

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) <i>(from October 1, 2013 until September 30, 2019)</i>
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 Machinery (ACM) in Computing Bologna Framework</p>
9. Date of production/revision of this specification	September 1, 2017
10. Aims of the Programme	
<p>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, data mining, enterprise architecture, artificial intelligence, mobile computing and animation, and elective courses.</p> <p>Graduates of the programme, three (3) to five (5) years after graduation shall be able to:</p> <ol style="list-style-type: none"> 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. 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 (2) 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 particular Computing problems, discuss the algorithm of the problems, and present the solution in class.
- Discovery-based learning. During laboratory hours, students will be given experiments to work 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.

Assessment Methods

- Assessment is through a combination of written examinations (essays, class tests, and homework) and assessed coursework (written reports, software demonstration and computer program/software development project / programming languages), oral presentations and interpersonal communication assessed through group projects.

12. Programme Structure**Bachelor of Science in Computer Science*****Curriculum Plan Effective SY 2017-2018***

REMEDIAL CLASSES

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT UNITS	PRE-REQUISITES
MATH300	Remedial Mathematics	3	0	0	
ENGL301	Speaking and Listening	9	0	0	
ENGL302	Grammar and Vocabulary	9	0	0	

FIRST YEAR

FIRST TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT UNITS	PRE-REQUISITES
ENGL401	English Communication Skills 1	3	0	3	
EUTH400	Euthenics1	1	0	0	
ECON400	Introduction to Economics	3	0	3	
HUMR400	Human Rights	3	0	3	
MATH401	College Algebra	3	0	3	
CHEM400	General Chemistry1	2	2	3	
CSCI411	Introduction to Computing	2	2	3	
Total Units				18	

SECOND TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT UNITS	PRE-REQUISITES
ENGL402	English Communication Skills 2	3	0	3	ENGL401
HIST400	History of Bahrain and GCC Region	3	0	3	
MATH402	Plane and Spherical Trigonometry	3	0	3	MATH401
CHEM401	General Chemistry 2	2	2	3	CHEM400
CSCI421	Computer Programming 1	2	2	3	CSCI411
CSCI423	Digital Design	2	2	3	CSCI411
CSCI424	Web Content Management System	0	2	1	CSCI411
Total Units				19	

THIRD TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT UNITS	PRE-REQUISITES
ENGL403	Speech and Oral Communication	2	2	3	ENGL402
ARAB400A	Arabic Language	3	0	3	
EUTH401	Euthenics2	1	0	0	EUTH400
MATH406	Differential Calculus with Analytic Geometry	5	0	5	MATH401
CSCI431	Computer Programming 2	2	2	3	CSCI421
CSCI433	Multimedia Development	2	2	3	CSCI411
Total Units				17	

SECOND YEAR
FIRST TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT UNITS	PRE-REQUISITES
MATH501	Integral Calculus with Differential Equation	5	0	5	MATH406
MATH503	Discrete Mathematics	3	0	3	MATH401
PHYS501	University Physics1	2	2	3	MATH406
CSCI511	Ethics in Computing	1	0	1	CSCI 411
CSCI512	Data Structures	2	2	3	CSCI431
CSCI513	Introduction to Financial Accounting	3	0	3	ECON400
Total Units				18	

SECOND TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT UNITS	PRE-REQUISITES
ENGL502	Technical Writing	3	0	3	ENGL402
SOCI400	Sociology	3	0	3	
MATH502	Advance Mathematics	3	0	3	MATH501
PHYS502	UniversityPhysics 2	2	2	3	PHYS501
CSCI521	Database Management Systems 1	2	2	3	CSCI512
CSCI522	Computer Organization and Architecture	2	2	3	CSCI423
Total Units				18	

THIRD TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT UNITS	PRE-REQUISITES
MATH409	Probability and Statistics	3	0	3	MATH503
PHYS503	University Physics 3	2	2	3	PHYS502
ENVS400	Environmental Science	3	0	3	CHEM400
CSCI531	Object -Oriented Programming	2	2	3	CSCI512
CSCI532	System Analysis and Design	2	2	3	CSCI521
CSCI533	Data Communications and Networking 1	2	2	3	CSCI423
Total Units				18	

THIRD YEAR
FIRST TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT UNITS	PRE-REQUISITES
MATH 504	Multivariate Calculus	2	2	3	MATH501
CSCI612	Theory of Programming Languages	2	2	3	CSCI531
CSCI613	Data Communications and Networking 2	2	2	3	CSCI533
CSCI614	Database Management Systems2	2	2	3	CSCI521
CSCI615	Automata and Formal Languages	3	0	3	MATH 503
CSCI616	Computer Graphics and Animation	2	2	3	CSCI512
Total Units				18	

SECOND TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT UNITS	PRE-REQUISITES
MATH505	Numerical Methods and Analysis	2	2	3	MATH502
MATH509	Symbolic Logic	3	0	3	MATH409
CSCI621	Algorithm Analysis and Design	3	0	3	CSCI512
CSCI623	Operating System	2	2	3	CSCI522
CSCI624	Software Design and Development	2	2	3	CSCI532
CSCI672	Free Elective			3	CSCI612
Total Units				18	

THIRD TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT UNITS	PRE-REQUISITES
MATH506	Linear Algebra	2	2	3	MATH504
CSCI631	Software Quality Assurance	3	0	3	CSCI624
CSCI633	Human Computer Interaction	3	0	3	CSCI624
CSCI634	Software Project Management	2	2	3	CSCI624
CSCI636	Visual Programming	2	2	3	CSCI612
CSCI637	Information Security and Governance	2	2	3	CSCI533
Total Units				18	

FOURTH YEAR
FIRST TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT UNITS	PRE-REQUISITES
MATH507	Optimization Methods	3	0	3	MATH505
CSCI641	Mobile Programming	2	2	3	CSCI633
CSCI642	Practicum	0	0	6	CSCI634
CSCI643	Research Project A	3	0	3	CSCI634
CSCI646	Technopreneurship	3	0	3	CSCI634
Total Units				18	

SECOND TRIMESTER

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT UNITS	PRE-REQUISITES
CSCI651	Data Mining	2	2	3	CSCI614
CSCI652	Artificial Intelligence	2	2	3	CSCI615
CSCI653	Research Project B	0	6	3	CSCI643
CSCI656	Special Topics in Computing	3	0	3	CSCI533
CSCI670	Elective 1			3	CSCI612, CSCI613
CSCI671	Elective 2			3	CSCI623, CSCI621
Total Units				18	
Grand Total				198	

ELECTIVE COURSES
EMERGING TRENDS IN COMPUTER SCIENCE

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT UNITS	PRE-REQUISITES
CSCI670a	Data Science and Big Data Analytics	3	0	3	CSCI612 CSCI613
CSCI670b	Cloud Computing	3	0	3	
CSCI670c	Internet of Things	3	0	3	
CSCI670d	E-Commerce Infrastructure And Application	3	0	3	

SOFTWARE EXPERTISE IN COMPUTER SCIENCE

COURSE CODE	COURSE TITLE	LEC Hrs	LAB Hrs	CREDIT UNITS	PRE-REQUISITES
CSCI671a	Object Oriented Analysis and Design	2	2	3	CSCI621 CSCI623
CSCI671b	Software Maintenance	3	0	3	
CSCI671c	Software Analysis and Testing Tools	3	0	3	
CSCI671d	Compiler Construction	2	2	3	
CSCI671e	Parallel and Distributed Computing	2	2	3	

13. Awards and Credits

Degree/ Certificate Awarded	Bachelor's Degree
Total Units for Degree	198
Total Trimesters Completed	11

14. Personal Development Planning

1. Conduct in-house trainings and seminars on current trends in computing, particularly on Computer Graphics, Networking, and Mobile Computing
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 remediation 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			
		Engineering Studies (BSIE, BSME, BSEnE)	Computing Studies (BSCS, BSIT)	Business (BSBI, BSAF)	International Business
Mathematics	Science/ Technical/General Track	At least 70% or C	At least 70% or C	At least 70% or C	At least 60% or D
	Commercial and Literature Tracks	At least 80% or B	At least 80% or B	At least 80% or B	At least 60% or D
Science		60	60	60	N/A
English		At least 80 or B	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			
		Engineering Studies (BSIE, BSME, BSEnE)	Computing Studies (BSCS, BSIT)	Business (BSBI, BSAF)	International Business
	Science/ Technical/General	At least 51 or C1	At least 51 or C1	At least 51 or C1	At least 41 or C2

Mathematics	ral Track				
	Commercial and Literature Tracks	At least 71 or B1	At least 71 or B1	At least 71 or B1	At least 41 or C2
Science		60	60	60	N/A
English		At least 71 or B1	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, BSME, BSEnE), Computing (BSCS, BSIT) Business (BSBI, BSAF)	For Commercial Track: Score 60-79% in Math For Scientific and technical Track: Score 60-69% in Math	N/A	Remediation 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 remediation course in English. However, if the result is lower than 55%, applicant will take remediation 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 (BSIE, BSME, BSEnE), Computing (BSCS, BSIT) or Business (BSBI, BASF) programme who has a secondary grade score in Math of 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.

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 remedial 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 remedial courses in English where he/she fails.
- d. If the applicant has not taken any course in Mathematics, the basis for evaluation whether remedial 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	ENGL401	English Communication Skills 1	(C)			√			
	MATH401	College Algebra	(C)	√					
	CHEM400	General Chemistry1	(C)	√		√		√	
	EUTH400	Euthenics1	(C)						
	ECON400	Introduction to Economics	(C)			√	√		
	HUMR400	Human Rights	(C)				√		
	CSCI411	Introduction to Computing	(C)	√		√		√	
Year 1 2nd Tri	ENGL402	English Communication Skills2	(C)			√			
	MATH402	Plane and Spherical Trigonometry	(C)	√					
	CHEM401	General Chemistry 2	(C)	√		√		√	
	HIST400	History of Bahrain and the GCC Region	(C)				√		
	CSCI421	Computer Programming 1	(C)		√			√	√
	CSCI423	Digital Design	(C)		√			√	
	CSCI424	Web Content Management System	(C)		√	√	√	√	√
Year 1 3rd Tri	ENGL403	Speech and Oral Communication	(C)			√			
	ARAB400A	Arabic Language	(C)				√		
	EUTH401	Euthenics	(C)						
	MATH406	Differential Calculus with Analytic Geometry	(C)	√					
	CSCI431	Computer Programming 2	(C)	√	√			√	√
	CSCI433	Multimedia Development	(C)	√	√	√		√	
Year 2 1st Tri	MATH501	Integral Calculus with Differential Equation	(C)	√					
	MATH503	Discrete Mathematics	(C)	√					
	PHYS501	University Physics1	(C)	√		√		√	
	CSCI511	Ethics in Computing	(C)			√	√	√	

18. Curriculum Skills Map

Year/ Level	Course Code	Course Title	Core (C) or Option (O)	1	2	3	4	5	6
	CSCI512	Data Structures	(C)	√	√			√	√
	CSCI513	Introduction to Financial Accounting	(C)			√	√	√	
Year 2 2nd Tri	SOCI400	Sociology	(C)				√		
	MATH502	Advanced Mathematics	(C)	√					
	ENGL502	Technical Writing	(C)			√		√	
	PHYS502	University Physics 2	(C)	√		√		√	
	CSCI521	Database Management Systems 1	(C)	√	√			√	☒
	CSCI522	Computer Organization and Architecture	(C)	√	√	√		√	
Year 2 3rd Tri	PHYS503	University Physics 3	(C)	√		√		√	
	ENVS400	Environmental Science	(C)	√					
	CSCI531	Object Oriented Programming	(C)	√	√			√	√
	CSCI532	System Analysis and Design	(C)	√	√	√			√
	CSCI533	Data Communications and Networking 1	(C)		√	√	√	√	
	MATH409	Probability & Statistics	(C)	√					
Year 3 1st Tri	MATH504	Multivariate Calculus	(C)	√		√		√	
	CSCI612	Theory of Programming Languages	(C)		√			√	√
	CSCI613	Data Communications and Networking 2	(C)	√	√	√		√	
	CSCI614	Database Management Systems2	(C)	√	√			√	√
	CSCI615	Automata and Formal Languages	(C)	√	√				√
	CSCI616	Computer Graphics and Animation	(C)	√	√			√	√
Year 3 2nd Tri	MATH505	Numerical Methods and Analysis	(C)	√		√		√	
	CSCI621	Algorithm Analysis and Design	(C)	√	√				√
	MATH509	Symbolic Logic	(C)	√				√	

18. Curriculum Skills Map

Year/ Level	Course Code	Course Title	Core (C) or Option (O)	1	2	3	4	5	6
	CSCI623	Operating Systems	(C)	√	√	√		√	
	CSCI624	Software Design and Development	(C)	√	√	√		√	√
		Elective 1	(E)						
Year 3 3rd Tri	CSCI631	Software Quality Assurance	(C)		√		√	√	√
	MATH506	Linear Algebra	(C)	√		√		√	
	CSCI633	Human-Computer Interaction	(C)		√		√	√	
	CSCI634	Software Project Management	(C)		√	√	√	√	√
	CSCI636	Visual Programming	(C)	√	√			√	√
	CSCI637	Information Security and Governance	(C)	√		√	√	√	
Year 4 1st Tri	CSCI641	Mobile Programming	(C)	√	√	√		√	√
	CSCI642	Practicum	(C)	√	√	√	√	√	√
	CSCI643	Research Project A	(C)	√		√	√	√	
	MATH507	Optimization Techniques	(C)	√					
	CSCI646	Technopreneurship	(C)			√	√	√	
Year 4 2nd Tri	CSCI651	Data Mining	(C)	√		√		√	√
	CSCI652	Artificial Intelligence	(C)	√		√		√	√
	CSCI653	Research Project B	(C)	√	√	√	√	√	√
		Elective 2	(E)						
		Elective 3	(E)						
	CSCI656	Special Topics in Computing	(C)	√		√	√	√	
ELECTIVES									
	CSCI670a	Data Science and Big Data Analytics	(E)	√				√	√
	CSCI670b	Cloud Computing	(E)	√		√	√	√	
	CSCI670c	Internet of Things	(E)	√	√	√			√
	CSCI670d	E-Commerce Infrastructure and Application	(E)	√		√	√		

18. Curriculum Skills Map

Year/ Level	Course Code	Course Title	Core (C) or Option (O)	1	2	3	4	5	6
	CSCI671a	Object Oriented Analysis and Design	(E)	√	√	√			√
	CSCI671b	Software Maintenance	(E)	√		√	√		√
	CSCI671c	Software Analysis and Testing Tools	(E)	√		√	√		√
	CSCI671d	Compiler Construction	(E)	√				√	√
	CSCI671e	Parallel and Distributed Computing	(E)	√	√				√

19. Course Description

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
ENGL401	English Communication Skills 1	3	0	3
<p>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.</p>				
Course Code	Course Title	Lec Hrs	Lab Hrs	Units
EUTH400	Euthenics 1	1	0	0
<p>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.</p>				
Course Code	Course Title	Lec Hrs	Lab Hrs	Units
ECON400	Introduction to Economics	3	0	3

The course presents tools of economic analysis, demand and supply, price discrimination and income distribution in a systematic way which imparts intuitive appreciation of the power and scope of microeconomics. The learners are introduced to the economic realities that a country is facing today along with some statistical tools to understand these broader economic realities. The learners who have no prior exposure to this course will be to develop an understanding of the basic tools, concepts, and theories of microeconomics.

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
HUMR400	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
MATH401	College Algebra	3	0	3

This course is designed to familiarize learners with main theories, principles and concepts of college algebra that are useful in analysis and simplification of basic and some advanced mathematical problems. Content includes functions which are polynomial, rational, exponential, logarithmic and related equations. Sketching graphs, Matrices, determinants, progressions and inequalities as applied to engineering.

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CHEM400	General Chemistry 1	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
CSCI411	Introduction to Computing	2	2	3

This course covers the detailed knowledge and understanding of computer hardware and software. It includes the discussion of number system, networking and internet and the interdisciplinary science of computing. It also provides a discussion of programme development structures and algorithm and flowchart development.

The laboratory focuses on configuring web browsers security, configuring E-mail security, configuring OS security and working with Microsoft Excel and Visio.

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
ENGL402	English Communication Skills 2	3	0	3
<p>This is an intermediate course in English communication geared towards equipping the college students with writingskills 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.</p>				
Course Code	Course Title	Lec Hrs	Lab Hrs	Units
HIST400	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 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
MATH402	Plane and Spherical Trigonometry	3	0	3
<p>This course is designed to familiarize learners with main theories, principles and concepts of plane and spherical trigonometry that are useful in analysis and simplification of some advanced mathematical problems. The course covers topics on angles and their measurement, trigonometric/circular functions, inverse trigonometric functions, identities, graphs of trigonometric functions, solutions of trigonometric equations, solutions of right and oblique plane triangles, introduction to spherical trigonometry and its applications.</p>				
Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CHEM401	General Chemistry 2	2	2	3
<p>This is lecture-laboratory course which includes topic on unsaturated hydrocarbons which illustrates the structure and reactions of alkanes, alkenes, alkynes, alkyl halides, alcohol, ethers, carboxylic acid, esters, aldehydes, ketones, amines and its role and behavior in the living system. It also introduces the students to the chemistry of heterocycles, carbohydrates, oil and fatty acids and amino acids, nomenclature of organic compounds, synthesis, and reaction techniques</p>				
Course	Course Title	Lec Hrs	Lab Hrs	Units

Code				
CSCI421	Computer Programming 1	2	2	3

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 using the tool Java Eclipse.

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CSCI423	Digital 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 comprises 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
CSCI424	Web Content Management System	0	2	1

This course explores the use of the three most popular open-source web-based content management systems to create dynamic and flexible websites. Students explore the fundamentals of planning dynamic websites, CMS database management, developing CSS-controlled site templates, and creating database-driven websites through the planning and creation of their own topic-based sites.

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
ENGL403	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
ARAB400A	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
EUTH401	Euthenics 2	1	0	0

This course is designed to provide the discussion on the students' rules and regulations of the university in order to practice the right conduct of behavior inside and outside the university premises. It intends to teach the students on the different stages of personality development, the equivalent penalties in different academic offences and factors that influence behavioral multiple intelligences. Further, the incorporation of oral/written communication through individual and group discussions can encourage learners to ponder on the meaning of life and discover the purpose of their existence.

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
MATH406	Differential Calculus with Analytic Geometry	5	0	5

This course is intended to develop practical skills in differential calculus and analytic geometry. Emphasis is placed on functions, limits and continuity, fundamental concepts of analytic geometry, explicit and implicit differentiation of algebraic and transcendental functions, conics, higher derivatives, polar coordinates and its applications (equations of tangent and normal lines, sketching polynomial curves, maxima and minima problems and time rates

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CSCI431	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 development of programs in Java. It starts from the concepts of arrays and progresses from exception handling to basic applets. The implementation of the programming theories and concepts is done in Java programming language using the tool Java Eclipse.

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CSCI433	Multimedia Development	2	2	3

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 through the use of 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 like

Macromedia Flash, Autodesk Maya

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
MATH501	Integral Calculus with Differential Equations	5	0	5

This course provides the students with knowledge and understanding of core concepts, theories and principles in evaluating definite and indefinite integrals and its applications in solving engineering and computing problems. The course also covers solutions to ordinary differential equations which can be used in modeling important applications in the scientific and engineering fields.

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
MATH503	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 logic, proofs, sets, relations, functions, graphs and trees. It simplifies and evaluates basic logic statements including compound statements, implications, inverses, converses, and contrapositives using truth tables and the properties of logic.

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
PHYS501	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
CSCI511	Ethics in Computing	1	0	1

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
CSCI512	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 graphs. 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	Course Title	Lec Hrs	Lab Hrs	Units
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Code				
CSCI513	Introduction to Financial Accounting	3	0	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
ENGL502	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
SOCI400	Sociology	3	0	3
This course is designed to expose students in a detailed approach of studying society. It intends to give emphasis on the sociological perspectives, relationships with other social sciences, the main figures in sociological development, including introduction to culture, transformation of societies, importance of socialization, social groups, deviance, and social control. Further, it incorporates the discussions on social institutions that enable the college students to understand the economic perspective from ancient to present, the evolution of education and the current viewpoint of family.				
Course Code	Course Title	Lec Hrs	Lab Hrs	Units
MATH502	Advanced Mathematics	3	0	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
PHYS502	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, Kirchhoff'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
CSCI521	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 Data Base Objects using Oracle SQL Developer tool.

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CSCI522	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.

The laboratory uses assembly language programs to implement the editor, assembler, and debugger in the microprocessor emulator. In addition, it performs computational and I/O operation through Assembly language programming

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
PHYS503	University Physics 3	2	2	3

This course is designed to explore the concepts of heat and thermodynamics, waves and optics, relativity, molecular, atomic, and nuclear physics using the concepts of mechanics, electricity and magnetism, vectors, and other mathematical models and their advanced application, such as the application of the laws of thermodynamics, light and electromagnetic waves, Einstein's special theory of relativity, Planck's Quantum theory, de Broglie's waves, Heisenberg's Uncertainty Principle, Dirac's electron theory, Hund's Rule, and atomic models from Thompson's to Quantum Mechanical, as well as nuclear models

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
ENVS400	Environmental Science	3	0	3

This course is an introduction to Environmental Science focusing on interrelationships of the natural world, sustainable development with environmental, economic and societal dimensions, energy transformations, ecological process and relationships, energy flow through systems, human population

growth, water processes and cycles, impacts of climate change, “green” electronic processes, energy utilization and efficiency, conventional and alternative energy sources, present day agricultural practices, biodiversity and threats by human activity, and conservation issues.

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CSCI531	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 C++.

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CSCI532	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 Microsoft Visio using UML

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CSCI533	Data Communications and Networking 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
MATH409	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
MATH504	Multivariate Calculus	2	2	3

This is the third part of the course in calculus focused on vector and multi-variable calculus. Topics associated with the course demonstrate advanced knowledge and understanding of the following: vectors and vector operators, calculus of functions of several variables including partial differentiation and multiple integrals, Lagrange multipliers, applications of partial differentiation, line integrals, Green's theorem, Stoke's theorem, and Divergence theorem. The course also includes laboratory components that make use of MATLAB as tool in solving problems in Multivariate Calculus.

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CSCI612	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 a strong foundation on different programming languages. The topics includes a 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 Object Oriented in C++/Java, Structured C/Pascal/VB and LISP as Logic Programming Language

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CSCI613	Data Communications and Networking 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
CSCI614	Database Management System 2	2	2	3

This course covers advanced and critical issues of database management systems. Topics Include transactions, query processing and query optimization, concurrency control, and client-server architecture, data warehouse, data mining, emerging database technologies.

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	Course Title	Lec Hrs	Lab Hrs	Units
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Code				
CSCI615	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 includedetailed 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
CSCI616	Computer Graphics and Animation	2	2	3

This course covers the advanced technologies underlying the generation and display of images using computer graphics algorithms. Topics include conversion of geometric primitives, 2D and 3D geometric transformations, clipping and windowing, hidden surface and hidden line elimination, line drawing, shading, half-toning, scene modeling and 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. Moreover, it uses animation tools for practicing on animation.

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
MATH505	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
CSC621	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
MATH509	Symbolic Logic	3	0	3

This course discussethe advanced concepts of symbolic logic that studies correct reasoning much like the

formal languages used in mathematics. Moreover, the course puts demands on and helps to develop linguistic, quantitative, and abstract reasoning skills. Students learn to apply these concepts through the use of formal languages for truth-functional and quantificational logic, truth tables, and formal derivations.

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CSCI623	Operating System	2	2	3

This course provides advanced and detailed information about the components and functionalities of operating systems (Windows and Linux). 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. In addition the scheduling, memory management and page replacement algorithms are implemented using Java.

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CSCI624	Software Design and Development	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 such as Microsoft Visio, Visual Studio and others.

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
MATH506	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
CSCI631	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 indepth 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
CSCI633	Human Computer Interaction	3	0	3

This course discusses advanced theories and techniques in Human-Computer Interaction (HCI) systems with variety of methods to evaluate computational abilities. It includes interface evaluation techniques, human-centered software evaluation and development, graphical user interface (GUI), Models of the systems, HCI aspects of multimedia systems, implementation and evaluations of HCI Models and groupware systems.

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CSCI634	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 UML using Ms Visio.

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CSCI636	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 using LINQ .net Library.

The laboratory focuses on training the students with hands-on experience on Visual Studio. 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
CSCI637	Information Security Governance	2	2	3

This course provides an advanced discussion of the importance of information security and support to protect the information resources of an organization as well as the fundamentals of security in the networked environment. Topics include information security (IS) issues; coverage of risks and vulnerabilities; detection of and reaction to threats to information resources; encryption and authentication technologies such as classical cipher design and analysis, modern private key block cipher design, details, public key encryption algorithms, digital signatures and hash functions, key management, X.509 certificates and certificate authorities; Point-to-Point Protocol (PPP): Password Authentication

Protocol (PAP) and Challenge Handshake Authentication Protocol (CHAP).

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CSCI641	Mobile Programming	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
CSCI642	Practicum	0	0	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 240 hours on-site training to get hands on experience of working in the industry.

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CSCI643	Research 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 makes the research proposal, problem statement, literature survey, research methodology of a research project.

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
MATH507	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
CSCI646	Technopreneurship	3	0	3

This course is discussing 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
CSCI651	Data Mining	2	2	3

This 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, 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
CSCI652	Artificial Intelligence	3	0	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 topics includes AI methodology and fundamentals, supervised and unsupervised learning, decision tree learning and natural language processing.

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

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CSCI653	Research 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
CSCI656	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 Biometrics, RFID, GIS, Cryptography, Web mining, Cloud Computing and Grid Computing. It exposes the current trends in Emerging technologies like Biometrics, RFID, GIS, elaborate on how cryptographic and web mining algorithms work, and discuss on new trends in computing field called Cloud Computing and Grid Computing.

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
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CSCI670A	Data Science and Big Data Analytics	3	0	3
<p>This course discusses the advanced concepts underlying data science and bog data analysis. It 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.</p>				
Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CSCI670B	Cloud Computing	3	0	3
<p>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 includedCloud 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.</p>				
Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CSCI670C	Internet of Things	3	0	3
<p>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 aretransforming every industry.</p>				
Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CSCI670D	E-Commerce Infrastructure and Application	3	0	3
<p>This course discusses the advanced concepts in 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.</p>				
Course Code	Course Title	Lec Hrs	Lab Hrs	Units

CSCI671A	Object Oriented Analysis and Design	2	2	3
<p>This course demonstrates the principles, design, and implementation of Object-Oriented Analysis according to real life mini projects. The course emphasis with requirements gathering & end with implementation of modularity, abstraction, encapsulation and manage requirements. Those are used subsequently to enforce Object Oriented concepts that produce a reusable design of the system that adapts to change. The course also covers how to analyze and design classes, their relationships to each other in order to build a model of the problem domain and use common UML diagrams throughout this process, such as use-case, class, activity & other diagrams.</p>				
Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CSCI671B	Software Maintenance	3		3
<p>This course covers and explains the advanced concepts of why software maintenance is a cost-effective option for system evolution, where the different actions of the software reengineering process take place, such as reverse engineering and program restructuring. How legacy systems can be assessed to decide if they should be scrapped, maintained, re-engineered, or replaced to improve maintainability, extensibility, and software adaptability to different environments. Furthermore, it covers techniques and methods of software maintenance, classification of changes, costs of maintenance, maintenance process models, program analysis, program slicing, object flow graphs, class diagram recovery and delta debugging</p>				
Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CSCI671C	Software Analysis and Testing Tools	3	0	3
<p>This course covers the advanced 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</p>				
Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CSCI671D	Compiler Construction	2	2	3
<p>This course covers the issues that arise in the design and construction of translators for programming languages. The topics covered include structure of one-pass and multiple-pass compilers; symbol table management; lexical analysis; traditional and automated parsing techniques, including recursive descent and LR parsing; syntax-directed translation and semantic analysis; run-time storage management; intermediate code generation; introduction to optimization; and code generation.</p> <p>In the laboratory part some of the theories, methods and principles treated in the theory part are illustrated and practically applied and the laboratory focuses on training the students with hands-on</p>				

experience on GCC/ANTLR.

Course Code	Course Title	Lec Hrs	Lab Hrs	Units
CSCI671E	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 in NetBeans with various simulation tools like Vmware, Hadoop, CloudSIM and IBM's Bluemix