabilities to adapt to rapidly changing technologies in computer science.

BCS Program Learning Outcomes (PLOs)

The BCS program has an approved and announced set of program learning outcomes (PLOs) that support its goals. The attainment of these outcomes prepares graduates to enter the professional practice in the field of computer science.

Learning Domains	BCS Program Learning Outcomes (PLOs)	
Knowledge & Understanding	**K1**	Demonstrate the knowledge of mathematics and natural sciences related to computer science.
	K2	Recognize the fundamental concepts within the body of knowledge in computer science.
Skills	**S1**	Analyze a complex computing problem and apply principles of computing (and other relevant disciplines) to identify solutions.
	S2	Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
	S3	Apply computer science theory and software development fundamentals to produce computing-based solutions.
	S4	Communicate effectively in a variety of professional contexts.
Values	**V1**	Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
	V2	Function effectively as a member or leader of a team engaged in activities appropriate to the computer science discipline.

Admission and Registration Rules

1. Student Admissions

1a. Admission of Fresh students

The general requirements for admission to Shaqra University can be listed as below:

- The new student should be a holder of a secondary school certificate or its equivalent from withinthe Saudi Arabia or from outside it.
- He/She should not have obtained a high school or equivalent for more than five years. While, theuniversity council may exempt from this condition if there are convincing reasons.
- He/She should have a good behavior registry.
- He/She should successfully pass any personal interview or test that the University Councilrequires.
- He/She should be medically fit.
- He/She should obtain his approval for study if he works in any governmental or private organization.
- He/she should meet any other conditions determined by the University Council at the time of admission.

According to the admission of freshmen, the University Council determines on the proposal of the College Council the number of students who can be admitted in the next academic year. If there is anexcess in the applicant number, the selection is done according to their grades in the general secondary certificate, personal interview, and admission tests (if found). In addition, the result of the general capabilities test, which is a prerequisite for all applicants, is considered. The ratio of each applicant is calculated as follows: 40% of the general cumulative average for the second year, 30% for the general capabilities test, and 30% for the acquisition test score. It is worth mentioning that the specialization in the College of Computing and Information Technology (CCIT), Shaqra University requires that the student passes successfully all the courses of the curriculum for the full preparatory year with a rate as mentioned in the following link: https://su.edu.sa/ar/deanships/deanship-admission-and-registration/allocation-criteria-after-passing-preparatory-year

1b. Admission of International Students

The admission process for international students is somewhat as same as national ones with alladdition of the following:

- To pass the required scores of both capabilities and acquisition tests.
- The equivalent cumulative ratio (40% secondary - 30% capabilities - 30% acquisition) should bea total higher than 85 degrees.
- Not to exceed 25 years of age.
- The student must be a regular resident of Saudi Arabia.

2. Transfer of Students

2a. Transfer from Other Universities

The student may, upon the approval of the head of the department and the dean of the collegein Shaqra University, accept his transfer from outside the university according to the following rules:

- The student has studied at a recognized college or university.
- The student should not be separated from the University for Disciplinary Reasons.
- The student has spent at least two semesters at the university from which he wishes to transfer, provided that the number of study credit hours recorded in his academic record is not less than (24) hours.
- The student should study at Shaqra University at least 60% of the graduation requirements.
- The student must apply for transfer before the beginning of the semester at least five weeks.

2b. Transfer from College to Other within the University

After the approval of the head of the department and the dean of the college in Shaqra University,accept his transfer from according to the following rules:

- The student must have spent at least one semester in the college that he wants to transfer from with at least (14) credit hours.
- The student should not be interrupted, delayed or apologized for the study from the college from which he wishes to transfer.
- His cumulative average should not be less than the limit determined by the College Council and should not be less than (2 of 5).
- Transfers between university faculties are permitted only twice during the entire period of university study.

2c. Transfer from One Specialization to Another within the College

After the approval of the Dean of the College, the student may transfer from one specialization toanother within the College according to the following rules:

- Completion of entry requirements for the specialization to be transferred to.
- Not violating the capacity of the department.
- The student has spent at least one semester in the specialization in which he wishes totransfer with 14 credit hours.
- The student should not be interrupted, delayed or apologized for the study from thespecialization in which he wishes to transfer.

3. Transfer of Courses

The College Council should compare the courses studied by the student outside the university onthe recommendation of the departments that provide these courses. The student's academic record should be confirmed in the student's academic records, and should not be included in the calculationof his cumulative average according to the following rules:

- The student has studied at a recognized college or university.
- The number of hours studied by the student in the course he wants to equal should be equalto or more than the number of hours spent at Shaqra University. This rule may be to considerexceptions by a maximum of one hour.
- The content of the material studied by the student must be identical to the content of the material in the Shaqra University by not less than (70%).

4. Visiting Students

Additionally, the transfer courses can be done for the visiting students. The visiting student isdefined as the student who is studying some courses in another university or in a branch of the university to which he belongs without transferring him. His credit hours can be calculatedaccording to the following rules:

- The acceptance of the department, the faculty and the grant acceptance and registration toallow the student to study as a visiting student.
- To be studied at a recognized college or university.
- The course topics being taught by the student outside the college are equivalent to the coursetopics in his college by 70% or more.
- The maximum number of academic credit hours outside the university is 25% of the totalnumber of credit hours required to graduate from Shaqra University.
- The number of credit hours for the course which the student has studied outside theuniversity should be equal to or more than the number of credit hours in Shaqra University.

5. Attendance and Apology from Study

5a. Attendance Rules

- The regular student must attend lectures and practical lessons. He is prohibited from entering the final exam if his attendance is less than the percentage determined by the university council,but not less than (75%) of the lectures and practical lessons specified for each course during thesemester.
- A student who has been prohibited from entering the final exam, is considered to be failing in the course and his final degree will be denied (DN)
- The College Council or its authorized representative may exclude the prohibition and allow thestudent to enter the test. But the student must present an excuse accepted by the Council. The University Council shall determine the attendance rate, not less than (50%) of the lectures and practical courses specified for the course.
- The student who misses the final test is zero in that test. His final result is calculated from his quarterly work degrees.

5b. Apology Rules

- A student may withdraw with the excuse of one or more courses during the semester with thefollowing rules;
- The number of remaining credit hours shall not be less than 12 hours. If he presents an acceptable excuse to the Dean of the College at least three weeks before the start of the final tests.
- A student may apologize for continuing to study a semester without being considered a failingstudent if he presents an acceptable excuse to the body determined by the university council.His final grade will be (W). The apology semesters must not exceed two consecutive semestersor three non-consecutive semesters.

6. Withdrawal from University

The student may withdraw from the university after completion of the procedures of removingthe university from the university and return the university card and bring his identity papers to return the original file. The withdrawal from the university shall entail the following:

- The period during which the student withdraws from the university shall be calculated as ifhe were not studying.
- The rewards of the withdrawn student shall be suspended from the semester until he registers for another semester.
- The student must be evacuated from the residence, the library and other university facilities.
- The student is considered to be withdrawn from the university and he has the right to re- enroll if he required in a period not exceeding four semesters or two academic years.
- The student may apply for postponement of the study for an excuse acceptable to the body determined by the University Council, provided that the postponement does not exceed twoconsecutive or three semesters.

7. Graduation Requirements

The Admission and Registration Deanship Office of the University is responsible for ensuringthat graduating students have met all graduation requirements which can be classified as below:

7a. First Year

The preparatory year aims at enhancing the skills of the student through intense English courses andcourses that improve their communication and computer skills. The preparatory year is 32 credit hours.

7b. Course Requirements

After successfully passing the preparatory year (32 credit hours) and to complete the graduation requirements for a B.S. in Computer Science, the students are required to successfully pass a total of 162 credit hours.

7c. Graduation Project Requirements

According to the graduation project requirements, the project is divided into two parts (3 credit hours each). The student is eligible to register for the Graduation Project (1) if the student completes successfully at least 130 credit hours including preparatory year. Graduation Project (1) and (2) can be taken during the first and second semesters only (not during summer semester).

7d. Field Training Requirements

Prior to graduation, after completion of at least 110 credit hours, each Computer Science majormust complete an approved Computer Science Field Training Program. Field training extends overat least 36 credit hours, and must be undertaken in companies or establishments accepted by the college.

BCS Program Curriculum Structure

Program Structure	Required/ Elective	No. of courses	Credit Hours	Percentage
Institution Requirements	Required	3	7	5%
	Elective	1	2	1.5%
College Requirements	Required	16	49	36.5%
	Elective	-	-	-
Program Requirements	Required	19	58	43.3%
	Elective	1	3	2.2%
Capstone Course/Project	Required	2	6	4.4%
Field Training/ Internship	Required	1	6	4.4%
Residency year	-	-	-	
Others	-	-	-	
Total		43	134	100%

BCS Program Study Plan

Level	Course Code	Course Title	Required or Elective	Pre-Requisite Courses	Credit Hours	Type of requirements (Institution,
Level 1	CUR 1201	Academic Skills	Required	-	2	Institution
	CIT 1301	Computer Skills	Required	-	3	Institution
	ENGL 1601	English Language Skills 1	Required	-	6	College
	MATH 1304	Introduction to Probability & Statistic	Required	-	3	College
	MATH 1301	Calculus 1	Required	-	3	College
Level 2	CSC 1301	Principles of Programming and Algorithms	Required	CIT 1301 -S	3	Program
	CSC 1201	English for Computing Purposes	Required	-	2	College
	CIS 1302	Introduction to Database	Required	CIT 1301 -S	3	College
	PHYS 1401	Physics 1	Required	-	4	College
	ENGL 1602	English Language Skills 2	Required	ENGL 1601 - S	6	College

Level	Course Code	Course Title	Required or Elective	Pre-Requisite Courses	Credit Hours	Type of requirements (Institution,
Level 3	-	Elective course (University)	Elective	-	2	Institution
	SLM 1201	Principles of Islam	Required	-	2	Institution
	CSC 2201	Computer Science Ethics	Required	-	2	College
	CSC 2302	Computer Programming 1	Required	CSC 1301 - S	3	College
	MATH 1302	Linear Algebra	Required	-	3	College
	CNE 2302	Digital logic Design 1	Required	PHYS 1401 - S	3	College
	CIS 2304	System Analysis and Design 1	Required	CIS 1302 - S	3	College
Level 4	CSC 2303	Computer Programming 2	Required	2302 - S CSC	3	College
	CSC 2304	Artificial Intelligence	Required	2302 - S CSC	3	College
	CSC 2305	Software Engineering	Required	- S2304 CIS	3	College
	MATH 1303	Discrete Mathematics	Required	-	3	College
	CNE 3304	Computer Networks 1	Required	CNE 2302 - S	3	College
	CIS 3302	Data Structures	Required	CNE 2302 - S	3	College

Level	Course Code	Course Title	Required or Elective	Pre-Requisite Courses	Credit Hours	Type of requirements (Institution,
Level 5	CSC 3301	Analysis and Design of Algorithms	Required	CIS 3302 - S	3	Program
	CSC 3302	Web Applications Development	Required	CNE 3304 - S	3	Program
	CSC 3303	Machine Learning	Required	CSC 2304 - S	3	Program
	MATH 1305	Numerical Methods	Required	MATH 1307 - S	3	Program
	CIS 2303	Database Management Systems	Required	CIS 1302 - S	3	Program
	CNE 3303	Computer Organization and Architecture 1	Required	CNE 2302 - S	3	Program
Level 6	CSC 3304	Theory of Computation	Required	MATH 1303 -S	3	Program
	CSC 3305	Computer Graphics	Required	MATH 1302 - S	3	Program
	CSC 3306	Deep Learning	Required	CSC 3303 - S	3	Program
	CIT 3306	Operating Systems	Required	CIS 3302 - S	3	Program

Level	Course Code	Course Title	Required or Elective	Pre-Requisite Courses	Credit Hours	Type of requirements (Institution,
	CNE 3305	Computer Networks 2	Required	CNE 3304 - S	3	Program
	CIS 3307	Information Security	Required	CNE 3304 - S	3	Program
Level 7	CSC 4391	Graduation Project 1	Required	Senior Standing (Achieving 95+ Credit Hours)	3	Program
	CSC 4699	Cooperative Training	Required	Achieving at least 95 Credit Hours	6	Program
Level 8	CSC 4301	Cryptography	Required	CIS 3307 - S	3	Program
	CSC 4302	Compilers Theory	Required	CSC 3304 - S	3	Program
	CSC 4303	Parallel and Distributed Computing	Required	CSC 3301 - S	3	Program
	CSC 4304	Software Testing	Required	CSC 2305 - S	3	Program
	CSC 43XX	Elective course	Elective	X	3	Program
	CSC 4392	Graduation Project 2	Required	CSC 4391 - S	3	Program

Elective Courses

Course Code	Course Title	Pre-Requisite Courses	Credit Hours
CSC 4351	Computer Vision	CSC 3306 - S	3
CSC 4352	Natural Languages Processing	CSC 3306 - S	3
CSC 4353	Games Programming	CSC 3305 - S	3
CSC 4354	User Interface Design	CSC 2303 - S	3
CSC 4355	Mobile Applications Development	CSC 2303 - S	3
CSC 4356	Software Quality Assurance	CSC 2305 - S	3
CSC 4357	Software Design Patterns	CSC 2303 - S	3
CSC 4358	Cloud Computing	CNE 3304 - S	3
CSC 4359	Advanced Operating Systems	CIT 3306 - S	3

BCS Course Description

1. Level One

Subject Code	CIT 1301
Course Title	Computer Skills
Credit hours	3 (2, 0, 2)
Level	1
Pre-Requisite	None
Co-Requisite	None
Catalogue Description	The computer skills course is concerned with developing students' computer use skills and prepares the student with the skills necessary to use and operate a computer. Topics included Introduction to Information Technology, Operating systems and file management, Word processing program, Spreadsheet program – Excel, Presentation program – PowerPoint, Database software – Access, Cloud services

Subject Code	MATH 1304
Course Title	Introduction to Probability and Statistic
Credit hours	3 (2, 1, 0)
Level	1
Pre-Requisite	None
Co-Requisite	None
Catalogue Description	Define the meaning of statistics, data, population, meaning of quantitative variables, levels of measures and sampling methods. Topics included Introduction to Probability and Random events, calculating probability using Venn diagram, Probability rules, Baye's Theorem Mean and Standard Deviation of a Discrete Random Variable, Application to the Random Variables, Mean and Standard Deviation of a Continuous Random Variable, Application to the Continues Random Variables, The mean and The Standard deviation of a Binomial Distribution, The Standard Normal Distribution, Concepts of simple linear correlation and linear regression.

2. Level

Subject Code	CSC 1301
Course Title	Principles of Programming and Algorithms
Credit hours	3 (2, 0, 2)
Level	2
Pre-Requisite	CIT 1301 - Computer Skills
Co-Requisite	None
Catalogue Description	This course helps the students understand how to develop algorithmic solutions for simple problems and represent them formally. Topics included Introduction to programming and algorithms, Algorithms, flowcharts and pseudocode, Concepts of datatypes, Concepts of control structures, Java overview, Java data types, Java operators, Java control structures, Java classes, Java methods, Java file I/O

Subject Code	CIS 1302
Course Title	Introduction to Database
Credit hours	3 (2, 0, 2)
Level	2
Pre-Requisite	CIT 1301 - Computer Skills
Co-Requisite	None
Catalogue Description	This course covers a wide array of topics such as characteristics and advantages of the database management systems, the concepts of database and its architecture, data models, database schemas and instances. Topics included Introduction and Overview, Centralized and client/server Architecture for DBMS, The Relational Data Model and Relational Database Constraints. Introduction to Structured Query Language (SQL), Formal Relational Query. Language (Relational Algebra & Relational Calculus), Conceptual Modeling and Database Design, SQL: Intersect expressions, Union and except expressions, Serious quantification lacking, Disk Storage, Basic File Structures, Normalization, group discussion.

3. Level 3

Subject Code	CSC 2201
Course Title	Computer Science Ethics
Credit hours	2 (2, 0, 0)
Level	3
Pre-Requisite	None
Co-Requisite	None
Catalogue Description	This course helps the students understand the Need for Computer Ethics Training and Historical Milestones. Topics included Ethics Overview, Ethical Principals, Computer Ethics, Evolution of computer ethics issues, Is computer ethics different from other kinds of ethics? The uniqueness of the computer, Computer ethics as a field of professional ethics, Case Studies: E-mail & Spam, the Cyber City Network, Intellectual Property and Changing. Technology, Privacy and Computer Technology, Ethical Hacking, Relevant Laws (Computer Crime, IP, Licensing, Privacy)

Subject Code	CSC 2302
Course Title	Computer Programming 1
Credit hours	3 (2,0,2)
Level	3
Pre-Requisite	CSC 1301 - Principles of Programming and Algorithms
Co-Requisite	None
Catalogue Description	This course covers Object Oriented Programming (OOP); Advantages of OOP over structured programming; Encapsulation; Classes and objects etc. Topics included Fundamental concepts of object oriented (classes, methods, instantiation, communication by message, encapsulation, inheritance, overriding, dynamic dispatch, polymorphism, etc.), Advanced techniques of OOP (exceptions, multithreaded programming, etc.) and other packages (I/O, strings, etc.), Object oriented concepts and tools such as the Unified Modeling Language (UML), Basics of Graphical User Interface (GUI) design using object-oriented programming.

Subject Code	MATH 1302
Course Title	Linear Algebra
Credit hours	3 (2, 1, 0)
Level	3
Pre-Requisite	None
Co-Requisite	None
Catalogue Description	This course introduces: Matrices and their operations., types of matrices. Elementary transformations. Determinants, elementary properties. Inverse of a matrix. Linear systems of equations. Topics included Matrices and their operations, Types of matrices, Elementary transformations, Determinants-elementary properties of determinants, Inverse of a matrix, Rank of matrix, System of Liner Equations, Vector spaces, Linear independence, Finite dimensional spaces, Linear subspaces, Inner product spaces, Linear transformations, Kernel and image of a linear transformation, Eigen values and Eigen vectors of a matrix and of a linear operator mapping.

Subject Code	CNE 2302
Course Title	Digital Logic Design 1
Credit hours	3 (2, 1, 0)
Level	3
Pre-Requisite	PHYS 1401 – Physics 1
Co-Requisite	None
Catalogue Description	This course covers the foundations of the digital logic design process. Topics covered include number systems, Boolean algebra, logic gates, logic simplification, combinational logic circuits: Topics included Number Systems, Operations, and Codes, Logic Gates, Boolean Algebra and Logic Simplification, Combinational Logic Analysis and Implementation, Functions of Combinational Logic, Latches and Flip-Flops, Registers and Counters, Memory and Storage.

Subject Code	CIS 2304
Course Title	System Analysis and Design 1
Credit hours	3 (2, 0, 2)
Level	3
Pre-Requisite	CIS 1302 - Introduction to Database
Co-Requisite	None
Catalogue Description	System analysis and design courses deal with planning the development of information systems through understanding and specifying in detail what a system should do and how the components of the system should be implemented and work together. Topics included Introduction to the Systems Development Life Cycle (SDLC), Project Managements and Scheduling, Requirements Determination, Functional Modelling and Use Cases, Process Modeling, Design and implementation, Data Modeling, System Design, Class and Method Design, Database Design, User Interface Design, Architecture Design.

4. Level 4

Subject Code	CSC 2303
Course Title	Computer Programming II
Credit hours	3 (2,0,2)
Level	4
Pre-Requisite	CSC 2301 - Computer Programming 1
Co-Requisite	None
Catalogue Description	This course covers data processing and analysis using Python. Topics included Basics of Python and data structures, Data collection from files, databases, online repositories and web crawling, Data processing and manipulation using pandas, Numerical computation using Numpy, Data visualization using Matplotib and Seaborn, Data processing on CPUs and GPUs using tensors, Process composition using pipelines

Subject Code	CSC 2304
Course Title	Artificial Intelligence
Credit hours	3(2, 0, 2)
Level	4
Pre-Requisite	CSC 2301 - Computer Programming 1
Co-Requisite	None
Catalogue Description	Artificial Intelligence course concentrates on topics in artificial intelligence, such as Introduction about Artificial Intelligence, Intelligent Agent, Problem solving. Topics included Introduction to AI, Uninformed Search Methods, Informed Search Methods, Adversarial Search, Expectimax Search and utilities, Constraint Satisfaction Problems, Markov decision Process. Reinforcement learning, Swarm Intelligence

Subject Code	CSC 2305
Course Title	Software Engineering
Credit hours	3(2, 0, 2)
Level	4
Pre-Requisite	CIS 2304 – System Analysis and Design 1
Co-Requisite	None
Catalogue Description	Software engineering is the study of applying theory, knowledge, and practice to effectively and efficiently create dependable software systems that meet the needs of customers and users. Topics included Software interaction with various systems including information management, embedded, process control, and communications systems, Different process models, Phases of software lifecycle and its deliverables, Software risks, Key components of a use case, Requirements model for a simple software system, Fundamental techniques used for requirements elicitation, Key components of a data model, Functional and non-functional requirements for a software system, Design principles: coupling and cohesion, and encapsulation., Mechanisms for implementing designs to achieve desired properties such as reliability, efficiency, and robustness, Integration strategies including top-down, bottom-up, and sandwich integration, The process of analyzing and implementing changes to code base developed for a specific project, Program validation and verification, Inspection of medium-size code segments, Types and levels of testing, Techniques for identifying significant test cases for integration, regression and system testing.

Subject Code	MATH 1303
Course Title	Discrete Mathematics
Credit hours	3 (2, 1, 0)
Level	4
Pre-Requisite	None
Co-Requisite	None
Catalogue Description	Fundamentals of Mathematical Logic: Sets and Subsets, Operations on Sets, Prepositional Logic: Matrix and Determinant, Counting. Topics included Fundamentals of Mathematical Logic, Prepositional Logic, Counting, Permutations and Combinations, Number Theory Recursion and Recurrences, Linear Programming, Graphs and Trees.

Subject Code	CNE 3304
Course Title	Computer Networks 1
Credit hours	3 (2, 0, 2)
Level	4
Pre-Requisite	CNE 2302 - Digital Logic Design 1
Co-Requisite	None
Catalogue Description	This course presents an overview of computer networks (types, layered standard models, and protocols). It covers data communication basics, signals basics, performance basics, data encoding, modulation, and transmission media. Topics included Overview of data communications and networking, Physical layer of the internet model TCP/IP, Data link layer of the internet model TCP/IP, Network layer of the internet model TCP/IP, Transport Layer of the Internet model TCP/IP (client/server model, transport protocols, Application Layer of the Internet model TCP/IP (Application layer services, Domain Name System (DNS), Hypertext Transfer Protocol (HTTP)).

Subject Code	CIS 3302
Course Title	Data Structures
Credit hours	3 (2, 0, 2)
Level	4
Pre-Requisite	CSC 2302 - Computer Programming 1
Co-Requisite	None
Catalogue Description	The main objective of this course is to provide students with the basics of data structures. It covers a wide area of topics such as Array, Linked lists, Stacks, Queues, Recursion, Graph and Tree structures. Topics included, Introduction and Overview, Basics of JAVA (Review), Arrays, Lists, Searching (Linear and Binary), Sorting – I, Sorting – II, (Selection Sort, Insertion Sort), Sorting – III, Stacks, Queues, Linked Lists, Trees, Graphs, Inbuilt Data Structure.

5. Level 5

Subject Code	CSC 3301
Course Title	Analysis and Design of Algorithms
Credit hours	3 (2, 0, 2)
Level	5
Pre-Requisite	CIS 3302 - Data Structures
Co-Requisite	None
Catalogue Description	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. Topics included, Introduction, Mathematical Background, Sorting Algorithms, Searching Algorithms, Greedy Approach, Dynamic Programming.

Subject Code	CSC 3302
Course Title	Web Applications Development
Credit hours	3(2,0,2)
Level	5
Pre-Requisite	CNE 3304 – Computer Networks 1
Co-Requisite	None
Catalogue Description	This course provides an introduction of web-development techniques that use HTML, CSS and JavaScript as web development essentials. Topics included, Introduction to course and Visual Studio Code, Introduction to Word Wide Web, Website Development Process, Introduction to HTML-I, Introduction to HTML-II, HTML Tables and Forms, Introduction to CSS – I, Introduction to CSS – II, Introduction to Box Model and Page Layout, Introduction to JavaScript – I, Introduction to JavaScript – II, JavaScript and HTML Documents, Introduction to Web Servers and Configurations, Developing a HTML Application , Deployment of the Web Application and hosting, Git-hub and version control for HTML Websites, Use of Git-hub and Firebase for NoSQL web applications

Subject Code	CSC 3303
Course Title	Machine Learning
Credit hours	3(2,0,2)
Level	5
Pre-Requisite	CSC 2304 - Artificial Intelligence
Co-Requisite	None
Catalogue Description	The aim of this course is to provide students with an introduction to algorithms and techniques of machine learning and its related applications. Topics included, Introduction to machine learning, Data Preparation, Data Preprocessing, Feature Selection, Data Balancing, Evaluation Techniques, Regression Methods, Support Vector Machines, Decision Trees, Clustering Methods, Principal Component Analysis, Ensemble Learning

Subject Code	MATH 1305
Course Title	Numerical Methods
Credit hours	3 (2, 1, 0)
Level	5
Pre-Requisite	MATH 1307 - Calculus 1
Co-Requisite	None
Catalogue Description	Numerical Methods for Solving Nonlinear Equations: Bisection method, fixed point method, Newton's method, secant method, multiple roots, modified Newton's method, rate of convergence (error analysis), Newton's method for solving nonlinear systems. Topics included, Numerical Methods for Solving Nonlinear Equations, Solving Systems of Linear Equations, Interpolation and Polynomial Approximations, Numerical Differentiation and Integration First derivative.

Subject Code	CIS 2303
Course Title	Database Management Systems
Credit hours	3 (2, 0, 2)
Level	5
Pre-Requisite	CIS 1302 - Introduction to Database
Co-Requisite	None
Catalogue Description	This course covers a wide array of topics such as database concepts and database management components and their functions. Topics included, Introduction and Overview, Database System Concepts and Architecture, The Relational Data Model and Relational Database constraints, Structured Query language (SQL), More SQL: Complex Queries, Triggers, Views, and Schema Modification, The Relational Algebra and Relational Calculus, The Enhanced Entity Relationship (EER) Model, Object, Object Relational, and XML: Concepts, Models, Languages, and Standards, Advance on Data Storage and Querying, Query Processing and Optimization, and Database Tuning, Database System Architecture, Presentation & Revision for Final Exam.

Subject Code	CNE 3303
Course Title	Computer Organization and Architecture 1
Credit hours	3 (2, 0, 2)
Level	5
Pre-Requisite	CNE 2302 - Digital Logic Design 1
Co-Requisite	None
Catalogue Description	This course helps the students understand how computers operate under the hood. The course topics are covered at both the architectural and micro-architectural (i.e., organizational) levels. Topics included, Basic concepts and computer performance, Top level view of computer function and interconnection, Memory (cache, internal, and external), Input/Output (programmed, interrupt driven, DMA), Instruction sets (characteristics, addressing modes, and formats), Instruction Pipelining, Superscalar processors, Parallel Processing and Multicore

6. Level 6

Subject Code	CSC 3304
Course Title	Theory of Computation
Credit hours	3 (2, 0, 2)
Level	6
Pre-Requisite	MATH 1303 - Discrete Mathematics
Co-Requisite	None
Catalogue Description	This course is an introduction to the theory of computational complexity and standard complexity classes. Topics included, Mathematical preliminaries, Regular languages, Regular expression, Deterministic and non-deterministic finite automata, Closure properties and pumping lemma, Context free grammar and languages, pushdown automata and pumping lemma, Turing machines, The Church-Turing Thesis, Computability, Decidability and the Halting problem, Complexity, class P and NP

Subject Code	CSC 3305
Course Title	Computer Graphics
Credit hours	3 (2, 0, 2)
Level	6
Pre-Requisite	MATH 1302 - Linear Algebra
Co-Requisite	None
Catalogue Description	This course is a Fundamental principles and techniques of computer graphics. The course covers the basics of going from a scene representation to a raster image using OpenGL. Topics included, Brief overview of computer graphics and architecture, Raster basics, From scene to image, Perspective and projection, affine and projective coordinates, rigid body motions. Object manipulation, concepts from projective geometry, Color perception and color models, local illumination, ambient, diffuse and specular light models. Material properties, Basic ray tracing, direct and indirect illumination, reflection and refraction. Constructive Solid Geometry (CSG), ray tracing CSG models, Object geometry: polygon mesh, implicit surfaces, parametric curves and surfaces, Survey of basic tools and techniques for animation, scientific visualization, and computer-aided design.

Subject Code	CSC 3306
Course Title	Deep Learning
Credit hours	3 (2, 0, 2)
Level	6
Pre-Requisite	CSC 3303 - Machine Learning
Co-Requisite	None
Catalogue Description	In this course Students will learn about the basics of deep neural networks, and their applications to various artificial intelligence tasks. Topics included, Introduction to Deep Learning, Neural Network Representation, Learning the Neural Network, Neural Network Optimization, Network Normalization, Regularization, Convolutional Neural Networks (CNN). Recurrent Neural Networks (RNN), Attention Models, Generative Adversarial Networks (GAN), Case Studies.

Subject Code	CIT 3306
Course Title	Operating Systems
Credit hours	3 (2, 0, 2)
Level	6
Pre-Requisite	CSC 3302 - Data Structures
Co-Requisite	None
Catalogue Description	An operating system is a software program that abstracts hardware and handles resource sharing among computer users. Topics included, Objectives and functions of modern operating systems, Client-server distributed operating systems and single user operating systems, The concept of logical layer, APIs and middleware, Resource usage and management by application software and system software, Kernel and user mode in an operating system, Interrupt processing, Device list and driver I/O queue, Concurrency within an operating system and the mechanisms to achieve it, The run-time problems of the concurrent operation of many separate tasks, States of a task during management of many tasks, Techniques for achieving synchronization in an operating system, State and transition diagrams, Processes, threads, scheduling algorithms and their relationship to application domains, Memory hierarchy and cost-performance trade-offs, Principles of virtual memory; tasks memory-allocation; cache memory; thrashing, Protection and security in an OS; features and limitations of an OS used to provide protection and security, Mechanisms in an OS to control access to resources.

Subject Code	CNE 3305
Course Title	Computer Networks 2
Credit hours	3 (2, 0, 2)
Level	6
Pre-Requisite	CIT 3304 - Computer Networks 1
Co-Requisite	None
Catalogue Description	This course introduces the students to the field of networking and give them competence in networking-based system design. Topics included, Overview of computer networks., Introduction to the Principles of internetworking, Internetworking hardware-Bridging and switching technologies, Virtual LANs and Routing strategies, The network development life cycle, Network analysis and design methodology, Network security design and the structured cabling systems, Traffic flow analysis, network reliability, Network management (SNMP), Network administration.

Subject Code	CIS 3307
Course Title	Information Security
Credit hours	3 (2, 0, 2)
Level	6
Pre-Requisite	CIT 3304 - Computer Networks 1
Co-Requisite	None
Catalogue Description	This course consists of an introduction to information security, types of major computer malware programs and cybersecurity attacks and their impacts. Topics included, what is Information Security, Identification and Authentication, Authorization and Access Control, Auditing and Accountability, Cryptography I, Cryptography II, Operations Security, Human Element Security, Physical Security, Network Security, Operating System Security, Application Security, Laws and Regulations, Information Security Policies

7. Level 7

Subject Code	CSC 4391
Course Title	Graduation Project 1
Credit hours	3 (0, 0, 6)
Level	7
Pre-Requisite	Senior Standing (Achieving 95+ Credit Hours)
Co-Requisite	None
Catalogue Description	The aim objective of the Graduation Project is to ascertain that the students have acquired the skills, knowledge and concepts necessary that need after graduation. Topics included, Discussion and explain the ways of choice graduation project with students, Assign references to students to read about the project after determining the subject of the project, Discussion with students the methods to build the project and Identified tasks and a tentative work plan for project, Theoretical explanation about how to build the project and prepare the report, Open discussion about what has been accomplished over the previous period with students, Final presentation of the graduation project I, Presentation of the graduation project to the Graduate Projects Arbitration Committee.

Subject Code	CSC 4699
Course Title	Cooperative Training
Credit hours	6 (0, 0, 12)
Level	7
Pre-Requisite	Achieving at least 95 Credit Hours
Co-Requisite	None
Catalogue Description	This course provides students with the opportunity to gain hands-on experience in a professional work environment, applying their theoretical knowledge to real-world challenges. Through partnerships with industry, students engage in practical projects, problem-solving, and skill development under the guidance of experienced professionals. This immersive experience enhances technical proficiency, professional communication, and workplace readiness, preparing students for successful careers in computer science and related fields.

8. Level 8

Subject Code	CSC 4301
Course Title	Cryptography
Credit hours	3 (2, 0, 2)
Level	8
Pre-Requisite	CIS 3307 - Information Security
Co-Requisite	None
Catalogue Description	This course provides an introduction to the basic theory and practice of cryptographic techniques used in computer security. Topics included, 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, 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, Public key Cryptography and RSA: principles of public key cryptosystems, The RSA algorithm, Public key Cryptography and RSA: principles of public key cryptosystems, The RSA algorithm, Cryptographic Hash functions: Applications of Cryptographic hash functions, simple hash functions, SHA-3, Digital signatures. Applications in authentication.

Subject Code	CSC 4302
Course Title	Compilers Theory
Credit hours	3 (2, 0, 2)
Level	8
Pre-Requisite	CSC 3304 - Theory of Computation
Co-Requisite	None
Catalogue Description	This course introduces topics include compiler design, lexical analysis, parsing, symbol tables, declaration and storage management, code generation, and optimization techniques. Topics included, Introduction to Compilers, Lexical Analysis, Syntax Analysis and Parsing, Parser Generators, Semantic Analysis, Intermediate Code Generation.

Subject Code	CSC 4303
Course Title	Parallel and Distributed Computing
Credit hours	3(2, 0, 2)
Level	8
Pre-Requisite	CSC 3301 - Analysis and Design of algorithms
Co-Requisite	None
Catalogue Description	This course introduces the different techniques and procedures of Parallel and Distributed System that enable to understand in depth knowledge. Topics included, Introduction to Distributed Systems, architectural models, networking and internetworking, Application Programming Interface: Inter process communication, RMI, Indirect communication, O.S. Support, Distributed objects and components, Distributed Sorting Algorithms, Security Issues and Internet applications with case studies, Introduction to Parallel Processing: parallel decomposition, architecture, communication and Coordination of parallel systems, Parallel Programming Overview, Parallel Sorting algorithms: Rank Sort, Bubble Sort, Odd-Even, Transposition sort, Shear Sort, Merge Sort, Quick Sort, Odd-even Merge Sort.

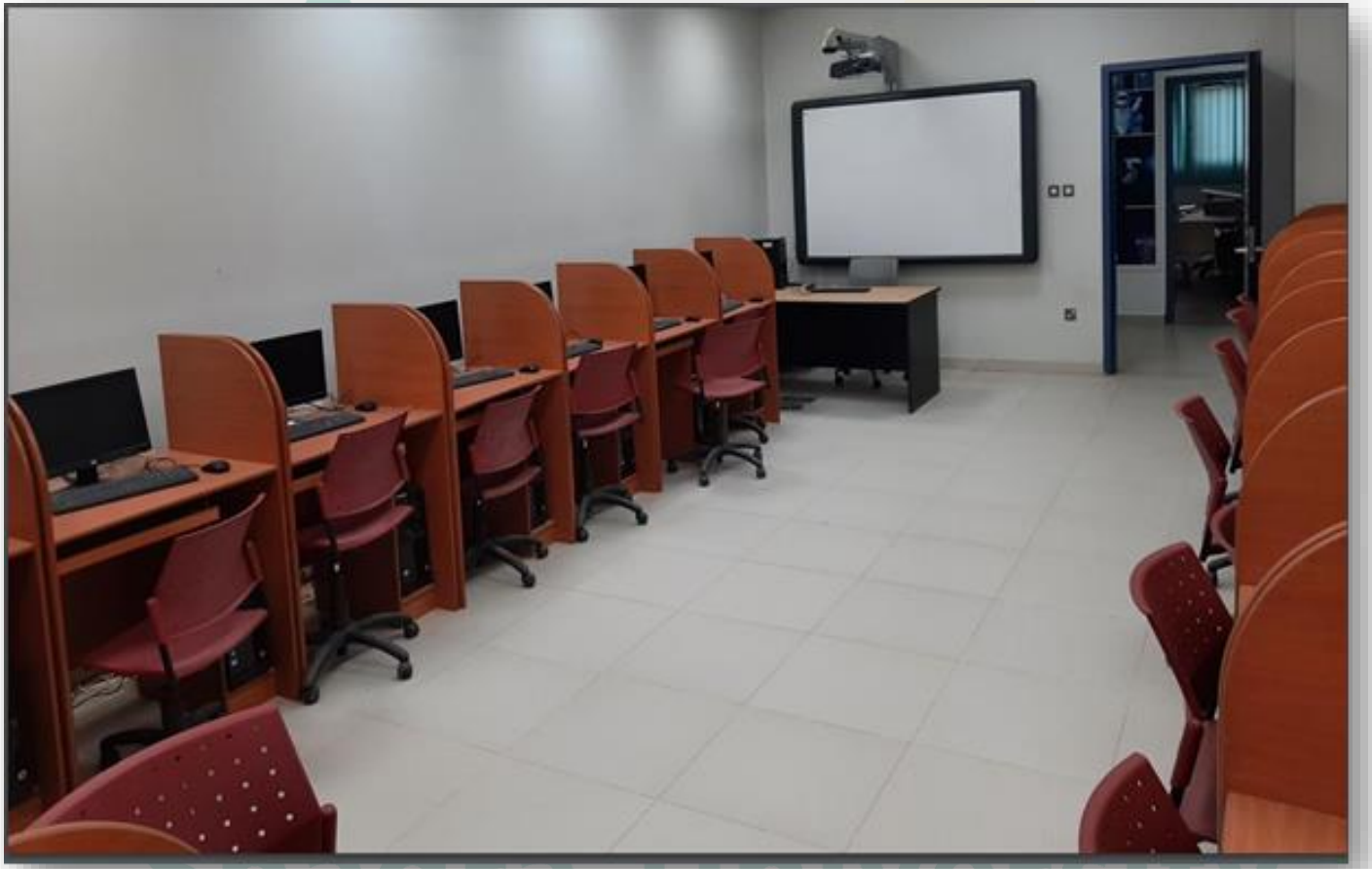
Subject Code	CSC 4304
Course Title	Software Testing
Credit hours	3(2, 0, 2)
Level	8
Pre-Requisite	CSC 2305 - Software Engineering
Co-Requisite	None
Catalogue Description	In this course Students will learn about the necessary skills to get familiar with software testing. Software testing is designed to ensure the delivery of a high-quality software product that meets the needs of its users and stakeholders. Topics included, Foundations of Testing, Testing Throughout the Software Life Cycle, Static techniques, Test Design Techniques, Test Management, Tool Support for Testing.

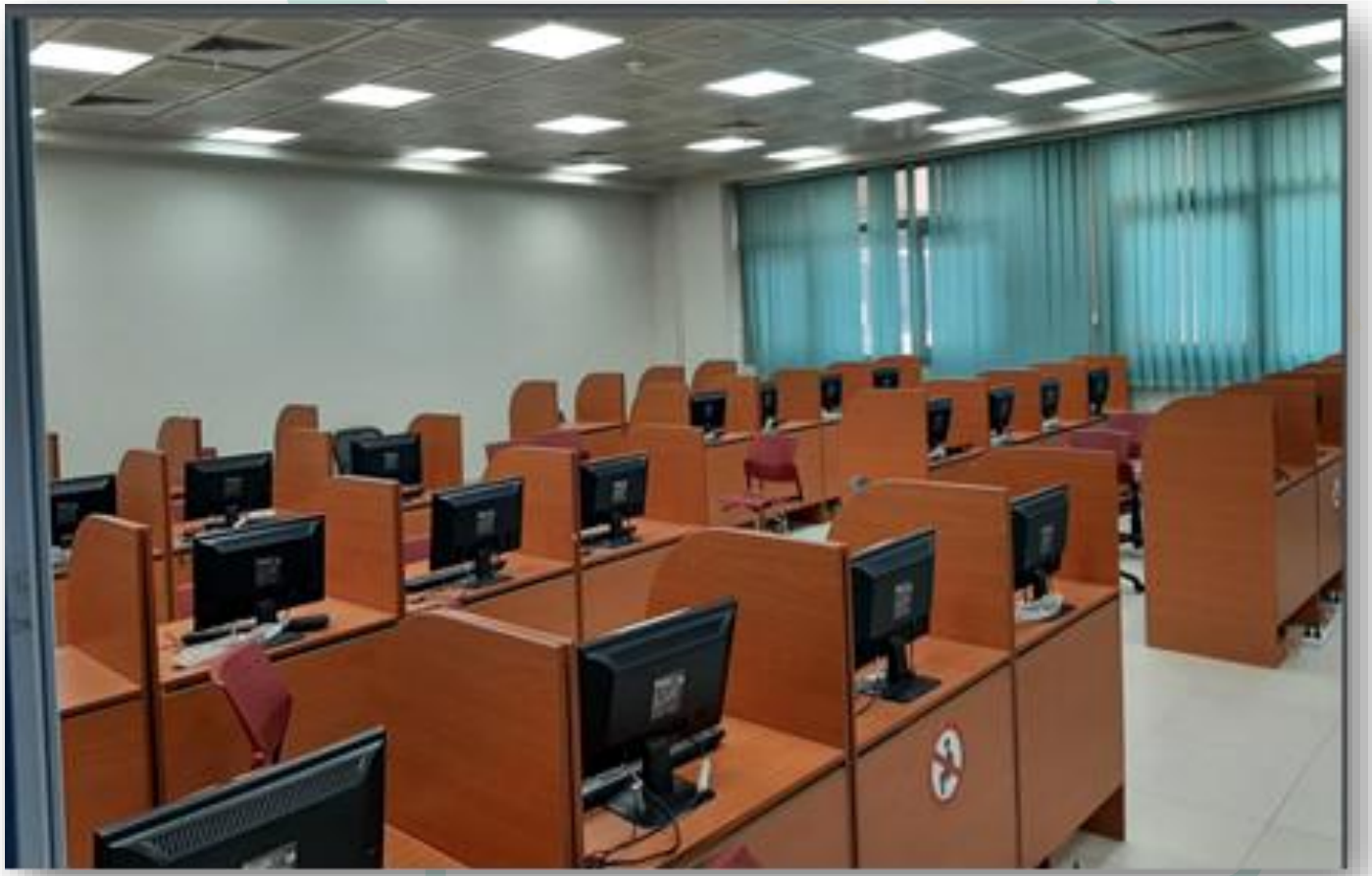
Subject Code	CSC 4392
Course Title	Graduation Project 2
Credit hours	3 (0, 0, 6)
Level	8
Pre-Requisite	CSC 2305 - Software Engineering
Co-Requisite	None
Catalogue Description	The students show their maturity in handling the graduation project (GP) by making significant progress as planned in the GP (1). By the end of the semester, the students should be able to implement and complete their projects successfully. Topics included, Review of Graduation Project 1 design, Project 2 planning and schedule, Programming language review, UI coding review Coding, best practices, Implementation of the project, Back-end implementation; testing, Back-end implementation; documentation, Front-end implementation; testing; documentation, Middle tier implementation; testing; documentation, Function and system testing; documentation, Conclusion and future work , Final report preparation (Including Graduation Project 1), Presentation of the graduation project to the Graduate Projects Arbitration Committee.

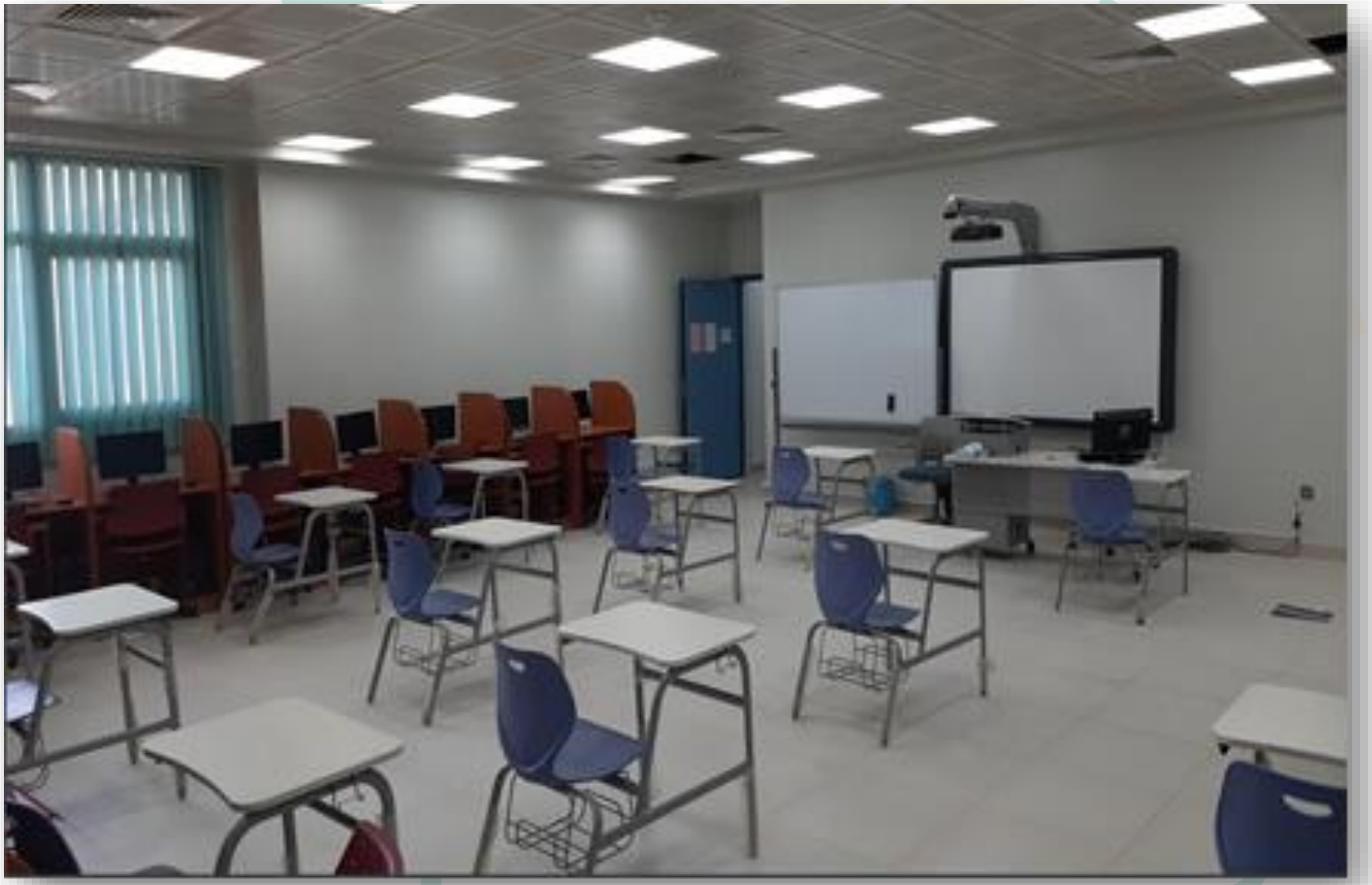
BCS Program Laboratories

The BCS program has a total of 11 computer laboratories (5 in the male section and 6 in the female section). Two of the laboratories (one in each section) contain MAC computers running macOS. The rest of the laboratories contain PCs that run Microsoft Windows. The average capacity of the laboratory is 20 student (or PC).

1. Male Branch Laboratories







2. Female Branch Laboratories