CS-501A  Computer Programming Essentials  Credits: 3
Term Offered: All Terms
Course Type(s): TPS
An introduction in computer programming for newly admitted graduate students. Students will learn basic concepts in modern computer programming. Students will complete all the programming exercises and assignments in the modern object-oriented language.

CS-501B  Program Development  Credits: 3
Prerequisite: CS-501A passed with a grade of B or higher.
Term Offered: All Terms
Course Type(s): None
Continuation at the coverage of the same modern object-oriented language introduced in CS-501A. More advanced object-oriented design, including inheritance and polymorphism.

CS-502  Theoretical Foundations of Computer Science  Credits: 3
Term Offered: All Terms
Course Type(s): None
Concepts, methods, models, and associated computer exercises for important topics in discrete mathematics and probability. Includes: logic and mathematical reasoning, functions, sets, summations, asymptotic notation, algorithms and complexity, number theory, cryptography, matrix algebra, induction and recursion, counting techniques, combinatorial objects, discrete structures, discrete probability theory, relations, graph theory, moments, random variables, and graph algorithms. Limited to Computer Science majors.

CS-503  Data Structures and Algorithms  Credits: 3
Prerequisite: CS-501B passed with a grade of B or higher.
Term Offered: All Terms
Course Type(s): None
Design and implementation of fundamental data structures and algorithms, including: linked lists, hashing, sorting, trees, stacks, queues, sets and bags, and recursion. Application to problem solving and object-oriented design of moderate-sized programs.

CS-505  Operating Systems Concepts  Credits: 3
Prerequisite: CS-503 passed with a grade of B or higher.
Term Offered: All Terms
Course Type(s): None
The basic concepts of operating systems from the point of view of an advanced user: the interaction of the kernel, the command interpreter, and user processes. Focus is on process and resource management, concurrency control, and inter-process communication. Examples and projects are based mainly on Unix. The course also includes an introduction to computer architecture from an operating-systems perspective (processors, devices, interrupts, clocks, etc.).

CS-509  Advanced Object-Oriented Programming and Design  Credits: 3
Prerequisite: CS-501B passed with a grade of B or higher.
Term Offered: Fall Term
Course Type(s): None
Object-oriented programming and design, using a language different from that used in CS 501B. Used in classes, inheritance, polymorphism, and libraries.

CS-510  Technical Communication  Credits: 3
Prerequisite: Open only to those students accepted in the MS program in Computer Science.
Term Offered: All Terms
Course Type(s): CISEL
Preparation, analysis, synthesis, and presentation of system documentation, technical papers, and data flow diagrams; literature search.

CS-511  Algorithm Design  Credits: 3
Prerequisites: CS-502 and CS-503, both passed with a grade of B- or higher.
Term Offered: Spring Term
Course Type(s): CISEL
Design and analysis of algorithms; dependence of algorithm efficiency on data structure choice; correctness of algorithm implementation and basic design techniques and their applications to programming with fundamental data structures.

CS-512  Introduction to Intelligent Systems  Credits: 3
Prerequisites: CS-502 and CS-503, both passed with a grade of B- or higher.
Term Offered: Spring Term
Course Type(s): CISEL
Introduction to methods and algorithms used to incorporate intelligence into computer programs. Topics include search techniques, representation and reasoning, and machine learning. Applications of these methods are stressed. Also covers implementation of some of the fundamental algorithms.
CS-521  Artificial Intelligence  Credits: 3  
Prerequisites: CS-503 and CS-520, both passed with a grade of B- or higher.  
Term Offered: All Terms  
Course Type(s): None  
Basic and advanced methods in symbolic and quantitative artificial intelligence through Lisp programming techniques. Current issues concerning rule-based vs. statistical methods via applications.

CS-525  Simulation  Credits: 3  
Prerequisites: CS-502, CS-503, and CS-514, all passed with a grade of B- or higher.  
Term Offered: Spring Term  
Course Type(s): None  
Formal models of discrete event systems, computer simulation of models, and analysis of simulation results. Discrete event simulation is applied to studying the performance of computer and communication systems. Object-oriented design and programming in C++.

CS-529  Web Services and .NET  Credits: 3  
Prerequisite: CS-503 passed with a grade of B- or higher.  
Term Offered: Spring Term  
Course Type(s): CISEL  
Introduction to Web services. Theoretical and practical coverage of client-server architecture, communication protocols, and messaging, including XML and SOAP transactions. .NET Framework architecture is used for the applications. We contrast with other platforms, e.g., Java-based Web services. Students implement Web services and simple clients on PCs or mobile devices.

CS-532  Compiler Design  Credits: 3  
Prerequisite: CS-512 passed with a grade of B- or higher.  
Term Offered: All Terms  
Course Type(s): CISEL  
The major techniques used in compiler writing, lexical analysis, syntax analysis, storage management, error detection and recovery, and code generation. Tools for compiler writing (LEX, YACC, etc.).

CS-533  Database System Implementation  Credits: 3  
Prerequisites: CS-502 and CS-503, both passed with a grade of B- or higher.  
Term Offered: Fall Term  
Course Type(s): CISEL  
DBMS architecture, data storage and indexing, query processing and optimization, transaction management and recovery, and some issues related to advanced database applications.

CS-535  Telecommunications  Credits: 3  
Prerequisites: CS-502, CS-505, and CS-514, all passed with a grade of B- or higher.  
Term Offered: Fall Term  
Course Type(s): None  
In-depth coverage of the lower layers of the network hierarchy: Physical layer, Data Link layer, Network layer, and Transport layer.

CS-536  File Management and Query Strategies  Credits: 3  
Prerequisite: CS-503 passed with a grade of B or higher.  
Term Offered: Summer Term  
Course Type(s): None  
Addresses data storage and organization, file management principles, and query processing and applications. Students will gain hands-on experience in file processing and application development.

CS-550  Computer System Architecture  Credits: 3  
Prerequisites: CS-502 and CS-503, both passed with a grade of B- or higher.  
Term Offered: All Terms  
Course Type(s): None  
Computer system interconnection structures, central processing unit, control unit, microprogrammed control, memory organization, cache and virtual memory, computer arithmetic, RISC processors, introduction to parallel processing, and case studies.

CS-560  Master’s Seminar  Credits: 3  
Prerequisite: Completion of twenty-one credits toward the MS degree, including four core courses, or permission of the instructor.  
Term Offered: All Terms  
Course Type(s): CISEL  
Emphasis on preparation, analysis, synthesis, and presentation of software system documentation, project progress reports, and technical papers based on literature research.

CS-588  Computer Science Practice and Experiences  Credits: 1  
Term Offered: All Terms  
Course Type(s): None  
Provides opportunity for Computer Science graduate students to obtain related experience in employment at a local company or institution with Monmouth University sponsorship. Available to Computer Science graduate students who have completed at least eighteen credit hours of graduate courses (500 level), with a minimum GPA of 3.00. Does not satisfy elective requirements. Students may take the course a maximum of two times. This is a pass/fail course.

CS-598  Special Topics in Computer Science  Credits: 3  
Prerequisites: CS-502 and CS-503, both passed with a grade of B- or higher.  
Term Offered: All Terms  
Course Type(s): CISEL  
Subject matter varies with the interest of the students and of the professor teaching the course. The exact nature of the topic covered in any given semester is indicated in the student's transcript.

CS-599  Independent Study in Computer Science  Credits: 3  
Prerequisite: Completion of all foundation and core courses; minimum G.P.A. of 3.50.  
Term Offered: All Terms  
Course Type(s): None  
Independent study in a topic not substantially treated in a regular graduate course, for students with superior ability; weekly consultation. Prior permission of directing professor and the graduate program director is required. This course can only be taken once for credit.

CS-611  Secure Web Services Design  Credits: 3  
Term Offered: Spring Term  
Course Type(s): CISEL  
Prerequisite: CS-501B passed with a grade of B- or higher.  
Provides opportunity for Computer Science graduate students to obtain related experience in employment at a local company or institution with Monmouth University sponsorship. Available to Computer Science graduate students who have completed at least eighteen credit hours of graduate courses (500 level), with a minimum GPA of 3.00. Does not satisfy elective requirements. Students may take the course a maximum of two times. This is a pass/fail course.
CS-618 Data Mining Credits: 3
Prerequisites: CS-517 and CS-520, both passed with a grade of B- or higher.
Term Offered: Spring Term
Course Type(s): CISEL
An introduction to the fundamental concepts, algorithms, and techniques of data mining. Topics include: data preprocessing, classification algorithms and techniques, anomaly detection, and the design of data warehousing and OLAP systems.

CS-625 Internet Crawler Credits: 3
Prerequisite: CS-529 passed with a grade of B- or higher.
Term Offered: All Terms
Course Type(s): CISEL
In-depth coverage of the crawler component of modern search engines. Examination of the architecture of crawlers; algorithms for visitation, retrieval and processing of Web pages, and link analysis (e.g., PageRank computation). Coverage of ethical and legal issues of customized Web robots. Students build automatic Internet crawlers.

CS-628 Security of E-Systems and Networks Credits: 3
Prerequisite: CS-518 passed with a grade of B- or higher.
Term Offered: All Terms
Course Type(s): CISEL
The fundamental techniques in security of e-based Systems and Computer Networks. E-based systems are ubiquitous in the modern world with applications spanning e-commerce, e-government, e-services, Virtual Private Networks (VPNs), health care, and government organizations. Deals with the fundamental concepts and tools of security of e-based systems and computer networks and its range of applications. The topics to be covered include: authentication of users, system integrity, confidentiality of communication, availability of business service, non-repudiation of transactions, public key cryptosystems, authentication and digital signature, e-security tools such as Public Key Infrastructure (PKI) systems, biometric-based security systems, trust management systems in communication networks, intrusion detection systems, protecting against malware, and computer network security risk management. Intended for graduate students in computer science, software engineering, and electrical engineering who have some background in computer networks and fundamentals of computer security.

CS-635 Wireless Network Systems and Security Credits: 3
Prerequisite: CS-514 passed with a grade of B- or higher.
Term Offered: All Terms
Course Type(s): CISEL
Fundamental techniques in the design, operation, performance evaluation, and security of wireless network systems. Among the topics covered are first, second, third, and fourth generation wireless systems, cellular wireless networks, medium access techniques, physical layer protocols (AMPS, IS-95, IS-136, GSM, GPRS, EDGE, WCDMA, cdma2000, etc.), fixed wireless systems, personal area networks (PANs) including Bluetooth and Home RF systems, wireless local area network (WLAN) technologies, architectures, protocols, and standards, and advanced topics. Security of WLANs, wireless sensor networks (WSNs), cellular systems, and Bluetooth and Home RF networks will be dealt with as well. Intended for graduate students in computer science, software engineering, and electrical engineering who have some background in computer networks.

CS-661 Computer Science Advanced Project Credits: 3
Prerequisites: Completion of all foundation and core courses and departmental approval.
Term Offered: All Terms
Course Type(s): CISEL
A challenging project, such as the development of a large, complex program, done under the supervision of a faculty member.

CS-691 Computer Science Thesis I Credits: 3
Prerequisites: Completion of all foundation and core courses and departmental approval.
Term Offered: All Terms
Course Type(s): None
Independent investigation of special topics reflecting the research interests of the sponsoring professor. Provides students with an opportunity to do extended relevant research in collaboration with, or under the supervision of, a faculty member. Sequential registration of one or more credits is required until successful completion. (Minimum of six credits must be accumulated.)

CS-692 Computer Science Thesis II Credits: 3
Prerequisite: CS-691.
Term Offered: All Terms
Course Type(s): None
Independent investigation of special topics reflecting the research interests of the sponsoring professor. Provides students with an opportunity to do extended relevant research in collaboration with, or under the supervision of, a faculty member. Sequential registration of one or more credits is required until successful completion. (Minimum of six credits must be accumulated.)

CS-698 Advanced Special Topics Credits: 3
Prerequisite: CS-503 passed with a grade of B or higher or as announced in the course schedule.
Term Offered: All Terms
Course Type(s): CISEL
The advanced subject matter varies with the interest of the students and of the professor. The full syllabus for a specific offering will be filed with the STE and Graduate School Deans when it is scheduled. The exact nature of the topic covered in any given semester is indicated in the student's transcript.

CS-699 Independent Study in Computer Science Credits: 3
Prerequisites: A minimum GPA of 3.50; completion of all foundation and core courses and departmental approval.
Term Offered: All Terms
Course Type(s): CISEL
Independent study of a subject not substantially treated in a regular graduate course. Designed for students with superior abilities who, with guidance and direction from the supervising faculty member, can master a new subject. (Limited to students who have not yet taken CS-699.)