COMPUTER SCIENCE CYBER OPERATIONS MAJOR, BACHELOR OF SCIENCE (BS)

Exam Requirement: All Computer Science majors are required to pass the Advanced Programming Exam prior to taking courses for which it is a prerequisite. Passing the exam is required for graduation and no exam waivers will be granted for degree completion.

Note: no course may be used as both a requirement and an elective in a student's program.

Grade Requirements: As a computer science student, you are expected to maintain an overall university GPA ≥2.3. Each computer science course must be completed with a minimum grade ≥C+. All supporting courses required by the department must be completed with a minimum grade ≥C.

Required Computer Science Courses		
CYBR 101	CYBERSECURITY FUNDAMENTALS	5
CSCD 202	COMPUTING ETHICS	4
CSCD 210	PROGRAMMING PRINCIPLES I	5
CSCD 211	PROGRAMMING PRINCIPLES II	5
CSCD 212	OBJECT ORIENTED PROGRAMMING WITH DESIGN PATTERNS	5
CSCD 240	C AND UNIX PROGRAMMING	5
CSCD 260	ARCHITECTURE AND ORGANIZATION	4
or EENG 260	MICROCONTROLLER SYSTEMS	
CSCD 300	DATA STRUCTURES	5
CSCD 320	ALGORITHMS	5
CSCD 327	RELATIONAL DATABASE SYSTEMS	4
CSCD 330	COMPUTER NETWORKS	4
CSCD 340	OPERATING SYSTEMS	5
CSCD 350	SOFTWARE DEVELOPMENT PRINCIPLES	4
CSCD 420	COMPILERS	4
Required Cybersecurity Courses		
CSCD 303	COMPUTER AND INFORMATION SECURITY	4
CSCD 433	ADVANCED NETWORKING CONCEPTS	4
CSCD 434	NETWORK SECURITY	4
CSCD 437	SECURE CODING	4
CYBR 403	CYBERSECURITY POLICIES, PRIVACY AND LAWS	4
CYBR 410	APPLIED CYBER DEFENSE	4
CYBR 412	APPLIED CYBER OPERATIONS	4
CYBR 455	DIGITAL FORENSICS AND CYBERCRIME	4
Required Supporting Courses		
EENG 160	DIGITAL CIRCUITS	5
MATH/HONS 161	CALCULUS I	5
MATH 162	CALCULUS II	5
MATH 231	LINEAR ALGEBRA	5
MATH 301	DISCRETE MATHEMATICS	5
MATH 380	ELEMENTARY PROBABILITY AND STATISTICS	5
Required Laboratory Science Sequence–choose one sequence from the following		**10-13**
Biology		
BIOL 171	BIOLOGY I	
BIOL 172	BIOLOGY II	
BIOL 270	BIOLOGICAL INVESTIGATION	
Chemistry		
CHEM 171 & 171L & CHEM 172 & CHEM 172L	GENERAL CHEMISTRY I and GENERAL CHEMISTRY LABORATORY I and GENERAL CHEMISTRY II and GENERAL CHEMISTRY LABORATORY II	
Geoscience		
GEOS 100	DISCOVERING GEOLOGY	
GEOS 113	THE EARTH'S CLIMATE AND WEATHER	
Physics		
PHYS 151	GENERAL PHYSICS I	
PHYS 152	GENERAL PHYSICS II	
PHYS 161	MECHANICS LABORATORY	
PHYS 162	HEAT AND OPTICS LABORATORY	
Required Electives–choose two courses from the following		**8**
Note: many of these elective courses have prerequisites.		
Notes: No course may be used for an elective that is used to satisfy another major requirement. Upper division MATH or CSCD 495–499 courses must have prior department approval of topic content.		
CSCD 409	SCIENTIFIC PROGRAMMING	
CSCD 423	RANDOMIZED ALGORITHMS AND PROBABILISTIC ANALYSIS	
CSCD 427	ADVANCED DATABASE MANAGEMENT SYSTEMS	
CSCD 429	DATA MINING	
CSCD 430	BIG DATA ANALYTICS	
CSCD 435	PRINCIPLES OF PROGRAMMING LANGUAGE	
CSCD 439	TOPICS IN COMPUTER SCIENCE (prior departmental approval of topic content is required)	
CSCD 443	DISTRIBUTED MULTIPROCESSING	
CSCD 445	GPU COMPUTING	
CSCD 460	ADVANCED ARCHITECTURE AND ORGANIZATION	
or EENG 460	COMPUTING SYSTEMS: ORGANIZATION AND DESIGN	
CSCD 461	EMBEDDED SYSTEMS	
or EENG 461	EMBEDDED SYSTEMS DESIGN	
CSCD 462	EMBEDDED REAL-TIME CONTROL	
or EENG 462	REAL TIME EMBEDDED SYSTEMS	
CSCD 467	PARALLEL AND CLOUD COMPUTING	
CSCD 470	3D COMPUTER GRAPHICS PRINCIPLES	
CSCD 471	ADVANCED 3D COMPUTER GRAPHICS	
CSCD 477	VIRTUAL REALITY AND DATA VISUALIZATION	
CSCD 480	INTELLIGENT SYSTEMS	
CSCD 483	MODELING AND SIMULATION	
CSCD 487	HUMAN COMPUTER INTERFACE	
CSCD 495	INTERNSHIP (variable credit–up to two 4 credit internships are allowed)	
CSCD 496	EXPERIMENTAL COURSE (variable credit–prior departmental approval of topic content is required)	
CSCD 498	SEMINAR (variable credit–may be repeated)	
CSCD 499	DIRECTED STUDY (variable credit–prior departmental approval of topic content is required)	
Required Senior Capstone Series		

CSCD 488	SENIOR PROJECT	5
CSCD 490	SENIOR CAPSTONE	5
Total Credits		**154-157**

Plan of Study

The following plan of study is for a student with zero credits. Individual students may have different factors such as: credit through transfer work, Advanced Placement, Running Start, or any other type of college-level coursework that requires an individual plan.

Courses could be offered in different terms, checking the academic schedule is paramount in keeping an individual plan current. **Students should connect with an advisor to ensure they are on track to graduate.**

All Undergraduate students are required to meet the Undergraduate Degree Requirements (http://catalog.ewu.edu/undergraduate-degree/).

First Year

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
EENG 160	5	CYBR 101 (Social Science BACR 1)	5	CSCD 202 (Humanities & Arts BACR 1)	4
ENGL 101	5	MATH 161	5	ENGL 201	5
Natural Science BACR 1 (choose from Laboratory Science Sequence)	5	Natural Science BACR 2 (choose from Laboratory Science Sequence)	5	Social Science BACR 2[1]	5
	15		**15**		**14**

Second Year

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
CSCD 210	5	CSCD 211	5	CSCD 212	5
MATH 380	5	CSCD 240	5	CSCD 300	5
Humanities & Arts BACR 2[1]	5	MATH 162	5	MATH 301	5
	15		**15**		**15**

Third Year

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
CSCD 260 or EENG 260	4	CSCD 320	5	CSCD 327	4
CSCD 303	4	CSCD 433	4	CSCD 340	5
CSCD 330	4	CSCD 437	4	CSCD 434	4
MATH 231	5			CSCD 420	4
	17		**13**		**17**

Fourth Year

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
CSCD 350	4	CSCD 488	5	CSCD 490 (Senior Capstone - graduation requirement)	5
CYBR 403	4	CYBR 410	4	CYBR 412	4
Cyber Operations Elective[2]	4	CYBR 455	4	Cyber Operations Elective[2]	4
Diversity - graduation requirement[1]	5	Global Studies - graduation requirement[1]	5		
	17		**18**		**13**

Total Credits 184

1. University Graduation Requirements (UGR) and Breadth Area Course Requirements (BACR) courses may be less than 5 credits and additional credits may be required to reach the required 180 total credits needed to graduate. Students should connect with an advisor to ensure they are on track to graduate.
2. Required Electives–choose two courses from the approved list. No course may be used for an elective that is used to satisfy another major requirement. Upper division MATH or CSCD 495–499 courses must have prior department approval of topic content. Many of the elective courses have prerequisites.

University Competencies and Proficiencies

English (http://catalog.ewu.edu/undergraduate-degree/#newitemtext)
Quantitative and Symbolic Reasoning (http://catalog.ewu.edu/undergraduate-degree/#mathcompproficienciestext)
Placement and Clearance (http://catalog.ewu.edu/placement/)
Prior Learning/Sources of Credit AP, CLEP, IB (http://catalog.ewu.edu/prior-learning/)

General Education Requirements (http://catalog.ewu.edu/undergraduate-degree/#generaleducationrequirementstext) (GER)

- Minimum Credits—180 cumulative credit hours
  - 60 upper-division credits (300 level or above)
  - 45 credits in residence (attendance) at Eastern, with at least 15 upper-division credits in major in residence at Eastern
- Minimum Cumulative GPA ≥2.0

Breadth Area Core Requirements (BACR)

Humanities and Arts (http://catalog.ewu.edu/undergraduate-degree/#humanitiesandfineartsgecrtext)
Natural Sciences (http://catalog.ewu.edu/undergraduate-degree/#naturalsciencesgecrtext)
Social Sciences (http://catalog.ewu.edu/undergraduate-degree/#socialsciencesgecrtext)

University Graduation Requirements (http://catalog.ewu.edu/undergraduate-degree/#universitygraduationrequirementstext) (UGR)

Diversity Course List (http://catalog.ewu.edu/undergraduate-degree/#cultureandgenderdiversityintheuslisttext)
World Language (http://catalog.ewu.edu/undergraduate-degree/#worldlanguagetext) (for Bachelor of Arts)
Global Studies Course List (http://catalog.ewu.edu/undergraduate-degree/#internationalstudiesrequirementtext)
Minor or Certificate (http://catalog.ewu.edu/undergraduate-degree/#majorminororcertificateugrtext)
Senior Capstone Course List (http://catalog.ewu.edu/undergraduate-degree/#capstonecourselisttext)

Application for Graduation (use EagleNET (https://inside.ewu.edu/eaglenet/)) must be made at least two terms in advance of the term you expect to graduate (undergraduate and post-baccalaureate).

Use the Catalog Archives (http://catalog.ewu.edu/archives/) to determine *two important catalog years*.
Requirements in Degree Works (https://inside.ewu.edu/records-and-registration/degree-works/) are based on these two catalog years:

a. The catalog *in effect at the student's first term* of current matriculation is used to determine **BACR** (Breadth Area Credit Requirements) **and UGR** (Undergraduate Graduation Requirements).
b. The catalog *in effect at the time the student declares a major or minor* is used to determine the program requirements.

Students who earn a BS in Computer Science Cyber Operations from EWU should be able to:

- analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions;
- design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline, utilizing techniques, skills, and tools necessary for computing practice;
- communicate effectively in a variety of professional contexts;
- recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles, including local and global impacts of computing solutions on individuals, organizations, and society;
- function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline;
- apply computer science theory and software development fundamentals to produce computing-based solutions;
- apply security principles and practices to maintain operations in the presence of risks and threats.