COMPUTER SCIENCE, MS

Program Description

The Master of Science with a major in Computer Science is designed to prepare graduate professionals who can apply the necessary knowledge of computing to information requirements of organizations in business, government, industry and education. The program provides for the education of individuals who will develop, maintain, or manage complex computer-based information systems.

The program provides the experienced professional with up-to-date specialized knowledge while developing those analytical skills necessary to stay abreast of the changing field of computing. The program also provides the recent baccalaureate graduate with additional applied and advanced knowledge, thus facilitating a more useful contribution to his/her career path.

Fast Track Computer Science BS to Computer Science MS

The university allows the opportunity for high-achieving undergraduate students to count a select number of graduate credits toward their undergraduate degree and thereby obtain a graduate degree at an accelerated pace. Students interested in the Fast Track in Computer Science should see the undergraduate catalog.

Program Goal

Prepare students to pursue careers in industry, academia, and government by offering a state of the art curriculum and advanced knowledge.

Student Learning Outcomes

At the time of graduation students will attain:

- the ability for effective oral and written communication of complex ideas to diverse audiences, and
- skills to efficiently solve complex problems from various domains with computers, and
- the ability to comprehend and apply state-of-the-art in the field, and
- an understanding of professional, ethical, legal, and security issues and responsibilities, and the societal impact of computing.

Chronological Procedure Leading to the MS Degree

1. **Completion of a degree plan**
   Upon admission to the MS degree program in computer science, and prior to enrollment in any course, *the student must contact the Graduate Academic Advisor in the College of Science & Engineering to have a degree plan completed.* The student will then be assigned a faculty advisor from the computer science faculty. Students should seek the advice of their faculty advisor on a regular basis about their progress toward their degree.
2. **Progress toward the degree**
   Once admitted to the graduate degree program in computer science, a student must complete at least six semester hours of credit per year toward the degree until the degree is completed. Failure to make this minimum progress will result in dismissal from the degree program with possible readmission based on the catalog in effect at the time of readmission. A student who is actively pursuing a graduate project or thesis and has completed all other course work for the degree will be given relief from this requirement, but must register continuously for the project or thesis until it is completed.
3. **Thesis or Courses Only**
   Thesis Option
   Students choosing the thesis option must obtain permission from their faculty advisor (who will chair their committee) to register for COSC 5398 Thesis I (3 sch), which should be taken in the next to last semester. During the first month of Thesis I, the student and their advisor should determine the thesis committee. This committee consists of at least three full-time Texas A&M University-Corpus Christi graduate faculty members, two of which must be in computer science.
   While taking Thesis I, the student will develop a written proposal of the thesis work and present the proposal for approval. Upon approval, the student may then register for COSC 5399 Thesis II (3 sch). The student must then continually register for COSC 5399 Thesis II (3 sch) until completion of their thesis. If the student fails to register for COSC 5399 Thesis II (3 sch) or fails their final examination, a grade of No Credit will be assigned to COSC 5398 Thesis I (3 sch) and all COSC 5399 Thesis II (3 sch) courses and the student must begin the process again.
   While taking COSC 5399 Thesis II (3 sch), the student will produce a written thesis that discusses their work. A draft copy of the thesis will be given to all committee members and the student will make any changes required by the committee. Upon approval of the thesis committee chair, the student may schedule their final oral examination. The thesis will be published and archived in the Mary & Jeff Bell library. Guidelines for writing the thesis are available in the Computer Science office.
   Course Only Option
   Students must take all required courses along with their chosen electives with at least two courses from each elective group. COSC 6370 Advanced Software Engineering (3 sch) is taken in the final semester.
4. **Final examination (Thesis Option)**
   After the student has completed all other requirements for the MS degree in computer science, he or she must schedule an oral exam over his/her graduate program of study. The oral exam will be administered by the graduate thesis committee and will focus heavily on the thesis itself.

For Additional Information

Website:
http://gradschool.tamucc.edu/degrees/science/computer_science.html

Campus Address;
Center for Instruction, Room 301
Phone: (361) 825-2474

Mailing Address:
Computer Science Program, Unit 5825
College of Science and Engineering
Texas A&M University-Corpus Christi
6300 Ocean Drive
Corpus Christi, Texas 78412-5825

Admission Requirements

1. In addition to meeting all University requirements, students seeking admission to the graduate degree program in computer science must submit the following to the Office of Research and Graduate Studies:
   - An application and application fee
   - Transcripts from regionally accredited institutions (international students will be required to submit relevant international transcripts)
   - An essay (500-1000 words) discussing why you wish to get a Master's degree and your areas of interest
   - GRE scores (within five years of the date of application)
   - International students must show English language proficiency through either TOEFL or IELTS exam and additional documents to the College of Graduate Studies. see http://gradschool.tamucc.edu/international.htm for full requirements
2. A student entering the program is expected to have adequate preparation in computer science and mathematics from their undergraduate degree. For computer science, this preparation must include successful completion of coursework in data structures, a high level programming language, computer architecture, operating systems, and software engineering. In mathematics, students must have successfully completed course work in discrete mathematics, calculus, plus one additional junior level or higher mathematics course such as linear algebra, numerical analysis, or applied probability and statistics.
   Students who have not successfully completed the above courses may be required to take leveling courses in any missing subjects. All leveling courses must be completed with a grade of "B" or better. In addition, students can take no more than 9 credits towards their degree prior to completing all leveling courses.
3. Students seeking admission to the Computer Science MS program have to identify a faculty member willing to serve as their graduate faculty advisor. Applicants can submit their interests at portal.cs.tamucc.edu (https://portal.cs.tamucc.edu/) after they have applied, accounts may take up to two weeks to be created after applying. Applicants will not be admitted to the program without a graduate advisor.

Program Requirements

Requirements for the Master of Science in Computer Science degree may be met through one of two options: Thesis Option (Option I) or Course Only Option (Option II). The Thesis Option requires a minimum of 30 credit hours and the Course Only Option requires a minimum of 36 credit hours. The Thesis Option allows for maximum flexibility in choosing elective courses. This option allows the student to concentrate on a particular field or area of computer science. The Course Only Option allows for flexibility in choosing elective courses but requires the student to take at least two electives from each of the three elective concentration tracks. The concentration tracks are Software and Programming, Data Sciences, and Cyber Science.

Code	Title	Hours
Core Courses		
COSC 6334	Design and Analysis of Algorithms	3
COSC 6351	Advanced Computer Architecture	3
COSC 6352	Advanced Operating Systems	3
Thesis or Course Option		
Select one of the following options:		21-27
Option 1 - Thesis		
Select a minimum of 12 hours of electives to support thesis		
COSC 6393	Research Methods in Computer Science	
COSC 5398	Thesis I	
COSC 5399	Thesis II	
Select electives that will support the student's thesis		
Option II - Course		
Select a minimum of 24 hours, with at least 6 credits hours from each concentration track		
COSC 6370	Advanced Software Engineering (Must be taken in last semester) ^	
Select electives across different areas of computer science, and must take at least two courses from each of the concentration tracks		
Concentration Tracks		
Software and Programming		
COSC 6340	Human-Computer Interaction	
COSC 6353	Compiler Design and Construction	
COSC 6356	Theory of Computation	
COSC 6360	Parallel Computing	
COSC 6361	Parallel Algorithms	
COSC 6362	Mobile Software Development	
COSC 6365	Current Trends in Programming	
Data Science		
COSC 6324	Digital Image Processing	
COSC 6326	Computer Vision	
COSC 6327	Introduction to Computer Graphics	
COSC 6328	Advanced Computer Graphics	
COSC 6336	Database Management Systems	
COSC 6337	Data Mining	
COSC 6338	Machine Learning	
COSC 6339	Deep Learning	
COSC 6350	Advanced Topics in DBMS	
COSC 6354	Artificial Intelligence ^	
COSC 6380	Data Analytics	
Cyber Science		
COSC 6355	Data Communications and Networking	
COSC 6357	Wireless Sensor Networks	
COSC 6374	Computer Forensics ^	
COSC 6375	Information Assurance ^	
COSC 6376	Network Security ^	
COSC 6377	Applied Cryptography	
COSC 6379	Advanced Information Assurance ^	
Total Hours		**30-36**

^ Blended offering

Electives

Electives are chosen by the student but are subject to approval by the student's graduate faculty advisor. For the Thesis Option, electives should be taken that will support the student's thesis. For the Course Only Option, students must obtain breadth by taking electives across different areas of computer science, and must take at least two courses from

each of the concentration tracks. Electives not listed in the concentration tracks may also be taken to fulfill remaining credit hours.

No more than six hours of approved electives may come from courses taken at another university or from outside of computer science. Credit from a master's degree earned at another institution will not be applied to a second master's degree at Texas A&M University-Corpus Christi. A maximum of six hours of approved Directed Independent Study may count toward the MS degree.

Courses

COSC 5300 Introductory Topics in Computer Science
3 Semester Credit Hours (3 Lecture Hours)
THIS COURSE INTRODUCES STUDENTS TO THE LEVELING TOPICS IN COMPUTER SCIENCE. THIS COURSE SERVES THE NEEDS OF CERTAIN TOPICS STUDENTS LACK FOR PURSUING A MASTER'S DEGREE IN COMPUTER SCIENCE. GRADE ASSIGNED WILL BE "CREDIT" (CR) OR "NO CREDIT" (NC).

COSC 5313 Foundations of Computer Organization and Architecture
3 Semester Credit Hours (3 Lecture Hours)
A STUDY OF INTERNAL COMPUTER CONCEPTS WITH RESPECT TO THE FUNCTIONING OF THE HARDWARE SUBSYSTEMS AND THEIR ROLES IN THE COMPUTING PROCESS. AN IN-DEPTH STUDY OF MACHINE AND ASSEMBLY LANGUAGE. (DOES NOT COUNT TOWARD TOTAL HOURS REQUIRED FOR MS IN COMPUTER SCIENCE.)

COSC 5320 DESIGN AND IMPLEMENTATION OF COMPUTERIZED INSTRUCTIONAL SYSTEMS
3 Semester Credit Hours (3 Lecture Hours)
PROVIDES A BROAD INTRODUCTION TO THE DEVELOPMENT OF COMPUTER-BASED LEARNING ENVIRONMENTS. COVERS THE THEORY AND PRACTICE OF USING THE COMPUTER BOTH IN THE CLASSROOM AND INDIVIDUALLY FOR LEARNING. COVERS A WIDE RANGE OF POSSIBILITIES FROM MULTIMEDIA PRESENTATION OF MATERIAL TO CONSTRUCTIVE ENVIRONMENTS AND COMPUTER-BASED INSTRUCTIONAL SYSTEMS.

COSC 5321 Data Structures
3 Semester Credit Hours (3 Lecture Hours)
A STUDY OF THE LOGICAL STRUCTURES USED FOR THE ORGANIZATION, STORAGE AND RETRIEVAL OF DATA. THESE STRUCTURES ARE ADDRESSED FROM BOTH MEMORY-RESIDENT AND FILE-RESIDENT POINTS OF VIEW. ALGORITHMS FOR THE CREATION, SEARCHING, AND MANIPULATION OF STANDARD DATA STRUCTURES USED IN COMPUTING ARE STRESSED. (DOES NOT COUNT TOWARD TOTAL HOURS REQUIRED FOR MS IN COMPUTER SCIENCE.)
Co-requisite: COSC 5312, MATH 2305.

COSC 5324 DIGITAL IMAGE PROCESSING
3 Semester Credit Hours (3 Lecture Hours)

COSC 5326 COMPUTER VISION
3 Semester Credit Hours (3 Lecture Hours)
Prerequisite: COSC 5324.

COSC 5327 INTRO TO COMPUTER GRAPHICS
3 Semester Credit Hours (3 Lecture Hours)
INTRODUCTION TO COMPUTER GRAPHICS This graduate course provides students with a foundation in basic principles and techniques for computer graphics on modern graphics hardware. Students will gain experience in interactive computer graphics using the OpenGL API. Topics include: graphics hardware, rendering, perspective, lighting, and geometry.

COSC 5328 ADVANCED COMPUTER GRAPHICS
3 Semester Credit Hours (3 Lecture Hours)
This course covers advanced computer graphics techniques. Students will be introduced to state-of-the-art methods in computer graphics. This course will focus on techniques for real-time rendering and animation.
Prerequisite: COSC 4328 or 5327.

COSC 5331 Foundations of Computer System Software
3 Semester Credit Hours (3 Lecture Hours)
INTRODUCTION TO OPERATING SYSTEMS CONCEPTS, PRINCIPLES, AND DESIGN. TOPICS INCLUDE: PROCESSES AND THREADS, CPU SCHEDULING, MUTUAL EXCLUSION AND SYNCHRONIZATION, DEADLOCK, MEMORY MANAGEMENT, FILE SYSTEMS, SECURITY AND PROTECTION, NETWORKING, AND DISTRIBUTED SYSTEMS. SELECTED EXISTING OPERATING SYSTEMS ARE DISCUSSED, COMPARED, AND CONTRASTED. (DOES NOT COUNT TOWARD TOTAL HOURS REQUIRED FOR MS IN COMPUTER SCIENCE.)
Prerequisite: COSC 5313.
Co-requisite: COSC 5321.

COSC 5334 THE DESIGN AND ANALYSIS OF ALGORITHMS
3 Semester Credit Hours (3 Lecture Hours)
An advanced course that concentrates on the design and analysis of algorithms used to solve a variety of problems. The methods of design covered include such topics as: divide-and-conquer, the greedy method, dynamic programming, search and traversal techniques, and backtracking.
Prerequisite: COSC 5321, MATH 2413 and 2305.

COSC 5336 DATABASE MANAGEMENT SYSTEMS
3 Semester Credit Hours (3 Lecture Hours)
A study of contemporary database management concepts. Performance (indexing, query optimization, update optimization), concurrency, security and recovery issues are discussed. Also includes the study of front-end environments that access the database.
Prerequisite: COSC 5335 and 5321.

COSC 5337 DATA MINING
3 Semester Credit Hours (3 Lecture Hours)

COSC 5340 HUMAN-COMPUTER INTERACTION
3 Semester Credit Hours (3 Lecture Hours)
Graduate-level survey of the field of Human-Computer Interaction (HCI) focusing on design strategies for making software usable by real-world people for doing real-world work. Topics include the role of HCI in the software product life cycle, task analysis of the user's work, architectures for human-computer dialogues, new and traditional approaches to user interface design, and user interface standards.
Prerequisite: COSC 5331.

COSC 5350 ADVANCED TOPICS IN DBMS
3 Semester Credit Hours (3 Lecture Hours)
The study of emerging database technologies. Topics are chosen from data warehousing, distributed databases, spatial databases and web-based applications.
Prerequisite: COSC 5336.

COSC 5351 ADVANCED COMPUTER ARCHITECTURE
3 Semester Credit Hours (3 Lecture Hours)
COMPUTER ARCHITECTURE An overview of computer architecture, which stresses the underlying design principles and the impact of these principles on computer performance. General topics include design methodology, processor design, control design, memory organization, system organization, and parallel processing.
Prerequisite: COSC 5331.

COSC 5352 ADVANCED OPERATING SYSTEMS
3 Semester Credit Hours (3 Lecture Hours)
Introduction to advanced concepts in operating systems and distributed systems. Topics include distributed system architectures, interprocess communication, distributed mutual exclusion, distributed synchronization and deadlock, agreement protocols, distributed scheduling and process management, distributed shared memory, distributed file systems, multiprocessor system architectures and operating systems, recovery and fault tolerance.
Prerequisite: COSC 5331.

COSC 5353 PRINCIPLES OF COMPILER CONSTRU
3 Semester Credit Hours (3 Lecture Hours)
COMPILER DESIGN AND CONSTRUCTION This course introduces the basic concepts and mechanisms traditionally employed in language translators, with emphasis on compilers. Topics include strategies for syntactic and semantic analysis, techniques of code optimization and approaches toward code generation.
Prerequisite: COSC 5330 and MATH 2305.

COSC 5354 ARTIFICIAL INTELLIGENCE
3 Semester Credit Hours (3 Lecture Hours)
Fundamental concepts and techniques for the design of computer-based, intelligent systems. Topics include: a brief history, methods for knowledge representation, heuristic search techniques, programming in LISP or Prolog.
Prerequisite: COSC 5321 and MATH 2305.

COSC 5355 DATA COMMUNICATIONS NETWORKING
3 Semester Credit Hours (3 Lecture Hours)
DATA COMMUNICATION SYSTEMS Areas studied include principles of computer-based communication systems, analysis and design of computer networks, and distributed data processing.
Prerequisite: COSC 5331.

COSC 5356 THEORY OF COMPUTATION
3 Semester Credit Hours (3 Lecture Hours)
THEORETICAL ASPECTS OF COMPUTING An introduction to theoretical foundations of modern computing. Topics include finite state machine concepts, formal grammars, and basic computability concepts.
Prerequisite: COSC 5321 and MATH 2305.

COSC 5357 WIRELESS SENSOR NETWORKS
3 Semester Credit Hours (3 Lecture Hours)
This is a graduate level course on wireless sensor networks; one of the fastest developing areas in computer science and engineering. The focus of this course is on the design of optimized architectures and protocols for such unique networks. Topics include the design principles of wireless sensor networks, energy management, MAC protocols, naming and addressing, localization, routing protocols, applications of wireless sensor networks, and associated challenges and measures.

COSC 5360 CONCURRENCY: PARALLEL AND DISTRIBUTED PROCESSING
3 Semester Credit Hours (3 Lecture Hours)
PARALLEL COMPUTING Introduction to the hardware and software issues in parallel computing. Topics include motivation and history, parallel architectures, parallel algorithm design, and parallel performance analysis. Students will be introduced to a variety of parallel computing paradigms including message passing systems and shared memory systems.
Prerequisite: COSC 5331.

COSC 5362 MOBILE SOFTWARE DEVELOPMENT
3 Semester Credit Hours (3 Lecture Hours)
Survey of software development on mobile platforms including both native and cross-platform applications with topics such as: prototyping, programming, testing, debugging, and deploying. Coverage of software life cycle on mobile platforms and how mobile hardware differs from traditional computers. COSC 5321

COSC 5370 ADVANCED SOFTWARE ENGINEERING
3 Semester Credit Hours (3 Lecture Hours)
Areas studied include engineering principles and their application to the design, development, testing, and maintenance of large software systems, tools and processes for managing the complexities inherent in creating and maintaining large software systems.
Prerequisite: COSC 5321.

COSC 5374 COMPUTER FORENSICS
3 Semester Credit Hours (3 Lecture Hours)
This course will introduce students to the fundamentals of computer forensics and various software tools used in cyber-crime analysis. Students will be introduced to established methodologies for conducting computer forensic investigations, as well as to emerging international standards for computer forensics. Applicable laws and regulations dealing with computer forensic analysis will also be discussed.
Prerequisite: COSC 5312.

COSC 5375 INFORMATION ASSURANCE
3 Semester Credit Hours (3 Lecture Hours)
An introduction to information security and assurance. This course covers the basic notions of confidentiality, integrity, availability, authentication models, protection models, secure programming, audit, intrusion detection and response, operational security issues, physical security issues, personnel security, policy formation and enforcement, access controls, information flow, legal and social issues, classification, trust modeling, and risk assessment.
Prerequisite: COSC 5312.

COSC 5376 NETWORK SECURITY
3 Semester Credit Hours (3 Lecture Hours)
This course is a study of networking basics and security essentials with respect to information services provided over a computer network. The course covers the technical details of security threats, vulnerabilities, attacks, policies, and countermeasures such as firewalls, honeypots, intrusion detection systems, and cryptographic algorithms for confidentiality and authentication and the development of strategies to protect information services and resources accessible on a computer network.
Prerequisite: COSC 5375.

COSC 5377 APPLIED CRYPTOGRAPHY
3 Semester Credit Hours (3 Lecture Hours)
This course includes an introduction to cryptographic algorithms and protocols for encrypting information securely, techniques for analyzing vulnerabilities of protocols, approaches to digital signatures and information digests, and implementation approaches for the most significant cryptographic methodologies.
Prerequisite: COSC 5312.

COSC 5379 ADVANCED INFORMATION ASSURANCE
3 Semester Credit Hours (3 Lecture Hours)
This course encompasses a broad range of topics involving information security, communications security, network security, risk analysis, operational security, health information privacy, criminal justice digital forensics, homeland security, the human element and social engineering, and applicable national and international laws. An in-depth information assurance capstone project or research paper will be required of each student to satisfy the information assurance graduate option requirements.
Prerequisite: COSC 5375.

COSC 5390 Internship
3 Semester Credit Hours
INDIVIDUAL CONTRACT AGREEMENT INVOLVING STUDENT, FACULTY, AND COOPERATING AGENCY (DISCIPLINE-RELATED BUSINESS, NONPROFIT ORGANIZATION, OR GOVERNMENT AGENCY) TO GAIN PRACTICAL EXPERIENCE APPROPRIATE TO COMPUTER SCIENCE IN OFF-CAMPUS SETTING. GRADE ASSIGNED WILL BE "CREDIT" (CR) OR "NO CREDIT" (NC).

COSC 5393 RESEARCH METHODS IN COMP SCIEN
3 Semester Credit Hours (3 Lecture Hours)
RESEARCH METHODS IN COMPUTER SCIENCE This course provides students with a range of experiences in conducting and communicating research. Students will learn major research methods and techniques. Experiences will be gained in all stages of research: reviewing literature, writing a proposal, designing an approach, and reporting results. Critical-reading/writing assignments and class discussions on state-of-the-art research in Computer Science will provide students with major research aspects. Fall, Spring

COSC 5395 GRADUATE PROJECT AND TECHNICAL REPORT
3 Semester Credit Hours
AN APPLIED RESEARCH PROJECT IN COMPUTING FROM PROBLEM DEFINITION TO IMPLEMENTATION IN AN AREA OF PARTICULAR INTEREST TO THE STUDENT THAT RELATES TO THE COURSE OF STUDY.
Prerequisite: COSC 5393 and 5370.

COSC 5396 DIRECTED INDEPENDENT STUDY
1-3 Semester Credit Hours
Study in areas of current interest. (A maximum of six hours may be counted toward the MS degree.) Fall, Spring, Summer.

COSC 5398 Thesis I
3 Semester Credit Hours (3 Lecture Hours)
THIS COURSE IS FOR COMPUTER SCIENCE MS STUDENTS CHOOSING THE THESIS OPTION. UPON CHOOSING A THESIS ADVISOR, STUDENTS WILL REGISTER FOR THIS COURSE. THIS COURSE IS ONLY CREDIT/NO CREDIT. STUDENTS WILL BE GIVEN A GRADE OF IN-PROGRESS UNTIL SUCCESSFULLY COMPLETING THEIR THESIS.
Prerequisite: COSC 6393.

COSC 5399 Thesis II
3 Semester Credit Hours (3 Lecture Hours)
THIS COURSE IS FOR COMPUTER SCIENCE MS STUDENTS CHOOSING THE THESIS OPTION. STUDENTS WILL CONTINUALLY REGISTER FOR THIS COURSE UNTIL SUCCESSFUL COMPLETION OF THEIR THESIS. A GRADE OF IN-PROGRESS WILL BE ASSIGNED UNTIL EITHER SUCCESSFUL COMPLETION OR FAILING TO REGISTER. IF FAILING TO REGISTER STUDENTS WILL RECEIVE A GRADE OF NO CREDIT FOR ALL 5399 AND 5398 COURSES.
Prerequisite: COSC 5398.

COSC 5590 SELECTED TOPICS
1-5 Semester Credit Hours (1-5 Lecture Hours)
Variable content study of specific areas of computer and information systems. May be repeated for credit when topics vary. Offered on sufficient demand.

COSC 5999 Advanced Research in Computer Science
1-9 Semester Credit Hours (1-9 Lecture Hours)
ADVANCED WORK IN A SPECIALIZED AREA OF COMPUTER SCIENCE. DOES NOT COUNT AS CREDIT TOWARD A DEGREE IN COMPUTER SCIENCE. COURSE IS TAKEN AS CREDIT/NON-CREDIT.

COSC 6324 Digital Image Processing
3 Semester Credit Hours
THIS COURSE INTRODUCES CONCEPTS AND TECHNIQUES FOR IMAGE PROCESSING. THE OBJECTIVE OF THIS COURSE IS TO INTRODUCE THE FUNDAMENTAL TECHNIQUES AND ALGORITHMS USED FOR PROCESSING AND EXTRACTING USEFUL INFORMATION FROM DIGITAL IMAGES. THE STUDENTS WILL LEARN HOW TO APPLY THE IMAGE PROCESSING METHODS TO SOLVE REAL-WORLD PROBLEMS.

COSC 6326 Computer Vision
3 Semester Credit Hours
THIS GRADUATE COURSE INTRODUCES CONCEPTS AND TECHNIQUES FOR MACHINE VISION. PARTICULAR EMPHASIS WILL BE PLACED ON METHODS USED FOR OBJECT RECOGNITION, MACHINE LEARNING, CONTENT-BASED IMAGE RETRIEVAL, IMAGE MATCHING, 3D VISION, TRACKING AND MOTION ANALYSIS.
Prerequisite: COSC 6324.

COSC 6327 Introduction to Computer Graphics
3 Semester Credit Hours
THIS GRADUATE COURSE PROVIDES STUDENTS WITH A FOUNDATION IN BASIC PRINCIPLES AND TECHNIQUES FOR COMPUTER GRAPHICS ON MODERN GRAPHICS HARDWARE. STUDENTS WILL GAIN EXPERIENCE IN INTERACTIVE COMPUTER GRAPHICS USING THE OPENGL API. TOPICS INCLUDE: GRAPHICS HARDWARE, RENDERING, PERSPECTIVE, LIGHTING, AND GEOMETRY.

COSC 6328 Advanced Computer Graphics
3 Semester Credit Hours
THIS COURSE COVERS ADVANCED COMPUTER GRAPHICS TECHNIQUES. STUDENTS WILL BE INTRODUCED TO STATE-OF-THE-ART METHODS IN COMPUTER GRAPHICS. THIS COURSE WILL FOCUS ON TECHNIQUES FOR REAL-TIME RENDERING AND ANIMATION.
Prerequisite: COSC 4328 or 6327.

COSC 6334 Design and Analysis of Algorithms
3 Semester Credit Hours (3 Lecture Hours)
AN ADVANCED COURSE THAT CONCENTRATES ON THE DESIGN AND ANALYSIS OF ALGORITHMS USED TO SOLVE A VARIETY OF PROBLEMS. THE METHODS OF DESIGN COVERED INCLUDE SUCH TOPICS AS: DIVIDE-AND-CONQUER, THE GREEDY METHOD, DYNAMIC PROGRAMMING, SEARCH AND TRAVERSAL TECHNIQUES, AND BACKTRACKING.
Prerequisite: COSC 5321, MATH 2413 and 2305.

COSC 6336 Database Management Systems
3 Semester Credit Hours (3 Lecture Hours)
A STUDY OF CONTEMPORARY DATABASE MANAGEMENT CONCEPTS. PERFORMANCE (INDEXING, QUERY OPTIMIZATION, UPDATE OPTIMIZATION), CONCURRENCY, SECURITY AND RECOVERY ISSUES ARE DISCUSSED. ALSO INCLUDES THE STUDY OF FRONT-END ENVIRONMENTS THAT ACCESS THE DATABASE.
Prerequisite: COSC 5321.

COSC 6337 Data Mining
3 Semester Credit Hours
AN INTRODUCTION TO FUNDAMENTAL STRATEGIES AND METHODOLOGIES FOR DATA MINING. TOPICS INCLUDE DATA PREPROCESSING, MINING FREQUENT DATA PATTERNS, CLASSIFICATION, CLUSTERING, AND OUTLIER DETECTION.

COSC 6338 Machine Learning
3 Semester Credit Hours (3 Lecture Hours)
MACHINE LEARNING IS A SET OF TECHNIQUES THAT HAVE BEEN SUCCESSFULLY USED IN THE PAST FEW DECADES FOR DATA ANALYSIS, PROCESS AUTOMATION, FUNCTION OPTIMIZATION, MODEL BUILDING, AND MANY OTHERS. THESE TECHNIQUES HAVE BEEN EXPLORED IN A DIVERSITY OF FIELDS SUCH AS ROBOTICS, SELF-DRIVING CARS, BIG DATA, CONTROL OF AUTONOMOUS SYSTEMS, IMAGE ANALYSIS, OBJECT RECOGNITION, DATA MINING, BUSINESS, AND FINANCIAL FORECASTING, TRANSPORTATION SYSTEMS, ANTENNA DESIGN, MEDICAL CARE SYSTEMS, AND MANY OTHERS. ML IS A SUBDIVISION OF ARTIFICIAL INTELLIGENCE THAT GIVES MACHINES THE ABILITY TO LEARN AND ADAPT WITH DIFFERENT ACQUIRED KNOWLEDGE AND EXPERIENCE. IN THIS COURSE, A STUDENT WILL LEARN ABOUT STATE OF THE ART ON MACHINE LEARNING AND GET TO KNOW HOW THEY CAN CARRY OUT THESE EVOLVING LEARNING ALGORITHMS. ML ALGORITHMS ATTEMPT TO MIMIC HOW THE HUMAN BRAIN WORKS. WE PLAN TO DEVELOP MANY EXERCISES ON HOW THESE ML ALGORITHMS WORK IN PRACTICAL APPLICATIONS IN BOTH INDUSTRY AND BASIC SCIENCE. WE PLAN TO COVER TOPICS SUCH AS ARTIFICIAL NETWORK NETWORKS, FUZZY LOGIC, HYBRID SYSTEMS, SEARCH AND OPTIMIZATION, CLASSIFICATION, CLUSTERING AND DEEP LEARNING. STUDENTS WILL GAIN EXPERIENCES ON SOME PROGRAMMING TOOLS AND A VARIETY OF APPLICATIONS OF MACHINE LEARNING.

COSC 6339 Deep Learning
3 Semester Credit Hours (3 Lecture Hours)
THIS COURSE INTRODUCES CONCEPTS AND TECHNIQUES FOR DEEP LEARNING. THE OBJECTIVE OF THIS COURSE IS TO INTRODUCE THE FUNDAMENTAL THEORY AND APPLICATION OF DEEP LEARNING. PARTICULAR EMPHASIS WILL BE PLACED ON REGULARIZATION AND OPTIMIZATION OF DEEP LEARNING MODELS, CONVOLUTIONAL NETWORK, RECURRENT NEURAL NETWORKS, AUTOENCODERS AND GENERATIVE MODELS. IN ADDITION, THE STUDENTS WILL LEARN HOW TO APPLY THE METHODS TO SOLVE REAL-WORLD PROBLEMS IN SEVERAL AREAS INCLUDING REMOTE SENSING, GEOSPATIAL, AND MEDICAL APPLICATIONS AND DEVELOP THE INSIGHT NECESSARY TO USE THE TOOLS AND TECHNIQUES TO SOLVE ANY NEW PROBLEM.

COSC 6340 Human-Computer Interaction
3 Semester Credit Hours (3 Lecture Hours)
THIS GRADUATE COURSE INTRODUCES CONCEPTS AND TECHNIQUES FOR HUMAN COMPUTER INTERACTION. ATTENTION WILL BE PAID TO USING NON-TRADITIONAL INPUTS SUCH AS CAMERAS AND MICROPHONES. STUDENTS WILL LEARN TOOLS FOR USING THESE INPUTS TO CREATE INTERACTIONS WITH USERS.
Prerequisite: COSC 5331.

COSC 6350 Advanced Topics in DBMS
3 Semester Credit Hours (3 Lecture Hours)
THE STUDY OF EMERGING DATABASE TECHNOLOGIES. TOPICS ARE CHOSEN FROM DATA WAREHOUSING, DISTRIBUTED DATABASES, SPATIAL DATABASES AND WEB-BASED APPLICATIONS.
Prerequisite: COSC 6336.

COSC 6351 Advanced Computer Architecture
3 Semester Credit Hours
AN OVERVIEW OF COMPUTER ARCHITECTURE, WHICH STRESSES THE UNDERLYING DESIGN PRINCIPLES AND THE IMPACT OF THESE PRINCIPLES ON COMPUTER PERFORMANCE. GENERAL TOPICS INCLUDE DESIGN METHODOLOGY, PROCESSOR DESIGN, CONTROL DESIGN, MEMORY ORGANIZATION, SYSTEM ORGANIZATION, AND PARALLEL PROCESSING.
Prerequisite: COSC 5331.

COSC 6352 Advanced Operating Systems
3 Semester Credit Hours (3 Lecture Hours)
INTRODUCTION TO ADVANCED CONCEPTS IN OPERATING SYSTEMS AND DISTRIBUTED SYSTEMS. TOPICS INCLUDE DISTRIBUTED SYSTEM ARCHITECTURES, INTERPROCESS COMMUNICATION, DISTRIBUTED MUTUAL EXCLUSION, DISTRIBUTED SYNCHRONIZATION AND DEADLOCK, AGREEMENT PROTOCOLS, DISTRIBUTED SCHEDULING AND PROCESS MANAGEMENT, DISTRIBUTED SHARED MEMORY, DISTRIBUTED FILE SYSTEMS, MULTIPROCESSOR SYSTEM ARCHITECTURES AND OPERATING SYSTEMS, RECOVERY AND FAULT TOLERANCE.
Prerequisite: COSC 5331.

COSC 6353 Compiler Design and Construction
3 Semester Credit Hours
THIS COURSE INTRODUCES THE BASIC CONCEPTS AND MECHANISMS TRADITIONALLY EMPLOYED IN LANGUAGE TRANSLATORS, WITH EMPHASIS ON COMPILERS. TOPICS INCLUDE STRATEGIES FOR SYNTACTIC AND SEMANTIC ANALYSIS, TECHNIQUES OF CODE OPTIMIZATION AND APPROACHES TOWARD CODE GENERATION.
Prerequisite: MATH 2305.

COSC 6354 Artificial Intelligence
3 Semester Credit Hours
FUNDAMENTAL CONCEPTS AND TECHNIQUES FOR THE DESIGN OF COMPUTER-BASED, INTELLIGENT SYSTEMS. TOPICS INCLUDE: A BRIEF HISTORY, METHODS FOR KNOWLEDGE REPRESENTATION, HEURISTIC SEARCH TECHNIQUES, PROGRAMMING IN LISP OR PROLOG.
Prerequisite: COSC 5321 and MATH 2305.

COSC 6355 Data Communications and Networking
3 Semester Credit Hours (3 Lecture Hours)
AREAS STUDIED INCLUDE PRINCIPLES OF COMPUTER-BASED COMMUNICATION SYSTEMS, ANALYSIS AND DESIGN OF COMPUTER NETWORKS, AND DISTRIBUTED DATA PROCESSING.
Prerequisite: COSC 5331.

COSC 6356 Theory of Computation
3 Semester Credit Hours
AN INTRODUCTION TO THEORETICAL FOUNDATIONS OF MODERN COMPUTING. TOPICS INCLUDE FINITE STATE MACHINE CONCEPTS, FORMAL GRAMMARS, AND BASIC COMPUTABILITY CONCEPTS.
Prerequisite: COSC 5321 and MATH 2305.

COSC 6357 Wireless Sensor Networks
3 Semester Credit Hours
THIS IS A GRADUATE LEVEL COURSE ON WIRELESS SENSOR NETWORKS; ONE OF THE FASTEST DEVELOPING AREAS IN COMPUTER SCIENCE AND ENGINEERING. THE FOCUS OF THIS COURSE IS ON THE DESIGN OF OPTIMIZED ARCHITECTURES AND PROTOCOLS FOR SUCH UNIQUE NETWORKS. TOPICS INCLUDE THE DESIGN PRINCIPLES OF WIRELESS SENSOR NETWORKS, ENERGY MANAGEMENT, MAC PROTOCOLS, NAMING AND ADDRESSING, LOCALIZATION, ROUTING PROTOCOLS, APPLICATIONS OF WIRELESS SENSOR NETWORKS, AND ASSOCIATED CHALLENGES AND MEASURES.

COSC 6360 Parallel Computing
3 Semester Credit Hours
INTRODUCTION TO THE HARDWARE AND SOFTWARE ISSUES IN PARALLEL COMPUTING. TOPICS INCLUDE MOTIVATION AND HISTORY, PARALLEL ARCHITECTURES, PARALLEL ALGORITHM DESIGN, AND PARALLEL PERFORMANCE ANALYSIS. STUDENTS WILL BE INTRODUCED TO A VARIETY OF PARALLEL COMPUTING PARADIGMS INCLUDING MESSAGE PASSING SYSTEMS AND SHARED MEMORY SYSTEMS.
Prerequisite: COSC 5331.

COSC 6361 Parallel Algorithms
3 Semester Credit Hours (3 Lecture Hours)
INTRODUCES AND EVALUATES IMPORTANT MODELS OF PARALLEL AND DISTRIBUTED COMPUTATION. TOPICS INCLUDE A SELECTION OF PARALLEL ALGORITHMS FOR VARIOUS MODELS OF PARALLEL COMPUTATION, COMBINATIONAL CIRCUITS, PARALLEL PREFIX COMPUTATION, DIVIDE AND CONQUER, POINTER BASED DATA STRUCTURES, LINEAR ARRAYS, MESHES AND RELATED MODELS, AND HYPERCUBES.

COSC 6362 Mobile Software Development
3 Semester Credit Hours
SURVEY OF SOFTWARE DEVELOPMENT ON MOBILE PLATFORMS INCLUDING BOTH NATIVE AND CROSS-PLATFORM APPLICATIONS WITH TOPICS SUCH AS: PROTOTYPING, PROGRAMMING, TESTING, DEBUGGING, AND DEPLOYING. COVERAGE OF SOFTWARE LIFE CYCLE ON MOBILE PLATFORMS AND HOW MOBILE HARDWARE DIFFERS FROM TRADITIONAL COMPUTERS.
Prerequisite: COSC 5321.

COSC 6365 Current Trends in Programming
3 Semester Credit Hours (3 Lecture Hours)
THIS IS A SURVEY OF CURRENT TRENDS IN COMPUTER PROGRAMMING. THE FOCUS OF THIS COURSE IS ON THE DEVELOPMENT OF COMPUTER PROGRAMS UTILIZING THE LATEST TECHNOLOGIES AND PARADIGMS. TOPICS INCLUDE STATE-OF-THE-ART IN PROBLEM SOLVING AND SOFTWARE DEVELOPMENT, PROGRAMMING TECHNIQUES AND APPROACHES, PROGRAMMING LANGUAGES, DEVELOPMENT TOOLS AND ENVIRONMENTS, AND SOFTWARE DEPLOYMENT METHODS.
Prerequisite: COSC 5321.

COSC 6370 Advanced Software Engineering
3 Semester Credit Hours
AREAS STUDIED INCLUDE ENGINEERING PRINCIPLES AND THEIR APPLICATION TO THE DESIGN, DEVELOPMENT, TESTING, AND MAINTENANCE OF LARGE SOFTWARE SYSTEMS, TOOLS AND PROCESSES FOR MANAGING THE COMPLEXITIES INHERENT IN CREATING AND MAINTAINING LARGE SOFTWARE SYSTEMS.
Prerequisite: COSC 5321.

COSC 6374 Computer Forensics
3 Semester Credit Hours
THIS COURSE WILL INTRODUCE STUDENTS TO THE FUNDAMENTALS OF COMPUTER FORENSICS AND VARIOUS SOFTWARE TOOLS USED IN CYBER-CRIME ANALYSIS. STUDENTS WILL BE INTRODUCED TO ESTABLISHED METHODOLOGIES FOR CONDUCTING COMPUTER FORENSIC INVESTIGATIONS, AS WELL AS TO EMERGING INTERNATIONAL STANDARDS FOR COMPUTER FORENSICS. APPLICABLE LAWS AND REGULATIONS DEALING WITH COMPUTER FORENSIC ANALYSIS WILL ALSO BE DISCUSSED.

COSC 6375 Information Assurance
3 Semester Credit Hours (3 Lecture Hours)
AN INTRODUCTION TO INFORMATION SECURITY AND ASSURANCE. THIS COURSE COVERS THE BASIC NOTIONS OF CONFIDENTIALITY, INTEGRITY, AVAILABILITY, AUTHENTICATION MODELS, PROTECTION MODELS, SECURE PROGRAMMING, AUDIT, INTRUSION DETECTION AND RESPONSE, OPERATIONAL SECURITY ISSUES, PHYSICAL SECURITY ISSUES, PERSONNEL SECURITY, POLICY FORMATION AND ENFORCEMENT, ACCESS CONTROLS, INFORMATION FLOW, LEGAL AND SOCIAL ISSUES, CLASSIFICATION, TRUST MODELING, AND RISK ASSESSMENT.

COSC 6376 Network Security
3 Semester Credit Hours
THIS COURSE IS A STUDY OF NETWORKING BASICS AND SECURITY ESSENTIALS WITH RESPECT TO INFORMATION SERVICES PROVIDED OVER A COMPUTER NETWORK. THE COURSE COVERS THE TECHNICAL DETAILS OF SECURITY THREATS, VULNERABILITIES, ATTACKS, POLICIES, AND COUNTERMEASURES SUCH AS FIREWALLS, HONEYPOTS, INTRUSION DETECTION SYSTEMS, AND CRYPTOGRAPHIC ALGORITHMS FOR CONFIDENTIALITY AND AUTHENTICATION AND THE DEVELOPMENT OF STRATEGIES TO PROTECT INFORMATION SERVICES AND RESOURCES ACCESSIBLE ON A COMPUTER NETWORK.
Prerequisite: COSC 6375.

COSC 6377 Applied Cryptography
3 Semester Credit Hours
THIS COURSE INCLUDES AN INTRODUCTION TO CRYPTOGRAPHIC ALGORITHMS AND PROTOCOLS FOR ENCRYPTING INFORMATION SECURELY, TECHNIQUES FOR ANALYZING VULNERABILITIES OF PROTOCOLS, APPROACHES TO DIGITAL SIGNATURES AND INFORMATION DIGESTS, AND IMPLEMENTATION APPROACHES FOR THE MOST SIGNIFICANT CRYPTOGRAPHIC METHODOLOGIES.

COSC 6379 Advanced Information Assurance
3 Semester Credit Hours
THIS COURSE ENCOMPASSES A BROAD RANGE OF TOPICS INVOLVING INFORMATION SECURITY, COMMUNICATIONS SECURITY, NETWORK SECURITY, RISK ANALYSIS, OPERATIONAL SECURITY, HEALTH INFORMATION PRIVACY, CRIMINAL JUSTICE DIGITAL FORENSICS, HOMELAND SECURITY, THE HUMAN ELEMENT AND SOCIAL ENGINEERING, AND APPLICABLE NATIONAL AND INTERNATIONAL LAWS. AN IN-DEPTH INFORMATION ASSURANCE CAPSTONE PROJECT OR RESEARCH PAPER WILL BE REQUIRED OF EACH STUDENT TO SATISFY THE INFORMATION ASSURANCE GRADUATE OPTION REQUIREMENTS.
Prerequisite: COSC 6375.

COSC 6380 Data Analytics
3 Semester Credit Hours (3 Lecture Hours)
THIS COURSE WILL INTRODUCE STATE-OF-THE-ART TECHNIQUES TO PROCESS AND ANALYZE DIFFERENT TYPES OF DATA, GENERATE INSIGHTS AND KNOWLEDGE FROM DATA, AND MAKE DATA-BASED DECISIONS AND PREDICTIONS. REAL-WORLD EXAMPLES WILL BE USED TO FAMILIARIZE STUDENTS WITH THE THEORY AND APPLICATIONS. MAIN TOPICS INCLUDE DATA PREPROCESSING, PROBABILITY THEORY, TESTS OF HYPOTHESIS, AND VARIOUS DATA ANALYSIS TECHNIQUES (E.G., CLUSTERING, CLASSIFICATION, PREDICTION/FORECASTING, ETC.) FOR DIFFERENT TYPES OF DATA INCLUDING STATIC, TIME-SERIES, SPATIAL, AND SPATIOTEMPORAL.

COSC 6393 Research Methods in Computer Science
3 Semester Credit Hours
THIS COURSE PROVIDES STUDENTS WITH A RANGE OF EXPERIENCES IN CONDUCTING AND COMMUNICATING RESEARCH. STUDENTS WILL LEARN MAJOR RESEARCH METHODS AND TECHNIQUES. EXPERIENCES WILL BE GAINED IN ALL STAGES OF RESEARCH: REVIEWING LITERATURE, WRITING A PROPOSAL, DESIGNING AN APPROACH, AND REPORTING RESULTS. CRITICAL-READING/WRITING ASSIGNMENTS AND CLASS DISCUSSIONS ON STATE-OF-THE-ART RESEARCH IN COMPUTER SCIENCE WILL PROVIDE STUDENTS WITH MAJOR RESEARCH ASPECTS. SPRING

COSC 6396 Directed Independent Study
3 Semester Credit Hours
STUDY IN AREAS OF CURRENT INTEREST. (A MAXIMUM OF SIX HOURS MAY BE COUNTED TOWARD THE MS DEGREE.) FALL, SPRING, SUMMER.

COSC 6590 Selected Topics
3 Semester Credit Hours (3 Lecture Hours)
VARIABLE CONTENT STUDY OF SPECIFIC AREAS OF COMPUTER AND INFORMATION SYSTEMS. MAY BE REPEATED FOR CREDIT WHEN TOPICS VARY. OFFERED ON SUFFICIENT DEMAND.