# ECU COURSE CATALOG

## 2025-2026 COMP. SCI. MATHEMATICS COURSES

**CPSMA-2103 Data Structures 3 Credits**
BASIC CONCEPTS OF DATA STRUCTURES, STACKS, QUEUES, TREES, TABLES, HASHING, LISTS, STRINGS, ARRAYS, FILES, AND APPLICATIONS TO VARIOUS AREAS OF COMPUTER SCIENCE. Required Previous: Take CMPSC-1133

**CPSMA-3103 Algorithm Analysis 3 Credits**
THIS COURSE PROVIDES AN INTRODUCTION TO THE ANALYSIS OF ALGORITHMS. TOPICS INCLUDE: COMMON ALGORITHMS USED IN PROGRAMMING, SORTING, SEARCHING, GRAPH TRAVERSAL, HASHING, DIVIDE-AND-CONQUER, DYNAMIC PROGRAMMING, GREEDY ALGORITHMS, ALGORITHMIC COMPLEXITY (WORST/AVERAGE/BEST CASE ANALYSIS FOR TIME/SPACE), NP COMPLEXITY, AND NP-COMPLETE PROBLEMS. Required Previous: Take MATH-2825 or MATH-2613

**CPSMA-3813 Data Mining 3 Credits**
INTRODUCTION IN KNOWLEDGE DISCOVERY AND DATA MINING, INCLUDING BASIC CONCEPTS OF DATA ANALYSIS IN DATABASES, DISCOVERING PATTERNS IN DATA, KNOWLEDGE INTERPRETATION, AND EXTRACTION. TOPICS INCLUDE MACHINE LEARNING TECHNIQUES SUCH AS ASSOCIATION RULE MINING, CLASSIFICATION, CLUSTERING, PREDICATION, TEXT MINING, AND WEB MINING. Required Previous: CPSMA-2103

**CPSMA-3913 Discrete Mathematics 3 Credits**
ACROSS ALL MATHEMATICS COURSES, DEPARTMENT OBJECTIVES FOR CONCLUDING STUDENTS' SKILLSET INCLUDE PROBLEM-SOLVING STRATEGIES AND REASONING SKILLS FOR ROUTINE AND NONROUTINE CONTEXTUAL OR NON-CONTEXTUAL PROBLEMS (ABSTRACT AND REAL-WORLD); COMMUNICATING MATHEMATICAL IDEAS ORALLY AND IN WRITING SUCH AS ANALYZING, REPRESENTING, AND GENERALIZING; CONSTRUCT MATHEMATICAL MODELS AS WELL AS UNDERSTAND THE PROCESS OF MODELING MATHEMATICS; AND COMPETENCY WITH SYMBOLIC MANIPULATION AS WELL AS FLEXIBILITY WITH Required Previous: Take CMPSC-1113

**CPSMA-3933 Operations Research 3 Credits**
A SURVEY OF OPERATIONS RESEARCH TECHNIQUES AS APPLIED TO QUANTITATIVE DECISION MAKING. TOPICS INCLUDE THE LINEAR PROGRAMMING MODEL AND OTHER OPTIMIZATION TECHNIQUES APPLIED TO INVENTORY, TRANSPORTATION, ASSIGNMENT, NETWORK MODELS, PROJECT SCHEDULING, AND SIMULATIONS. Required Previous: Take MATH-2613 or MATH-2825

**CPSMA-4313 Data Processing and Visualization 3 Credits**
ADDRESSES FUNDAMENTAL CONCEPTS AND TECHNIQUES IN SUMMARIZING DATA, MANAGING, AND PRESENTING PICTORIAL REPRESENTATIONS OF COMPLEX DATA FOR EFFECTIVE DATA-DRIVEN DECISION MAKING. TOPICS INCLUDE STATE-OF-THE-ART MODELING, DATA CLEANSING, ANALYSIS AND VISUALIZATION TECHNIQUES OF COMPLEX HIGH DIMENSIONAL DATA AS WELL AS PLOTTING AND DATA GRAPHICS SYSTEMS USING VARIOUS TOOLS. Required Previous: CPSMA-2103

**CPSMA-4373 Network Science 3 Credits**
PROVIDES AN INTRODUCTION TO NETWORK SCIENCE. MODELING OF SYSTEMS AS NETWORKS, USING GRAPH THEORY, FROM A VARIETY OF DISCIPLINES IS EXPLORED. ANALYSIS ALGORITHMS FOR NETWORKS AND THE CHALLENGES ASSOCIATED WITH APPLYING THEM TO LARGE SCALE NETWORKS ARE PRESENTED. RELATED SOFTWARE FOR NETWORK ANALYSIS IS STUDIED. THE COURSE WILL FOCUS ON THE APPLICATIONS OF COMPLEX NETWORK ANALYSIS TO FIELDS SUCH AS BIOLOGY, CYBER-SECURITY AND SOCIAL NETWORKS. Required Previous or Concurrent: CMPSC-1113 or Departmental Approval

**CPSMA-4413 Numerical Methods 3 Credits**
AN INTRODUCTION TO BASIC NUMERICAL ANALYSIS WITH EMPHASIS UPON NUMERICAL METHODS AND ERROR ANALYSIS IN THE STUDY OF SUCH TOPICS AS POWER SERIES, SOLUTIONS OF EQUATIONS AND SYSTEMS OF EQUATIONS, INTEGRATION AND DIFFERENTIATION, CONVERGENCE, AND SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS. Required Previous: Take MATH-3025

**CPSMA-4513 Data Applications in Business 3 Credits**
APPLICATIONS OF DATA TECHNIQUES WITH AN EMPHASIS ON REAL-WORLD PROBLEM SOLVING UTILIZING PROBLEMS FROM BUSINESS, INDUSTRY AND GOVERNMENT. TOPICS INCLUDE REGRESSION ANALYSIS, MARKOV CHAINS, ERROR ANALYSIS, MONTE CARLO SIMULATIONS, AND BIG DATA. EMPHASIS WILL BE MADE TO PROFESSIONAL CODING AND PRESENTATIONS.

**CPSMA-H3913 Honors-Discrete Mathematic 3 Credits**
ACROSS ALL MATHEMATICS COURSES, DEPARTMENT OBJECTIVES FOR CONCLUDING STUDENTS' SKILLSET INCLUDE PROBLEM-SOLVING STRATEGIES AND REASONING SKILLS FOR ROUTINE AND NONROUTINE CONTEXTUAL OR NON-CONTEXTUAL PROBLEMS (ABSTRACT AND REAL-WORLD); COMMUNICATING MATHEMATICAL IDEAS ORALLY AND IN WRITING SUCH AS ANALYZING, REPRESENTING, AND GENERALIZING; CONSTRUCT MATHEMATICAL MODELS AS WELL AS UNDERSTAND THE PROCESS OF MODELING MATHEMATICS; AND COMPETENCY WITH SYMBOLIC MANIPULATION AS WELL AS FLEXIBILITY WITH

**CPSMA-H3933 Honors-Operations Research 3 Credits**
A SURVEY OF OPERATIONS RESEARCH TECHNIQUES AS APPLIED TO QUANTITATIVE DECISION MAKING. TOPICS INCLUDE THE LINEAR PROGRAMMING MODEL AND OTHER OPTIMIZATION TECHNIQUES APPLIED TO INVENTORY, TRANSPORTATION, ASSIGNMENT, NETWORK MODELS, PROJECT SCHEDULING, AND SIMULATIONS.

**CPSMA-H4373 Honors-Network Science 3 Credits**
PROVIDES AN INTRODUCTION TO NETWORK SCIENCE. MODELING OF SYSTEMS AS NETWORKS, USING GRAPH THEORY, FROM A VARIETY OF DISCIPLINES IS EXPLORED. ANALYSIS ALGORITHMS FOR NETWORKS AND THE CHALLENGES ASSOCIATED WITH APPLYING THEM TO LARGE SCALE NETWORKS ARE PRESENTED. RELATED SOFTWARE FOR NETWORK ANALYSIS IS STUDIED. THE COURSE WILL FOCUS ON THE APPLICATIONS OF COMPLEX NETWORK ANALYSIS TO FIELDS SUCH AS BIOLOGY, CYBER-SECURITY AND SOCIAL NETWORKS.

**CPSMA-H4413 Honors-Numerical Methods 3 Credits**
AN INTRODUCTION TO BASIC NUMERICAL ANALYSIS WITH EMPHASIS UPON NUMERICAL METHODS AND ERROR ANALYSIS IN THE STUDY OF SUCH TOPICS AS POWER SERIES, SOLUTIONS OF EQUATIONS AND SYSTEMS OF EQUATIONS, INTEGRATION AND DIFFERENTIATION, CONVERGENCE, AND SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS.

**CPSMA-S5982 Seminar- 2 Credits**
DIRECTED INTENSIVE STUDY ON SELECTED PROBLEM OR SPECIAL TOPIC.