CSC 099/Orientation to Computer Science   **0 course units**
(fall)
An introduction to the computer science program with a focus on the discipline, including an investigation of computing ethics. Students familiarize themselves with departmental procedures, standards, staff and faculty. An introduction to mentored research and internship experiences engages the first-year student in the culture and expectations of the department and of the discipline. A short introduction to basic Unix knowledge. Students develop an appreciation for the services offered by the College and for the resources available within the department and across campus.

CSC 101/Introduction to Interactive Computing   **1 course unit**
(cross-listed as IMM 120)
(every semester)
A first course in computing languages for interactive multimedia. Students are introduced to the art of programming through state-of-the-art multimedia technologies (Processing). Through intensive laboratory experience students learn the programming fundamentals (e.g., variables, functions, control structures and logic, persistent storage, and networking). Problems related to interactivity are emphasized (e.g., through assignments based on interactive coding). Efficiency, data structure organization, and objects are introduced within the context of interactive computing problem solving. This course may not be taken by computer science majors without permission of the department, and then only for free elective credit.

CSC 102/Introduction to Computational Modeling   **1 course unit**
(occasionally)
Students model various social and other complex problems and analyze them using multiple computer simulation programs. Students also modify existing programs and implement simple custom modules so that they can analyze the problems of their choice. Through this process students are expected to learn the principles behind computational modeling which would let them see real-world problems in a precise and concise manner. This course may not be taken by computer science majors without permission of the department, and then only for free elective credit.

CSC 104/Human and Artificial Intelligence   **1 course unit**
(occasionally)
In this course students focus on both human and artificial intelligence as a means of improving one's own use of intellect. Various mathematical and computational mechanisms behind intelligence are explored, and analytical and logical reasoning skills are put into practice. Logical and probabilistic analysis, the two main themes behind the mathematical/computational mechanisms, are examined. Students use logical formulae to model particular aspects of human intelligence, e.g., communication and reasoning. They also use probabilistic methods to model decision making under uncertainty as well as certain aspects of learning.

CSC 105/Mobile Computing   **1 course unit**
(occasionally)
Requisite: Reserved for non-computer science students. Eligible for free elective credit for computer science majors.
This course strengthens skills in problem analysis and solution development using creative approaches in mobile computing. Students analyze problem specifications, explore how algorithms help solve problems, and create innovative solutions using programming and computing tools. Programming real applications for mobile devices such as smartphones or tablets is included in the course. No prior programming experience is needed. This course may not be taken by computer science majors without permission of the department, and then only for free elective credit.

CSC 199/Computer Science Professional Development Seminar　　　　**0.25 course units**
(fall)
Prerequisite: CSC099 (waived for students entering the computer science program from another program within TCNJ with prior similar experience) and a minimum of sophomore status. This course is a seminar offering for computer ccience students that provides them with information, tools and resources necessary for professional development and instills a need for life-long learning and growth in their field. It is a half semester, 0.25 units mandatory seminar for students majoring in computer science.

CSC 215/Computer Science I for Science and Engineering　　　　**1 course unit**
(every semester)
An introduction to computing and object-oriented programming, with an emphasis on using computational methods to develop algorithms to solve scientific problems. Topics include control structures, data typing including structures and arrays, parameterized procedures, objects and classes, and recursion as well as simple I/O control. This course may not be taken by computer science majors without permission of the department, and then only for free elective credit.

CSC 220/Computer Science I: Computational Problem Solving　　　　**1 course unit**
(every semester)
A first course in computer science for computer science majors in which students learn to express algorithmic ideas in an abstract manner. An object-oriented language such as Java will be introduced; however, the emphasis is on algorithmic design and implementation rather than language mechanics. Students will become intimately familiar with expressing mathematical ideas as programs.

CSC 230/Computer Science II: Data Structures　　　　**1 course unit**
(every semester)
Prerequisite: CSC 220
A second course in computer science in which students learn how the algorithms and structures studied in CSC 220 are implemented. Classic data structures (lists, queues, stacks, trees, and hash tables) and algorithms (searching and sorting) are considered. The analysis of implementation techniques is addressed by studying the trade-offs between static and dynamic structures.

CSC 250/Accelerated CS I, II　　　　**1 course unit**
(fall)
Prerequisite: Permission of the department for computer science majors; CSC 215 for non-majors
A first, intensive course in computer science for students with demonstrated extensive experience programming. Additionally, it is for students who took CS I/CS II courses elsewhere but have no experience programming in the programming language or paradigm that supports the CS I/CS II sequence. The course covers the material of CSC 220 (CS I) and CSC 230 (CS II) in one semester. The basic introduction to programming of CSC 220 is considered a review, while the emphasis on problem solving and solution design is presented within the context of a thorough grounding in the classic data structures using the modern object-oriented framework. *Note: Students (majors or minors) who take CSC 250 must complete an additional CS option*

CSC 270/Discrete Structures　　　　**1 course unit**
(every semester)
Prerequisite: Completion of CSC 215, 220, or 250 with a C or better)
This course introduces students to concepts and structures fundamental to computer science, while emphasizing algorithmic thinking, mathematical reasoning, and their applications. Topics include logic, sets, functions, relations, graphs, induction, recursion, languages and grammars, and finite-state machines.

CSC 307/Data Mining and Predictive Modeling   **1 course unit**
(occasionally)
Prerequisites: STA 215, and BIO 352 or CSC 320
An introduction to Data Mining and Predictive Modeling. Topics include decision trees, link functions, logic regression, neural networks, TreeNet, support vector machine, text mining, association rules (market basket analysis), and link analysis.

CSC 315/Database Systems   **1 course unit**
(fall, odd-numbered years)
Prerequisite: CSC 230 or 250 with a minimum grade of C
This course introduces students to the fundamental concepts necessary for designing and implementing database systems. It stresses the fundamentals of database modeling and design, the language and facilities provided by database management systems, and system implementation techniques. A database management system like Oracle or PostgreSQL is utilized to underscore concepts learned in class.

CSC 320/Information Retrieval   **1 course unit**
(cross-listed as IMM 320)
(fall, even-numbered years)
Prerequisites: For CS students or other majors: CSC 230 or 250 with a grade of C or higher. For IMM students: IMM core with a grade of C or higher
The course discusses theory and practice of searching and retrieval of information. Topics covered include automated indexing, statistical and linguistic models, text classification, Boolean and probabilistic approaches to indexing, query formulation and output ranking, information routing and filtering, topic detection and tracking, as well as measures of retrieval effectiveness, including relevance, utility, miss/false-alarm. Techniques for enhancing retrieval effectiveness including relevance feedback, query reformulation, thesauri, concept extraction, and automated summarization. Experimental retrieval approaches from relevant state-of-the-art conferences (TREC) as well as modern Internet search engines are discussed in detail.

CSC 325/Computer Architecture   **1 course unit**
(fall)
Prerequisites: CSC 230 or 250, and CSC 270 both with a grade of C or higher
Introduces the architecture of a general-purpose computer by considering its structure at the hardware and software levels through the instruction set. Project-oriented course that stresses design and implementation of the processor of a computer. Introduces design and simulation of combinational and sequential logic circuits, the design of the instruction set for a von Neumann architecture, and the writing of programs in an assembly language for such a machine. Topics include combinational logic design; finite state machines; instruction set architectures; elements of computer organization; RTL; processor and hardware control unit design; computer arithmetic and ALU design; memory subsystem and cache design; reduced instruction sets; and I/O interfaces.

CSC 335/Analysis of Algorithms   **1 course unit**
(fall)
Prerequisites: CSC 230 or 250, and CSC 270, both with a grade of C or higher
This course presents the major principles of algorithm design and analysis, and applies those principles to classical problems in computer science. Topics include complexity, advanced ADTs, searching and sorting, graph search and traversal, dynamic programming, cryptography, theoretical computer science, operations on polynomials and matrices, and pattern matching. As a capstone experience, students participate in a mini-colloquium covering the course topics.

CSC 345/Operating Systems **1 course unit**
(spring)
Prerequisites: CSC 325 with a minimum grade of C
Operating systems (OS) theory and implementation, examining the operating system as an interface between the application program and computer hardware. OS services for memory, processor, file, and device management are examined. Study of resource management implemented by an operating system in a multiprogramming environment. Case studies include system software design and implementation highlighting standard operating systems such as Unix, Linux, and Windows.

CSC 350/Computer Graphics **1 course unit**
(fall, odd-numbered years)
Prerequisites: CSC 230 or 250 and CSC 270, both with a grade of C or higher
This course is an introduction to the fundamentals underlying the design of computer graphics software, taking an algorithmic approach to the study of graphic operations required to create a complex scene. The modeling and transformation process is stressed. Topics include 2D and 3D graphic elements and transformations, viewing and clipping, hierarchical modeling, visible surface detection, and lighting models.

CSC 360/Computer Networking **1 course unit**
(spring, even-numbered years)
Prerequisites: CSC 230 or CSC 250 with a grade of C or higher
This course introduces basic elements of modern computer and telecommunication networks. A hybrid five-layer reference model resembling the popular TCP/IP model is discussed. In each layer, the state-of-the-art hardware and software technologies are introduced. These include: fiber-optic and mobile/cellular communications; HTTP/WEB; TCP/UDP and ATM adaptation layer protocols; network security.

CSC 365/Games I: Design and Architecture **1 course unit**
(cross-listed as IMM 365)
(fall)
Prerequisites: CSC 230 or CSC 250 or IMM 270
This course is an opportunity for students from a variety of disciplines to participate in the development of games. Through lectures, readings, discussions and hands-on workshops, the class will cover the game design process, with a focus on "playcentric" design. A variety of games will be created, both digital and non-digital using the tools and applications used in game design. The class will also consider games within their social context, exploring the relationship between games and real world issues such as addiction and behavior. Serious games and immersive environments will be explored as well as their impact on health and education.

CSC 380/Artificial Intelligence **1 course unit**
(spring, odd-numbered years)
Prerequisites: CSC 230 or 250 with a grade of C or higher; or permission of the instructor
The study of how to make the computer behave intelligently. Topics: state-space methods of problem solving, heuristic search techniques, representation and use of knowledge, applications and design of expert systems, natural language processing, vision and image understanding. Design of specifications for intelligent agents is discussed at length and a high level implementation is developed in First Order Logic, LISP, Prolog, or any of the current AI languages.

CSC 391/Independent Study in Computer Science **variable course units (0.3 – 1)**
(every semester)
Prerequisite: By invitation only, with permission of the department
Student independently studies an appropriate area. A faculty adviser and a project description must be agreed upon before registering for this course.

CSC 399/Internship in Computer Science   **1 course unit**
(every semester)
Prerequisites: Permission of department and college specified minimum GPA of 2.5, and upper-level standing (junior or senior) required
A supervised computer-related field experience in industrial, governmental, or the private sector. Faculty supervisor advises the student where to focus the learning objective for the given internship. A project at the internship is to be the level of research in junior/senior independent study topics in computer science. Grading is a letter grade. Paper and poster presentation required.

CSC 415/Software Engineering   **1 course unit**
(every semester)
Prerequisite: CSC 230 or CSC 250, with a grade of C or higher
This course introduces students to software engineering with an emphasis on collaborative problem solving and software application development. It aims to integrate the principles of computer science and other disciplines to develop systematic models and reliable techniques for producing high-quality software. The Unified Modeling Language is used to describe each stage of application development, particularly analysis and design.

CSC 425/Compilers and Interpreters   **1 course unit**
(spring, even-numbered years)
Prerequisites: CSC 270 and CSC 415, both with a grade of C or higher
This course balances theory and practice, by applying theoretical principles within a software project. Topics: formal language theory, regular expressions, finite state automata, Backus-Naur form grammars, formal and informal specification of semantics. Lexical analysis, parsing, scope analysis, type checking, and code generation. Issues of programming language design. Following an attribute grammar specification, students implement a compiler for an object-oriented language.

CSC 435/Programming Languages   **1 course unit**
(spring odd-numbered years)
Prerequisites: CSC 270 and CSC 415, both with a grade of C or higher
The principles and practices of programming languages are examined. Students gain experience in applying models of languages in varied contexts. Topics include: static and dynamic typing models; object-oriented, procedural, logic, and functional programming models; decision constructs and core data structures; and unique (language specific) high-level constructs. The emphasis is on language design, use, and implementation.

CSC 450/Computer and Network Security   **1 course unit**
(fall even-numbered years)
Prerequisites: CSC 360; or permission of the instructor
This course examines current concepts and practical techniques in computer and network security. In addition to participating in a broad discussion of system security, students gain hands on experience in diagnostic and development techniques. Students apply their depth of understanding in a broad array of computer science areas, such as computer architecture and organization, operating systems, networking, and software design to the security projects developed in this course.

CSC 445/Theory of Computation   **1 course unit**
(spring even-numbered years)
Prerequisites: CSC 270 and CSC 415, both with a grade of C or higher
This course focuses on the traditional, algorithmic theory of computation consisting of three subareas: (1) computability, (2) complexity theory, and (3) formal languages and automata. The topics include: Turing machines, decidability/undecidability, reducibility, Church-Turing thesis, context-free grammars/languages, push-down automata, finite automata, regular expressions/languages, and time/space complexity including NP-completeness.

CSC 465/Games II: Implementation and Project Management   1 course unit
(same as IMM 460)
(spring)
Prerequisites: CSC 365 or IMM365; or permission of the instructor
This is a multidisciplinary course that invites students from a variety of disciplines to participate in the implementation of a robust demonstration video game. Programmers, software engineers, digital artists, sound specialists and musicians work collaboratively to create a single game (designed in Games I). Each student defines a personal role in the process so that no two students will complete the same set of course requirements. All students however participate in learning about and implementing a project management structure to plan and execute the sequence of activities that must take place to complete the game. The class will also consider games within their social context, exploring the relationship between games and real world issues such as addiction and behavior. Serious games and immersive environments will be explored as well as their impact on health and education.

CSC 470/Topics in Computer Science   1 course unit
(every semester)
Prerequisites: CSC 270 and CSC 415, both with a grade of C or higher or permission of the department.
Study of an advanced topic in computer science chosen by the instructor. Normally taken by junior or senior computer science majors, this course may be elected several times, as long as the topics differ.

CSC 471/Genomics and Bioinformatics   1 course unit
(occasionally)
(cross-listed as BIO 471)
Prerequisites: BIO 185 and CSC 230 or 250
This course will cover theoretical and practical components of genomics and bioinformatics. The major topics will include mapping and sequencing genomes, sequence alignment of nucleic acids and proteins, haplotype maps, analysis of complex traits, parallel profiling of gene expression, proteomics, phylogenetic analysis, and data mining. The laboratory will begin with the *in silico* analysis of gene families, continue to the formulation of a testable hypothesis about gene function, writing a mini-grant for peer review, testing of the hypothesis in a model organism, and conclude with a formal presentation of the data generated during the semester. This course is best suited for undergraduates who wish to continue with a career in basic science or biomedical research.

CSC 498/Mentored Research I in Computer Science   0.25, 0.5, 0.75 or 1 course unit
(every semester)
Prerequisites: CSC 415 with a grade of C or higher, minimum 2.5 GPA, and minimum of 12 earned course units, and permission of faculty mentor
Intensive study of an advanced topic in computer science under the supervision of a faculty mentor. Emphasizes student activity, use of journals and monographs, discussions, solution and presentations of problems. This course culminates in the writing of a journal-style paper and the presentation of a public lecture. In order to satisfy the one course unit capstone requirement for the major, this course must be completed within a single semester or within two consecutive semesters with the same mentoring faculty, and includes a presentation of a public lecture or a poster.

CSC 499/Mentored Research II in Computer Science   0.25, 0.5, 0.75 or 1 course unit
(every semester)
Prerequisites: CSC 498, minimum 2.5 GPA, and minimum of 12 earned course units, and permission of faculty mentor
For continuing projects begun in CSC 498.