 University of Technology Bahrain	Doc. No.	QR-AAD-018
	Issue No.	01
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College/Department: College of Computer Studies		
BSCS PROGRAMME SPECIFICATION 2022-2023		Page 1 of 29

1. Teaching Institution	University of Technology Bahrain
2. University Department	College of Computer Studies
3. Programme Title	Bachelor of Science in Computer Science (BSCS)
4. Title of Final Award	Bachelor of Science in Computer Science
5. Modes of Attendance offered	Actual classroom learning-interactive
6. National Qualification Framework Level and Credit	NQF Level 8 594 NQF Credits (198 ACS Credits)
7. Accreditation	Computing Accreditation Commission (CAC) - Accreditation Board for Engineering and Technology (ABET)
8. Other external influences	<p>Local External Influences/References Ministry of Education (MOE), Higher Education Council (HEC) National Authority of Qualifications and Quality Assurance for Education and Training (NAQQAET)</p> <p>International External Influences/References Accreditation Board for Engineering and Technology (ABET) Association in Computing Machinerics (ACM) in Computing Bologna Framework</p>
9. Date of production/revision of this specification	September 1, 2022

10. Aims of the Programme

The Computer Science Programme involves the understanding of concepts, principles, applications, and technologies of computing. It focuses on the study of data structures and algorithms, computer architecture, data communications and networking, operating systems, survey of programming languages and techniques in programming. It includes advanced topics in computing, but not limited to human computer interaction, web technologies, data analytics, artificial intelligence, mobile application development, cloud computing, and elective courses.

Programme Educational Objectives:

The objectives of Computer Science programme are to produce graduates who will be able to:

1. Apply knowledge to effectively analyze and assess real life problems to develop economically viable and socially acceptable computing solutions.
2. Demonstrate excellence in professionalism, moral and ethical conduct, interpersonal skills and adaptable communication to prevalent trends in technology and changing technology.
3. Work productively as successful computer professionals in diverse career paths including supportive and leadership roles on multidisciplinary teams or be active in higher studies.

11. Learning Outcomes, Teaching, Learning and Assessment Methods

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
3. Communicate effectively in a variety of professional contexts.
4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
6. Apply computer science theory and software development fundamentals to produce computing-based solutions.

Teaching and Learning Methods

- Active and Engaged Learning- Students are required to attend the sessions regularly. Students learn by doing, writing, and solving problems. Active participation of the students' during discussion is expected. Learning is an active process, and as such, students must engage with the course materials, i.e., reading the textbook and other assigned advanced readings.
- Problem-based learning- After each topic, sample problems will be provided to students. Working in groups, students identify what they already know, what they need to know, and how and where to access new information that may lead to resolution of the problem.
- Collaborative learning- Students will be divided into groups with at least three (3) members and each group will be provided with problems or projects that they will work on together to search for understanding, meaning, or solutions Each group is expected to work together in solving Computing problems, discuss the algorithm of the problems, and present the solution in class.
- Discovery-based learning- Students will be given experiments to work on in groups where they can apply the theories and principles learned. This is an opportunity to have hands-on experience and maximize their learning through actual simulation.
- Research-based learning- This learning methodology develops the students' research skills as well as presentation skills. It provides an opportunity for critical thinking and broadens the theoretical knowledge in the lecture component of the class. It requires students to undertake capstone research and inquiry projects.
- Experiential learning- Engaging students to hands on experience which attempts to apply theories and knowledge learned in the classroom to real-world situations.

Assessment Methods

- Assessment is done independently for each course. Variety of assessment tools will be used to assess achievement of intended learning outcomes including but not limited to: written examinations, assignments, case analysis, written reports, software demonstration and

computer program/ software development project/programming exercises, presentations, projects and thesis.

12. Programme Structure

Bachelor of Science in Computer Science (BSCS)
Curriculum Plan Effective SY 2022-2023

FOUNDATION COURSES

COURSE CODE	COURSE TITLE	LEC	LAB	CREDIT UNITS	PRE-REQUISITES
ENGL501	Speaking and Listening	9	0	0	
ENGL504	Grammar and Vocabulary	9	0	0	
MATH510	Remedial Mathematics	5	0	0	

FIRSTYEAR

FIRSTTRIMESTER

COURSE CODE	COURSE TITLE	LEC	LAB	CREDIT UNITS	PRE-REQUISITES
CSCI617	Introduction to Computing	2	2	3	
ENGL611	English Communication Skills 1	3	0	3	
ARAB600	Arabic Language	3	0	3	
EUTH500	Euthenics	1	0	0	
MATH631	Calculus 1	5	0	5	
HIST600	History of Bahrain and GCC Region	3	0	3	
Total Units				17	

SECONDRIMESTER

COURSE CODE	COURSE TITLE	LEC	LAB	CREDIT UNITS	PRE-REQUISITES
CSCI626	Ethics for Computing	2	0	2	CSCI617
CSCI627	Computer Programming 1	2	2	3	CSCI617
ENGL621	English Communication Skills 2	3	0	3	ENGL611
HUMR600	Human Rights	3	0	3	
CHEM611	General Chemistry	2	2	3	
MATH711	Calculus 2	5	0	5	MATH623
Total Units				19	

THIRDTRIMESTER

COURSE CODE	COURSE TITLE	LEC	LAB	CREDIT UNITS	PRE-REQUISITES
CSCI628	Multimedia Development	2	2	3	CSCI617
CSCI638	Digital logic Design	2	2	3	MATH622
CSCI639	Computer Programming 2	2	2	3	CSCI627
ENGL631	Speech and Oral Communication	2	2	3	ENGL621

MATH622	Discrete Mathematics	3	0	3	MATH611
PHYS631	University Physics 1	2	2	3	MATH631
Total Units				18	

SECOND YEAR**FIRSTTRIMESTER**

COURSE CODE	COURSE TITLE	LEC	LAB	CREDIT UNITS	PRE-REQUISITES
CSCI711	Data Structures	2	2	3	CSCI639
CSCI712	Green Computing	3	0	3	CSCI617
ENGL711	Technical Writing	3	0	3	ENGL621
ACCT600	Introduction to Financial Accounting	2	2	3	MATH631
MATH722	Advanced Mathematics	2	2	3	MATH711
PHYS711	University Physics 2	2	2	3	PHYS711
Total Units				18	

SECONDRIMESTER

COURSE CODE	COURSE TITLE	LEC	LAB	CREDIT UNITS	PRE-REQUISITES
CSCI721	Object-Oriented Programming	2	2	3	CSCI711
CSCI722	Database Management Systems 1	2	2	3	CSCI711
CSCI723	Computer Organization and Architecture	2	2	3	CSCI638
CSCI724	Web Technologies 1	2	2	3	CSCI639
CSCI725	Introduction to Data Science	2	2	3	CSCI711
MATH621	Probability and Statistics	3	0	3	MATH622
Total Units				18	

THIRDTRIMESTER

COURSE CODE	COURSE TITLE	LEC	LAB	CREDIT UNITS	PRE-REQUISITES
CSCI731	Computer Networks 1	2	2	3	CSCI723
CSCI732	Database Management Systems 2	2	2	3	CSCI722
CSCI733	System Analysis and Design	2	2	3	CSCI722
CSCI734	Algorithm Analysis and Design	3	0	3	CSCI711
CSCI735	Automata and Formal Languages	3	0	3	MATH622
MATH732	Numerical Methods and Analysis	2	2	3	MATH621
Total Units				18	

THIRDYEAR**FIRSTTRIMESTER**

COURSE CODE	COURSE TITLE	LEC	LAB	CREDIT UNITS	PRE-REQUISITES
CSCI811	Computer Graphics	2	2	3	CSCI721
CSCI812	Operating System	2	2	3	CSCI723
CSCI813	Computer Networks 2	2	2	3	CSCI731
CSCI814	Visual Programming	2	2	3	CSCI733
CSCI815	Fundamentals of Cryptography	2	2	3	CSCI731
MATH733	Linear Algebra	2	2	3	MATH732
Total Units				18	

SECOND TRIMESTER

COURSE CODE	COURSE TITLE	LEC	LAB	CREDIT UNITS	PRE-REQUISITES
CSCI821	Theory of Programming Languages	2	2	3	CSCI732
CSCI822	Statistical Analysis and Data Mining	2	2	3	CSCI732
CSCI823	Software Engineering	2	2	3	CSCI733
CSCI824	Web Technologies 2	2	2	3	CSCI724
CSCI825	Human Computer Interaction	3	0	3	CSCI733
MATH821	Optimization Methods	3	0	3	MATH732
Total Units				18	

THIRD TRIMESTER

COURSE CODE	COURSE TITLE	LEC	LAB	CREDIT UNITS	PRE-REQUISITES
CSCI831	Software Quality Assurance	3	0	3	CSCI733
CSCI832	Parallel and Distributed Computing	2	2	3	CSCI813
CSCI833	Software Project Management	2	2	3	CSCI733
CSCI834	Cyber Security	2	2	3	CSCI813
CSCI835	Cloud Computing	2	2	3	CSCI813
CSCI880	Elective 1	2	2	3	CSCI825, CSCI813
Total Units				18	

FOURTH YEAR**FIRST TRIMESTER**

COURSE CODE	COURSE TITLE	LEC	LAB	CREDIT UNITS	PRE-REQUISITES
CSCI841	Mobile Application Development	2	2	3	CSCI825
CSCI842	Internship	0	0	6	CSCI833
CSCI843	Software Project A	3	0	3	CSCI833
CSCI844	Ethical Hacking	2	2	3	CSCI813
CSCI881	Free Elective	3	0	3	

Total Units	18
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SECOND TRIMESTER

COURSE CODE	COURSE TITLE	LEC	LAB	CREDIT UNITS	PRE-REQUISITES
CSCI851	Big data Analytics	2	2	3	CSCI823
CSCI852	Artificial Intelligence and Machine Learning	2	2	3	CSCI821
CSCI853	Software Project B	0	6	3	CSCI843
CSCI854	Special Topics in Computing	3	0	3	CSCI835
CSCI855	Technopreneurship	3	0	3	CSCI824
CSCI882	Elective 2	2	2	3	CSCI833, CSCI831
Total Units				18	
Grand Total				198	

LIST OF ELECTIVES**Software Expertise in Computer Science**

COURSE CODE	COURSE TITLE	LEC	LAB	CREDIT UNITS	PRE-REQUISITES
CSCI880a	AR VR Tech	2	2	3	CSCI825, CSCI813
CSCI880b	Software Analysis and Testing Tools	2	2	3	
CSCI880c	Embedded System	2	2	3	

Emerging Trends in Computer Science

COURSE CODE	COURSE TITLE	LEC	LAB	CREDIT UNITS	PRE-REQUISITES
CSCI882a	Internet of Things	2	2	3	CSCI834, CSCI831
CSCI882b	Wireless and Mobile Networks	2	2	3	
CSCI882c	E-Commerce Infrastructure And Application	3	0	3	

13. Awards and Credits

Degree/ Certificate Awarded	Bachelor's Degree
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Total Units for Degree	198
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Total Trimesters Completed	11
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14. Personal Development Planning

- Conduct in-house trainings and seminars on current trends in computing, particularly on Cloud Computing, Artificial Intelligence, Data Analytics, Mobile Application Development etc.

2. Send faculty members to local and international conferences, seminars and trainings related to their field of specialization.
3. Support faculty members to conduct research projects aligned to college research thrusts and priorities.
4. Establish partnerships and linkages where research collaborations can be made.
5. Encourage research publication and dissemination through participation in international research conferences and fora.

15. Admission Criteria

Admission to University of Technology Bahrain (UTB) is open to all qualified applicants.

Criteria for Admission to the University

Acceptance to the University depends on the following criteria:

Admissions Criteria for Undergraduate Students

A. For First Year Undergraduate Applicants

Acceptance to the University depends on the following admissions requirements:

1. Completely filled out an admission application form.
2. Minimum secondary school scores 60% or its equivalent.
3. UTB Placement Test (Oxford Online Placement Test (OOPT)) result.
4. Submission of all required documents stated in the Admissions Policy.

To be admitted to any undergraduate programme, the applicant must satisfy the minimum secondary school grades or its equivalent without the need to take the UTB placement test and foundation classes of English, and Math, as shown in the following table:

Subtest Component for Bahraini, KSA, Kuwait, Qatar, Yemen, Switzerland, USA, and Ecuador Qualification		Programme		
		BSME, BSEnE, BSIT, BSBI, BSAF	BSIE, BSCS	BSIB
Mathematics	Science/ Technical/General Track	At least 70% or C	At least 70% or C	At least 60% or D
	Literature and Islamic Tracks	At least 71 or B1	All must undergo remedial Mathematics	At least 41 or C2
Science		60	60	N/A
English		At least 80 or B	At least 80 or B	At least 80 or B

Subtest Component for Other Qualification (Indian, Pakistan, and West African)		Programme		
		BSME, BSEnE, BSITm BSBI, BSAF	BSCS, BSIE	BSIB
Mathematics	Science/ Technical/Gen eral Track	At least 51 or C1	At least 51 or C1	At least 41 or C2
	Literature and Islamic Tracks	At least 71 or B1	All must undergo remedial Mathematics	At least 41 or C2
Science		60	60	N/A
English		At least 71 or B1	At least 71 or B1	At least 71 or B1

*Note: Science component is subject to the evaluation of the Dean.

For the undergraduate applicant who did not meet the minimum required secondary school grades in Mathematics, Science and English or its equivalent, his/her admissions depends on the following criteria:

Programme	Secondary School Grade	Placement Test in English (OOPT)	Remarks
All Programmes	60-79 % grade in English	Score \geq 55 %	No need for remediation in English
		Score < 55 %	Remediation in English
Engineering BSIE And Computing BSCS	Mathematics: Literature and Islamic Tracks	N/A	Remediation in Math
Engineering (BSME, BSEnE), Computing	For Commercial Track: Score 60-79% in Math For Scientific and technical Track:	N/A	Remediation in Math

(BSIT) Business (BSBI, BSAF)	Score 60-69% in Math		
	For Science score <60%	N/A	Tutorial class in general sciences
International Business	Score <60% in Math	N/A	Remediation in Math
All Programmes	CGPA < 60% for Bahraini and KSA CGPA < 41% for Indian and Pakistan	N/A	Will be subjected to 5% admission rule of UTB (As explained under note)

*This is applicable to Bahraini and similarly equivalent qualification.

a. Secondary Grade in English

A qualified applicant for all programmes whose secondary school grade in English is within 60-79%, needs to take the placement test in English (OOPT). If the OOPT test result is 55 or above, applicant will not take foundation course in English. However, if the result is lower than 55%, applicant will take foundation course in English.

b. TOEFL/IELTS

Qualified applicant who attains the score of at least 500 (173 CBT, 61 iBT) for TOEFL, or with a score of 5.5 for IELTS, is exempted to sit the required English placement test.

c. Secondary Grade in Math

A qualified applicant for Engineering (BSME, BSEnE), Computing (BSIT) or Business (BSBI, BASF) programme who has a secondary grade score 60-79% for commercial track and 60-69% for scientific and technical tracks and lower than 60% for the International Business programme has to take the remediation course in Math.

For BSIE and BSCS all admitted applicants from Literature and Islamic Tracks and 60-69% for scientific and technical tracks will be required to take remediation in Mathematics (MATH301).

Note: UTB can accept new students equivalent to 5% of the total enrollment where student applicant has a CGPA below 60% but not lower than 50% from Bahraini Schools; below 41% but not lower than 33% from Indian and Pakistan Schools; and for other non-Bahrain based Schools, it will be based on the passing mark of the school. The 5% is subject to strict evaluation by the dean and the applicant's score in the OOPT and the secondary school grades.

d. Secondary Grade in Science

A qualified applicant for Engineering (BSIE, BSME, BSEnE), Computing (BSCS, BSIT) or Business (BSBI, BASF) programme who has a secondary grade score in science of lower than 60% has to take tutorial class in general science before taking any university-level science course.

B. For Undergraduate Transfer Student Applicants

Application Requirements:

1. Completely filled out an admission application form
2. Official Transcript of Records (TOR) from the university previously attended. Rules and regulations of the HEC-Bahrain regarding the authentication of foreign certificates and private school certificates are to be applied when necessary.
3. Course description of all completed courses for which transfer credit is sought (authenticated by the originating university)
4. Certificate of Transfer from the university previously attended stamped by MOE, if any.
5. Withdrawal Certificate stamped by MOE
6. Submission of all required documents stated in the admissions policy.
7. The applicant should have a good moral standing from the university from which he/she is transferring.

Admissions Requirements:

- a. For Bahrain and KSA qualifications, the applicant should have at least a secondary school average of 60%. For non-Bahrain secondary qualifications (Indian and Pakistan) the applicant should have at least 41% secondary school average; and for other non-Bahraini qualifications please refer to the table of cut-off.
- b. If the applicant has taken and passed courses in English and Mathematics in the previous university, the applicant will be exempted in taking the foundation courses in both English and Mathematics. The applicant may proceed to mainstream university courses and is eligible to apply for credit transfer.
- c. If the applicant has not taken any courses in English, he/she shall take the OOPT. If the results on the two parts of OOPT results is passed, he will proceed to university English courses, otherwise, he/she will enroll the foundation courses in English where he/she fails.
- d. If the applicant has not taken any course in Mathematics, the basis for evaluation whether foundation course in mathematics is required or not is the score in mathematics subjects in his/her last year in the secondary school certificate using the table presented earlier.

The transfer of course credits is accepted at UTB provided that courses applied for crediting are equivalent to the courses where credit will be transferred. Practicum (Internship) course is eligible for credit transfer with the same practicum (internship) course from other university or re-admitted student from UTB.

The University requires the undergraduate student to complete at least 50% of the required credit units/hours of a programme in residence at UTB. The maximum credit units/hours that are eligible for

transfer credits should not exceed two-thirds (66%) of the required credit units/hours based on his/her original degree from another university.

16. CGPA Requirement for Graduation

The required CGPA for an undergraduate student to be eligible for graduation is 2.0 out of 4.

17. Key Resources of information about the programme

1. Included in the College Catalogue
2. Uploaded on the UTB website

18. Curriculum Skills Map

Year/ Level	Course Code	Course Title	Core (C) or Option (O)	1	2	3	4	5	6
Year 1 1st Tri	CSCI617	Introduction to Computing	(C)	√		√		√	
	ENGL611	English Communication Skills1	(C)			√			
	ARAB600	Arabic Language	(C)				√		
	EUTH500	Euthenics	(C)						
	MATH631	Calculus 1	(C)	√					
	HIST600	History of Bahrain and GCC Region	(C)				√		
Year 1 2nd Tri	CSCI626	Ethics for Computing	(C)			√	√		
	CSCI627	Computer Programming1	(C)	√	√				√
	ENGL621	English Communication Skills2	(C)			√			
	HUMR600	Human Rights	(C)				√		
	CHEM611	General Chemistry	(C)	√				√	
	MATH711	Calculus 2	(C)	√					
Year 1 3rd Tri	CSCI628	Multimedia Development	(C)		√			√	
	CSCI638	Digital logic Design	(C)	√	√				
	CSCI639	Computer Programming2	(C)	√	√				√
	ENGL631	Speech and Oral Communication	(C)			√			
	MATH622	Discrete Mathematics	(C)	√					
	PHYS631	University Physics1	(C)	√					
Year 2	CSCI711	Data Structures	(C)	√	√				√

18. Curriculum Skills Map

Year/ Level	Course Code	Course Title	Core (C) or Option (O)	1	2	3	4	5	6
1st Tri	CSCI712	Green Computing	(C)	√			√	√	
	ENGL711	Technical Writing	(C)			√			
	ACCT600	Introduction to Financial Accounting	(C)	√					
	MATH722	Advanced Mathematics	(C)	√					
	PHYS711	University Physics2	(C)	√					
Year 2 2nd Tri	CSCI721	Object-Oriented Programming	(C)	√	√				√
	CSCI722	Database Management Systems 1	(C)	√	√			√	√
	CSCI723	Computer Organization and Architecture	(C)	√	√				
	CSCI724	Web Technologies 1	(C)	√	√			√	√
	CSCI725	Introduction to Data Science	(C)	√	√				√
	MATH721	Probability and Statistics	(C)	√					
Year 2 3rd Tri	CSCI734	Computer Networks 1	(C)	√	√				√
	CSCI732	Database Management Systems 2	(C)	√	√			√	√
	CSCI733	System Analysis and Design	(C)	√	√	√		√	√
	CSCI731	Algorithm Analysis and Design	(C)	√	√				
	CSCI735	Automata and Formal Languages	(C)	√	√				
	MATH732	Numerical Methods and Analysis	(C)	√					
Year 3 1st Tri	CSCI811	Computer Graphics	(C)	√	√			√	
	CSCI812	Operating System	(C)	√	√				
	CSCI813	Computer Networks 2	(C)	√	√				√
	CSCI814	Visual Programming	(C)	√	√	√		√	√
	CSCI815	Fundamentals of Cryptography	(C)	√	√				
	MATH733	Linear Algebra	(C)	√					
Year 3 2nd Tri	CSCI821	Theory of Programming Languages	(C)	√	√				
	CSCI822	Statistical Analysis and Data Mining	(C)	√				√	√

18. Curriculum Skills Map

Year/ Level	Course Code	Course Title	Core (C) or Option (O)	1	2	3	4	5	6
	CSCI823	Software Engineering	(C)	√	√	√		√	√
	CSCI824	Web Technologies 2	(C)	√	√	√		√	√
	CSCI825	Human Computer Interaction	(E)	√				√	
	MATH821	Optimization Methods	(C)	√	√				
Year 3 3rd Tri	CSCI831	Software Quality Assurance	(C)	√			√	√	
	CSCI832	Parallel and Distributed Computing	(C)	√	√				√
	CSCI833	Software Project Management	(C)	√			√	√	
	CSCI834	Cyber security	(C)	√	√		√		
	CSCI835	Cloud Computing	(C)	√	√			√	
	CSCI880	Elective 1	(E)	√	√	√		√	√
Year 4 1st Tri	CSCI841	Mobile Application Development	(C)	√	√	√		√	√
	CSCI842	Internship	(C)	√	√	√	√	√	√
	CSCI843	Software Project A	(C)	√		√	√	√	
	CSCI844	Ethical Hacking	(C)	√			√		
	CSCI881	Free Elective	(E)	√					
Year 4 2nd Tri	CSCI851	Bigdata Analytics	(C)	√	√	√		√	√
	CSCI852	Artificial Intelligence and Machine Learning	(C)	√		√		√	√
	CSCI853	Software Project B	(C)	√	√	√	√	√	√
	CSCI854	Special Topics in Computing	(C)	√			√	√	
	CSCI855	Technopreneurship	(C)	√		√		√	
	CSCI882	Elective 2	(E)	√	√			√	
ELECTIVES									
	CSCI881a	AR VR Tech	(E)	√	√			√	
	CSCI881b	Software Analysis and Testing Tools	(E)	√	√			√	
	CSCI881c	Embedded System	(E)	√	√			√	
	CSCI882a	Internet of Things	(E)	√	√			√	

18. Curriculum Skills Map

Year/ Level	Course Code	Course Title	Core (C) or Option (O)	1	2	3	4	5	6
	CSCI882b	Wireless and Mobile Network	(E)	√	√			√	
	CSCI882c	E-Commerce Infrastructure And Application	(E)	√	√			√	

19. Course Description

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI617	Introduction to Computing	2	2	3

This course covers a detailed knowledge and understanding of computer hardware and software. It includes the discussion of number systems, networking and the internet and the interdisciplinary science of computing. It also provides a discussion of programme development structures, algorithm and flowchart development. The laboratory delivers practices in Microsoft 365 Apps, configuring web browsers security, configuring E-mail security, configuring OS security.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
ENGL611	English Communication Skills 1	3	0	3

This is an introductory course in English communication designed to provide comprehensive, up-to-date and relevant instruction in the correct use of grammar. It intends to build up students' confidence in communicating their thoughts, ideas, information and messages through the functions and structures of different words, phrases, clauses, sentences, and paragraphs. In addition, the integration of language skills increases their communicative competence and prepares them for the academic and social challenges in college and beyond.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
ARAB600	Arabic Language	3	0	3

The course focuses on the fundamentals of Arabic language, such as reading, analyzing, and critique. It explains the characteristics of the required texts, which deal with different literary genres, prose and poetry. The course also focuses on the understanding and application of grammatical rules and basic morphological methods in Arabic, taking into account the correct spelling skills.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
EUTH500	Euthenics	1	0	0

This course is designed to bring in the policies and procedures in the university, to guide the students in the performance of their respective role and to become adept on ideals needed in their academic pursuit. Thus, students are oriented on the history, vision, mission, values and objectives of the university, the services and academic support available, the academic and non-academic policies, the different misconduct and violations with corresponding penalties in which the learning objectives are better facilitated by various classroom discussion through collaborative teamwork learning experience.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
MATH631	Calculus 1	5	0	5
<p>This is the first calculus course in a series of three calculus courses which deals with conic section, limits, continuity, differentiation and integration, applications of the derivative to determine the shape of the graphs, evaluation of limits by the L'Hopital Rule, finding the maximum and the minimum values of functions including problems of finding rates. The course ends with the introduction of indefinite and definite integrals by parts, u-substitution and application of area problems</p>				
Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
HIST600	History of Bahrain and GCC Region	3	0	3
<p>This Course includes the history of the Kingdom of Bahrain and the Arabian Gulf region. It includes the important events in Bahrain and the Arabian Gulf region and their impact on the current situation. It covers the strategic importance of Bahrain, starting with "Ancient civilizations and passing through" the Islamic era, Bahrain's entry into Islam, Portuguese occupation, competition of powers in the 17th century and the rise of a tribe of Al-Atub. It includes the history of Bahrain under the British protection and the conventions between Bahrain and Great Britain up to British troops leaving the region. It describes the places and persons as well as the historical developments and achievement in Bahrain during the time of Al- Khalifah. It includes independence of Bahrain, issuing of the first constitutional law, reform project by His Majesty King Hamad, constitutional amendments, establishment of GCC, history of Arab Gulf states. It makes the student able to present his patriotic character through historical discussions.</p>				
Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI627	Computer Programming 1	2	2	3
<p>This course covers detailed knowledge in problem solving and algorithm development, with emphases on developing good programming habits, and programming in a modern computer language. The course familiarizes the students with the features of object-oriented programming and its applications to solve the problems. It includes a discussion of an overview of the Java language syntax, including packages, classes, methods, variables, conditional statements, and control flow. The laboratory focuses on the implementation of the programming theories and concepts in Java programming language.</p>				
Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI628	Multimedia Development	2	2	3
<p>This course provides detailed information and some advanced necessary skills on multimedia development and delivery. The course familiarizes the students with the components of multimedia, its applications, underlying techniques of incorporating multiple media, compression and sharing. Students will learn to apply the art of visual communication using multimedia technologies. The laboratory focuses on training the students to implement the theoretical knowledge that they have gained in lecture along with their creativity using any multimedia software.</p>				
Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
ENGL621	English Communication Skills 2	3	0	3

This is an intermediate course in English communication geared towards equipping the college students with writing skills in preparation for academic writing. It progresses from familiarizing the sentence conventions to balancing the structures of the sentence for variation and rhythm. Further, it enables students to follow the principles that govern the composition writing in achieving unity, coherence, and emphasis; to improve their expository, descriptive, narrative and argumentative works and to get hold of the discipline in academic writing for future advantages by providing them the opportunity in adhering the process of writing for effective communication.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
HUMR600	Human Rights	3	0	3

This course makes the students able to know the background, main concepts of Human Rights and the philosophical thoughts and Islamic view which contribute in modern Human Rights. It makes them able to analyze what is mentioned in different kinds of Human Rights sources as Universal Declaration of Human Rights, International Covenant on Civil and Political Rights and International Covenant on Economic, Social and Cultural Rights. It deals in the same approach with the National Sources of Human Rights such as the Constitutional Law of Kingdom of Bahrain and National Action Charter with applications as well. The course makes the students able to analyze, discuss and debate Human Rights issues in different ways.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CHEM611	General Chemistry	2	2	3

This course demonstrates atomic theories, relationships between structure and properties of matter, scientific notation, density calculation, Atomic structure and energy levels, periodic table, ions formation and chemical bonding, chemical reactions and emphasizing the chemical change, balancing equation, Discussion on gas law includes properties and application of gas laws, Acids and bases, solution and clarification of acid – base concept

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
MATH622	Discrete Mathematics	3	0	3

This course introduces fundamental concepts and techniques in set theory in preparation for its many applications in computer science. Topics include propositions, predicates, proofs, sets, relations, functions, graphs and trees. It simplifies and evaluates basic logic statements including compound statements, implications, inverses, converses, and contrapositives using truth table and the properties of logic.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI626	Ethics for Computing	2	0	2

This course provides exploration and analysis of a broad range of topics regarding the ethical implications of widespread use of computer technology. Topics include socio-technical computer ethics, ethics and information technology, ethics in IT configured societies, information flow privacy and surveillance, digital intellectual property, and professional ethics in computing.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI638	Digital logic Design	2	2	3

This course focuses on the concept of digital design and provides an overview of the principles underlying coding systems, logic gates, digital circuits, Boolean function and Boolean algebra. It extends to the

combinational logic circuits which comprise Encoder, Decoder and Multiplexer and sequential logic circuits include Latches, flip-flops, registers and counters.

The laboratory consists of hands-on assignments on Logic Gate Designer Simulation to illustrate concepts discussed in the class and to give students the opportunity to build and test real systems.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI639	Computer Programming 2	2	2	3

This course covers object-oriented techniques using modern fourth generation language. Topics include arrays, recursion, exception handling, inheritance and polymorphism, file handling, and basic applets, strings, GUI, Java events.

The laboratory focuses on the implementation of the programming theories and concepts in Java programming language

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
ENGL631	Speech and Oral Communication	2	2	3

This is a developmental course in English communication geared towards competent, efficient, and effective interpersonal speaking across communicative contexts. It refines oral communication skills through accurate articulation of segmental phonemes, pronunciation drills and enunciation of the suprasegmental features of speech, specifically sentential stress, and intonation. Further, it incorporates the mechanics and techniques of speech craft and delivery with emphases on practical speaking experiences and analysis of audience psychology, which are deemed applicable in diverse speech situations.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
MATH711	Calculus 2	5	0	5

This is the second course from a sequence of three calculus courses. The course is an enhancement on the topics taught in Calculus I, which contained primarily on the applications of integration such as calculating volumes, lengths of curves and surface area, the techniques of integration of various functions, and proper and improper integrals. It also deals with sequences, series and their convergence, powers series and their convergence including differentiating and integrating power series. The course ends with the topics on the introduction of polar coordinate system, polar curves and some basic polar calculus.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
PHYS711	University Physics 1	2	2	3

This course is designed to explore the concepts of motion using vectors and other mathematical models and their advanced application, such as the application of Newton's laws of motion, projectile motion, work, energy, momentum and impulse, rotational dynamics, equilibrium of a rigid body, and periodic motion.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI711	Data Structures	2	2	3

This course covers advanced problem solving in linear and non-linear data structures and their implementation. Topics include arrays, sorting and searching techniques, stacks, queues, linked lists, trees

and hash tables. In addition, it covers various strategies for choosing appropriate structures according to the system requirements.

The laboratory portion covers the implementation of linear data structures such as stacks and queues and nonlinear data structure like trees and graphs using array and linked list.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI712	Green Computing	3	0	3

This course empowers students to reduce energy use, waste, and other environmental impacts of IT systems while reducing life cycle costs, thereby improving competitive advantage. Students learn how to measure computer power usage, minimize power usage, procure sustainable hardware, design green data centers, recycle computer equipment, configure computers to minimize power, use virtualization to reduce the number of servers, and other green technologies. Students also learn how to make green IT an integral part of organizational culture and planning, to foster long term sustainable information technology.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
ENGL711	Technical Writing	3	0	3

This is an advanced course in English academic writing designed to deal with the application of the technical writing principles with the correspondence on business, science, and technology. It aims to develop the technical writing skills and communication of the college students thru the discussions of its elements and ethics with the use of digital technologies. Furthermore, it enables students to adapt the various communication routes in the workplace, to conceptualize suitable contents of technical writing, to understand the characteristics and other methods of communication techniques, to plan and organize advanced level tasks and to work effectively and with accountability with other team members in a creative and productive manner, in any language learning scenario when achieving personal and group outcomes.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
ACCT600	Introduction to Financial Accounting	2	2	3

Financial accounting examines accounting concepts, the accounting model, measurement processes, financial statements, financial analysis, monetary and fixed assets, inventory, current and long-term liabilities and equity structures of partnerships, proprietorships, and corporations.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
MATH722	Advanced Mathematics	2	2	3

This course deals with the study of complex numbers, series solutions of ordinary differential equations by power series, Bessel Function, Frobenius method. Basics of Fourier series, Fourier transform, Laplace, and inverse Laplace Transforms. Using MATLAB or other mathematical software in order to solve mathematical problems

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
PHYS722	University Physics 2	2	2	3

This course is designed to explore the concepts of electricity and magnetism using the concepts of mechanics, vectors, and other mathematical models and their advanced application, such as application of Coulomb's law, Gauss's law, Ohm's law, Kirchoff's laws, electric potential and potential difference, basic

circuits, series and parallel circuits and combinations, magnetic field and flux, induced EMF, and applications such as electric motors and basic AC electric generators.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI721	Object Oriented Programming	2	2	3

This course covers the advanced concepts of object-oriented programming such as abstraction, inheritance, polymorphism, and Encapsulation. Topics also include functions, pointers, overloading operators, templates, exceptions handling and Input Output streams for programming applications.

The laboratory focuses on training the students with hands-on experience on Object Oriented Concepts.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI722	Database Management System 1	2	2	3

This course provides advanced core theories and practical skills in the databases and database management systems with information technology applications. The theoretical knowledge covers Database Environment, Relational Model, Database Operations, Structured Query Language, Entity Relationship Model and Normalization. It exposes the student to the advance concepts and techniques in database and development as well provides a foundation for research in databases.

The laboratory practices the Data Definition Language (DDL) Commands, Data Manipulation Language (DML) Commands, Data Query Language (DQL) Commands, Transaction Control Language (TCL) Commands, SQL Built-in Functions, Constraints, Joins, GroupBy Command, Subqueries and Database Objects.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI723	Computer Organization and Architecture	2	2	3

This course integrates the advanced theoretical and practical skills in the system components and technological improvements in processor, memory, bus and I/O operations. It also includes the discussion on operations of cache and main memory, I/O operations, bus controls, I/O interrupts and interfaces, I/O devices and characteristics. It provides the design of various computer systems and its programming languages. It also explains the internal organization of a computer system and interrupts operations through Assembly language instruction.

Through laboratory and in-course project, the students will creatively implement complex applications of microprocessor-based systems using Assembly language

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI724	Web Technologies 1	2	2	3

This course is an overview of the modern Web technologies used for Web Development focusing on the technologies, protocols and architectures of the Internet. The topics include History of the Web, Hypertext Markup Language (HTML), Extensible HTML (XHTML), Cascading Style Sheets (CSS), and JavaScript, technology used in web services (WSDL, SOAP, UDDI). In the lab, students are taught in practice how to design web applications using HTML, XHTML, CSS, JavaScript and web services.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI725	Introduction to Data Science	2	2	3

This course utilizes several open-source tools to address big data challenges, taking an “Open” or technology-neutral approach. It covers concepts, and techniques needed to deal with various aspects of data science practice, including data collection, cleansing, mangling, and integration, exploratory data analysis, predictive modeling, descriptive modeling, data product creation, machine learning algorithms, evaluation, effective communication and Data Visualization.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
MATH621	Probability and Statistics	3	0	3

This course provides a demonstration of the main concepts of probability and statistics with applications. IT also covers identifying the theorem of probability and linked with real life problems. How to differentiate between the combination and permutation, explain how to find the mean and variance from the moment generating function. Explain and interpret the findings from different hypothesis tests for decision making. Finally, SPSS will be used to run the statistical measures (e.g. hypothesis tests and regression model)

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI731	Computer Networks 1	2	2	3

This course integrates the core theories, principles, concepts, structure, functions and components of the Internet and computer networks. The OSI and TCP/IP models are used to examine the services and the associated protocols in each layer. The concepts and structure of IPv4 addressing and subnetting, its application, operation and implementation to networks are discussed.

The laboratory part makes use of a range of approaches including the Packet Tracer and GNS3 to allow students to implement static routing and critically analyze network requirements, issues and/or problems. These simulators will allow the students to build networks, use appropriate devices and IP addresses, and perform configurations

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI732	Database Management System 2	2	2	3

This course covers advanced and critical issues of database management systems. Topics include storage systems, transaction management, concurrency control, database architecture, Blockchain databases and database administration.

The laboratory focuses on training the students with hands-on experience with advanced PL/SQL using Oracle. Moreover, it focuses on administrative level commands.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI733	System analysis and Design	2	2	3

The course describes the concepts and methods used in the analysis and design of computer-based information systems. It includes the discussion of typical computer systems life cycles, system requirements and specification, feasibility concerns, system design, fault tolerance, people and interface issues, compliance with ethical and legal standards and quality issues.

The laboratory focuses on training the students with hands-on experience on using UML using various tools

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSC734	Algorithm Analysis and Design	3	0	3

This course introduces advanced techniques to support the design and analysis of algorithms, focusing on practical considerations of efficiency. Topics include the mathematical tools such as recurrence relations and asymptotic bounds that are necessary for the analysis of algorithm's Time and Space complexity. The various algorithmic design strategies like Brute Force algorithm, Greedy, Divide and Conquer and Dynamic Programming with applications on fundamental computing problems like sorting, searching, decision and optimization.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI735	Automata and Formal Languages	3	0	3

This course covers the advanced concept of computability and mathematical models, such as finite automata, grammars and Turing machines, and the relations between these models. The topics include detailed concepts in automata theory and formal languages including grammar, finite automaton, regular expression, formal language, pushdown automaton and Turing machine.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
MATH732	Numerical Methods and Analysis	2	2	3

This course demonstrates critical knowledge and understanding of specialist theories, principles, and concepts of the study of numerical approximations and errors, numerical solutions of non-linear equations, interpolation and curve fittings, numerical differentiation and integration. The course also covers analysis of accuracy of numerical differentiation and integration methods and solution of initial value problems using Euler Method. Analysis of accuracy of Euler's method. The course also includes laboratory components that make use of MATLAB as tool in solving problems in Numerical Analysis.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI811	Computer Graphics	2	2	3

This course covers the advanced technologies underlying the generation and display of images using computer graphics algorithms. Topics include Geometric primitives its attributes and implementations, 2D and 3D transformations and Viewing and Computer Animation.

The Laboratory focus on providing practical experience by using Graphic tools to understand, realize and implement the concepts, theories and models learnt in the lectures.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI812	Operating System	2	2	3

This course provides advanced and detailed information about the components and functionalities of an operating systems. Topics include operating system structures, process management & scheduling, memory management, virtual memory management, deadlocks, file systems, directory structure, protection, security and distributed operating systems.

In laboratory, the various operating system commands are illustrated using Windows and Linux Operating Systems. scheduling, memory management and page replacement algorithms are implemented using Java.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI813	Computer Networks 2	2	2	3

This course provides an in-depth and advanced discussion of routing technology. It integrates the core theories, concepts, functions, and operations of a router including the principles and applications of routing

protocols. Topics include router components and configuration; Unicast and Multicast routing protocols: RIPv1, RIPv2, EIGRP, OSPF and BGP; VLSM and IPv6. The students make use of a range of approaches including the Packet Tracer, GNS3 and the actual network devices in the laboratory in performing advanced and complex network configurations using the different routing protocols and in the critical analysis of network requirements, issues and/or problems.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI814	Visual Programming	2	2	3

This course discusses advanced skills needed for software development using Visual Programming tools. It includes programs with graphical interfaces, Visual Basic Controls and Dialog Boxes, Decision Structures, Loops, Classes and Objects, Arrays and Collections and Exceptional Handling and Debugging. Moreover, it covers event-driven programming and interaction with databases. The course also provides brief introduction to ASP.Net

The laboratory focuses on training the students with hands-on experience on Visual Studio.Net. The students will gain skills on Visual programming using the Integrated Development Environment (IDE) Visual Studio.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI815	Fundamentals of Cryptography	2	2	3

This course emphasizes systematic authentication to follow the advancement of cryptographic techniques and security protocols. It exposes the various protocols and cryptographic functions to estimate the strength of security using advance encryption/decryption algorithm. It also discusses the security enhancement techniques such as symmetric and asymmetric encryption and key exchange management. In addition, it investigates the various complex security issues and develops a high level security mechanism in contemporary networked computer systems. The laboratory portion implements the complex level conversion of plain text to cipher text using RSA algorithm, Diffie-Hellman-Key-Exchange algorithm and Stream Cipher Technique to embed security in Java. In addition it identifies the suitable cryptographic algorithms for a given problem to resolve security issues.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
MATH733	Linear Algebra	2	2	3

This course use specialist level skills to relate to and adapt main and core theories and concepts in the study of matrices and determinants, and their applications in numerical solutions of systems of linear equations. It also includes important topics such as linear transformations, eigenvalues and eigenvectors, complex vectors and matrices and numerical linear algebra. In the laboratory, MATLAB is use as a mathematical software and solutions to a variety of mathematical problems are determined.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI821	Theory of Programming Languages	2	2	3

This course covers the rigorous comprehensive study of programming languages and the various concepts which will provide students with a strong foundation in different programming languages. The topics includes advance concepts of language paradigms, language design and implementation issues, related to

parallelism. The laboratory focuses on training the students with hands-on experience in three different domains of languages such as various flavors of programming languages.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI822	Statistical Analysis and Data Mining	2	2	3

This course provides an in-depth study of the field of statistical analysis and data mining as it relates to real-world applications. The course explores how the advanced and complex data mining interdisciplinary field brings together techniques from databases, statistics, machine learning, and information retrieval. It covers the field of data mining and includes the topics data preprocessing, predictive modeling, model evaluation techniques, clustering, classification, and association analysis and anomaly detection.

The Laboratory session discusses Weka and R data mining tool and using that perform preprocessing, classifications and clustering based on real word data sets.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI823	Software Engineering	2	2	3

This course demonstrates the advanced concepts in software design paradigms; identify software requirements and use Computer Aided Software Engineering in designing and developing efficient software application. The course covers an in-depth survey of software process, project management, project metrics, project scheduling, risk management, software testing and software quality assurance. The course also covers the implementation of the proposed system using structured programming, software reviews, software testing techniques and strategies, software maintenance.

The laboratory focuses on providing students with hands-on experience using different tools to design a mini project.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI824	Web Technologies 2	2	2	3

This course focuses on dynamic database-driven Web site development. It covers more advanced tools and techniques for designing web sites using current web design and development tools. It also includes client-and-server-side scripting, maintaining persistent information on the Web, user-interface design concepts, client-side and server-side technologies, Web Site Management with Content Management Systems (CMS) and Web databases.

The laboratory focuses on implementing a Web Application using tools such as PHP, MySQL, PostgreSQL, Apache and AJAX.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI825	Human Computer Interaction	3	0	3

The course provides detailed knowledge to the field of human-computer interaction (HCI), an interdisciplinary field that integrates cognitive psychology, design, computer science, and others. Examining the human factors associated with information systems provides the students with the knowledge to understand what influences usability and acceptance of IS. The course examines human performance, components of technology, methods, and techniques used in the design and evaluation of IS. Societal impacts of HCI such as accessibility are also discussed. User-centered design methods are

introduced and evaluated. This course also introduces students to the contemporary technologies used in empirical evaluation methods

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
MATH821	Optimization Methods	3	0	3

The course takes an advanced and unified view of optimization and covers the main areas of application of core optimization algorithms. The topics include linear optimization, robust optimization, network flows, dynamic optimization and non-linear optimization.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI831	Software Quality Assurance	3	0	3

This course discusses advanced concepts of software quality and techniques in software quality assurance, particularly software testing and validation. It presents the in-depth interplay between testing, quality assurance and quality engineering to ensure the quality of the software. This course covers software quality and assurance framework, testing concepts and issues, verification and validation, inspection, software reliability, quality models and measurement and formal methods.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI832	Parallel and Distributed Computing	2	2	3

This course provides an overview of distributed and parallel systems, with special emphasis on cloud-based implementations. Topics include distributed systems and models, computer clusters for scalable parallel computing, virtual machines, cloud platform architecture, service-oriented architectures, grid computing, and peer-to-peer computing.

The Laboratory exercises will be used to demonstrate various aspects of parallel and distributed computing using MS MPI.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI833	Software Project Management	2	2	3

This course focuses on the advanced management and development of software project management techniques and methods. It covers project definition, project scheduling, team management, software measurement and estimation techniques, risk analysis, project management tools and software process models, process measurement, software project planning, cost estimation and scheduling, project management tools, factors influencing productivity and success. Furthermore, it covers the software process standards and process implementation, software contracts and intellectual property and approaches to maintenance and long-term software development.

In the laboratory focuses on training the students with hands-on experience on project management tools

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI834	Cyber security	2	2	3

This course is designed to provide concepts and practices cyber security with sufficient coverage of essential topics required for entry-level cyber security certifications. An effective cyber security defense consists of four distinct challenges: securing the infrastructure, securing devices, securing local networks, and securing the perimeter. Overcoming these challenges requires a detailed understanding of the concepts and practices within each realm. This course covers each challenge individually for greater depth

of information, with real-world scenarios that show what vulnerabilities look like in everyday computing scenarios.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI835	Cloud Computing	2	2	3

This course covers advanced concepts required to build a cloud infrastructure based on a cloud computing reference model. The reference model includes five fundamental layers, namely, physical, virtual, control, and service and three cross-layer functions, namely business continuity, security, and service management for building a Cloud infrastructure. Furthermore, Topics included Cloud infrastructure reference model, resource management, programming models, application models, system characterizations, and implementations, deployment of Cloud computing systems. Moreover, this course takes an open approach to describe concepts and technologies.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI841	Mobile Application Development	2	2	3

This course provides a systematic explanation of advanced concepts in mobile programming and provide an in depth coverage of mobile systems and it application development. It includes the mobile user interface, application development standards and the mobile technology. Moreover, it covers various mobile computing applications using common paradigms in mobile application frameworks and development environments.

The Lab component of the course includes developing apps based on UI widgets, custom views and layouts, notification, toast, menus, dialog, list and data storage using Java and XML in Android Studio.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI842	Internship	0	180	6

This course provides the students with an opportunity to be immersed in the actual work environment along their specialization. The students are required to complete 180 hours on-site training to get hands on experience of working in the industry.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI843	Software Project A	3	0	3

This course provides guideline that will enable the students to effectively prepare a research project in relation to their field of specialization. It deals with the development of the essential ideas, concepts, principles, tools, and skills needed for developing a research project. It includes Research issues, System Analysis, System Design, Project tracking and control of a research project. It make the research proposal, problem statement, literature survey, research methodology of a research project.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI844	Ethical Hacking	2	2	3

This course is designed to provide concepts and practices of cybersecurity with expert coverage of essential topics required for entry-level cybersecurity certifications. It covers the four distinct challenges: securing the infrastructure, securing devices, securing local networks, and securing the perimeter and the concepts and practices to overcome these challenges. This course covers each challenge individually for greater

depth of information, with real-world scenarios that show what vulnerabilities look like in everyday computing scenarios. It will explore the various means that an intruder has available to gain access to computer resources. We will investigate weaknesses by discussing the theoretical background behind, and whenever possible, actually performing the attack. We will then discuss methods to prevent/reduce the vulnerability.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI851	Bigdata Analytics	2	2	3

This course provides fundamental concepts related to big data and analytics. This course will explore the theory and applications of big data and demonstrate the process from data to decisions. Students will learn big data in various formats, data processing platforms and data analytics tools to transform, visualize, model, and communicate the insights hidden in the data, providing end users with timely knowledge to support decision making. The course will explain the challenges organizations are facing with managing big data

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI852	Artificial Intelligence and Machine Learning	2	2	3

This course covers advanced theories and state-of-the-art techniques of artificial intelligence. Artificial intelligence (AI) is a research field that studies how to realize the intelligent human behaviors on computers. The AI is to make a computer that can learn, plan, and solve problems autonomously. The topic includes building blocks and components of artificial intelligence, learning about concepts like algorithms, machine learning, and neural networks.

The laboratory focuses on training the students with building models using various artificial intelligence algorithms.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI853	Software Project B	3	0	3

This course provides opportunity to students to integrate their knowledge by implementing a significant software system as part of a systems development project including proper documentation in a real world environment.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI854	Special Topics in Computing	3	0	3

This course provides theoretical advanced knowledge on current trends, issues and development in the field of Information Technology to make aware the changes in technologies, applications and systems. Topics include High Performance computing, Crypto currency, Block Chain. It exposes the current trends in Emerging technologies like High performance computing elaborate on how crypto currency and Block chain works, and discuss on new trends in Web data Mining.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI855	Technopreneurship	3	0	3

This course is discusses the rapid evolving world on creative new venture in internet marketing. The road to entrepreneurial success is long, winding and strewn with pitfalls, obstacles and blind turns. This course intends to give an understanding of technopreneurship fundamentals. The topics covered include in

information age, developing business plan, financing and marketing business, innovation and creativity, financial management, and products identification. Students will be exposed to various case studies on successful entrepreneurs.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI881A	AR VR Tech	2	2	3

In this course, students will learn & practice about the revolutionary medium of XR. Learn to create immersive experiences that inform, educate, entertain, and change the way we think about industries including Aerospace, Defense, Energy, Healthcare, Manufacturing and more. Students will be introduced to the core fundamentals of XR development engine & software and practical implementations of 3D graphics, OpenGL ES, AR, VR & MR which will prepare them to design and develop immersive XR apps & Solutions. After an introduction to the fundamentals, intermediate concepts will be learned by working through a XR project.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI881B	Software Analysis and Testing Tools	2	2	3

This course covers the Aspects of software development besides programming, such as diagnosing bugs, testing, and debugging, comprise over 50% of the cost of software development. Furthermore topics are covered software maintenance tasks such as debugging, maintaining and testing. Many diverse techniques exist with their own strengths and limitations. Those Techniques as well as imparts hands-on experience with applying them to automate testing, debugging, and finding bugs in complex real-world programs.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI881C	Embedded System	2	2	3


This course will cover the basics of embedded system organization, system on programmable-chip technologies and real-time systems. It provides the advance knowledge required for embedded computer design and development as well as real-time operating systems. Students are introduced to software development concepts applicable to real time and embedded systems

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI882A	Internet of Things	2	2	3

This course discusses the advanced and current leading IoT technologies for building IoT solutions for Smart Homes, Smart Campus etc., using IoT sensor, actuators, and devices. It covers key concepts of IoT (Internet of Things) and challenges related to digital transformation, security and privacy. The course examines the evolution of the Internet and how the interconnection of people, processes, data, and things are transforming every industry.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI882B	Wireless and Mobile Networks	2	2	3

This course examines the characteristics of mobile and wireless networks and the impact of these characteristics on the development of software and supporting protocols. Topics covered include: mobile and wireless application design and development environments, middleware support, protocol requirements for ad-hoc and sensor networks, wireless & mobile security vulnerabilities and standards, supporting reliable communication in lossy and intermittently connected networks; challenges and

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architectures for wireless mobility - 4G networks, Wi-Fi, Wi-Max, Bluetooth, Mobile IP, convergence of voice and data networks.

Course Code	Course Title	Lec. Hrs	Lab. Hrs	Units
CSCI882C	E-Commerce Infrastructure and Application	3	0	3

This course discusses electronic commerce applications, and technologies which are used to conduct business on the World Wide Web. It analyzes the essentials of e-commerce, its infrastructure, current business models in business-to-customers (B2C) and business-to-business (B2B) transactions, security and quality assurance, web site design strategies, payment systems, and various issues--Internet marketing, legal, regulatory, technological, social, and ethical--which relate to electronic business, systems development issues, electronic data interchange, web-based marketing, e-supply chains, e-procurement, e-marketplace, customer relationship management, and web-enabling mobile. The course also allocates hands-on practices covering client-side (front-end) and server-side (back-end) applications in web-based business information systems. E-Business case studies are used to signify the advantages and the challenges related to integrating ecommerce applications.