

Rowan University  
Computer Science Department

## Proposal: Minor Change to the Computer Science Prerequisites

### 1. Details

#### a. Changes Requested

We request approval for the following minor change to the Computer Science course prerequisites.

The Computer Science major and minor course requirements have changed over the last several years.

- Computer Science and Programming (0704.103) has been replaced with the two courses Introduction to Object Oriented Programming (0704.113) and Object Oriented Programming and Data Abstraction (0704.114).
- Discrete Structures (1703.160) has replaced Discrete Mathematics (1703.150).
- Computer Laboratory Techniques (0701.205) is no longer required. Instead, much of that material is included in Introduction to Object Oriented Programming (0704.113) and Object Oriented Programming and Data Abstraction (0704.114).
- A “bridge” course, Java for Object Oriented Programmers (0704.112), has been added to the curriculum for students who decide to major or minor in Computer Science after taking Computer Science and Programming (0704.103).

These already-approved curriculum changes require updating the prerequisites listed for several upper-level Computer Science courses.

- **From** Computer Science and Programming (0704.103) **To** Introduction to Object Oriented Programming (0704.113), or Computer Science and Programming (0704.103) and Java for Object Oriented Programmers (0704.112); and Object Oriented Programming and Data Abstraction (0704.114).
- **From** Discrete Mathematics (1703.150) **To** Discrete Structures (1703.160).
- **From** Computer Laboratory Techniques (0701.205) **To** *eliminated*.

Affected courses are Computer Laboratory Techniques (0701.205), Data Structures and Algorithms (0704.222), Structured Design and Programming Using COBOL (0704.233), Computer Organization (0706.205), Foundations of Computer Science (0707.210), Robotics (0707.310), and Artificial Intelligence (0707.450).

#### b. Sponsor

Stephen J. Hartley, Chair, and members of the Computer Science Department Curriculum Committee.

## 2. Rationale

### a. Need for the Changes

The updating of the prerequisites is made necessary by the course changes to the Computer Science major and minor.

### b. Curricular Effect

None (bookkeeping).

## 3. Results of Consultation

We solicited letters of consultation from Management Information Systems, Mathematics, and Electrical/Computer Engineering. Received letters are attached.

From hartley Thu Aug 19 14:31:29 2004  
To: Czochor@rowan.edu, hamilton@rowan.edu, schmalzel@rowan.edu  
Cc: head@rowan.edu, kay  
Subject: letters of consultation solicited

We solicit letters of consultation for the two curriculum proposals to be submitted fall 2004. Thank you.

[Courtesy carbon copy to Linda Head, ECE.]

Curriculum proposal to change the prerequisites in the catalog course descriptions to reflect Discrete Structures, IOOP, OOPDA, and C-minimum grades; includes at the end the complete revised catalog course descriptions.

<http://elvis.rowan.edu/~hartley/updatePrereqs.pdf>

Curriculum proposal to make Public Speaking a prerequisite of Computers and Society instead of College Composition II.

<http://elvis.rowan.edu/~hartley/changeCompSocPrereq.pdf>

From hamilton@rowan.edu Fri Aug 20 11:24:09 2004  
Date: Fri, 20 Aug 2004 11:24:00 -0400  
From: "Diane Hamilton" <hamilton@rowan.edu>  
To: <hartley@elvis.rowan.edu>  
Cc: "Daniel J. McFarland" <mcfarland@groupwise.rowan.edu>  
Subject: Re: letters of consultation solicited

Hi Stephen,

Consider your proposals supported by MIS.

- - - - -  
Diane Hamilton, Ph.D.  
Professor of MIS

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College of Business  
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856-256-4760 (phone)  
856-256-4439 (fax)

From Czochoor@rowan.edu Thu Aug 26 12:23:57 2004  
Date: Thu, 26 Aug 2004 12:22:54 -0400  
From: "Ronald Czochoor" <Czochoor@rowan.edu>  
To: <hartley@elvis.rowan.edu>  
Subject: Re: letters of consultation solicited

Steve,

After reviewing the proposed curriculum changes listed below, it is clear that the proposed changes are needed to clarify prerequisites. The Mathematics Department has no problem with any of the proposed changes and is happy that the Discrete Structures changes are being made explicit.

We expected that the approval by the University Curriculum Committee of the course proposal for Discrete Structures would have automatically changed all prerequisites that listed Discrete Mathematics to also include Discrete Structures since it was requested as part of the proposal.

Ron Czochoor, Chairman  
Mathematics Department  
Rowan University  
Phone: 856.256.4845  
Fax 856.256.4816  
Webpage: <http://www.rowan.edu/mars/depts/math/czochoor/index.htm>  
Dept. webpage: <http://www.rowan.edu/mars/depts/math/>

The (revised) prerequisites for all Computer Science courses follow.

Computer Science  
Jennifer Kay, Chair  
Robinson Hall  
856-256-4805  
kay@rowan.edu

0701 Computer Science, General

0701.100 ..... 3 s.h.

Computer Literacy

This course teaches students how to use microcomputers effectively. Students learn about computer hardware and how it functions with an operating system and application software. Computer file management, data storage, multimedia, computer architecture, local area networks, the Internet, data security, and obtaining information from a library database are included. There is extensive hands-on use of windows, word processing, spreadsheets and the Internet.

0701.102 ..... 3 s.h.

Introduction to Programming

This course acquaints students with the logical structure of a computer, the algorithmic formulation of problems, and a modern high-level programming language. Extensive programming experience is included in the course. Proficiency equivalent to Intermediate Algebra (1701.121) is expected for this course.

0701.104 ..... 3 s.h.

Introduction to Scientific Programming

This course emphasizes algorithmic solutions of problems. The syntax of a high-level programming language is also studied, as well as the writing of structured code. Proficiency equivalent to Intermediate Algebra (1701.121) is expected.

0701.200 ..... 3 s.h.

Computing Environments

(Prerequisite: 0701.100 or equivalent or have passed the Rowan Computer Competency Exam [0701.050])  
Students will be exposed to a variety of computing environments. The course will include extensive hands-on use of a variety of software applications. Topics covered will include user tools, user programming techniques, application packages, and networking communications. Students will gain an understanding of the principles of computing which will enable them to adapt to future technological developments. A solid and fundamental understanding of computers and current operating systems, word processing and spreadsheet software are essential to this course.

0701.205 ..... 3 s.h.

Computer Laboratory Techniques

(Prerequisite: 0704.103 or 0704.113)

A practical introduction to the hardware, software and networks used by the Computer Science Department. A foundation in programming using the language or languages required for intermediate and advanced computer science courses will be included. In order to succeed in this course, it is strongly recommended that students have a grade of C- or higher in the prerequisite courses.

0701.395 ..... 3 s.h.

Topics in Computer Science

(Prerequisite: permission of the instructor)

This course enables the faculty to offer courses in advanced topics which are not offered on a regular basis. Prerequisites will vary according to the specific topic being studied.

0704 Computer Programming

0704.103 ..... 4 s.h.

### Computer Science and Programming

This course emphasizes programming methodology, algorithms, and simple data structures. A programming language rich enough to allow easy implementation of data structures is studied. Prior programming experience in any programming language is expected for this course.

0704.110 ..... 3 s.h.

#### An Introduction to Programming Using Robots

(Prerequisite: 0701.100 or equivalent)

This course teaches fundamental programming skills centered in the context of robot programming. Students will program small robots to perform a variety of tasks. In addition to learning a sophisticated programming language, students will gain skills in design techniques and experience working in teams to build complex systems.

0704.112 ..... 1 s.h.

#### Java for Object Oriented Programmers

(Prerequisite: 0704.103 or equivalent experience)

This course is designed for students who have substantial programming experience in an object-oriented language, but who need to learn Java as prerequisite knowledge for other courses in the curriculum. Students will study the syntax and semantics of Java, classes (inheritance, encapsulation, polymorphism, methods, etc.) control structures, input/output, and documentation schemes. In order to succeed in this course, it is strongly recommended that students have a grade of C- or higher in the prerequisite courses.

0704.113 ..... 4 s.h.

#### Introduction to Object Oriented Programming

(Prerequisite: Formal and declared status as a Computer Science major or permission of instructor, 1701.121 or the high school equivalent)

Introduces the fundamental concepts of programming from an object-oriented perspective. Topics include simple data types, control structures, an introduction to array and string data structures and algorithms, as well as debugging techniques and the social implications of computing. The course emphasizes modern software engineering principles and developing fundamental programming skills in the context of a language that supports the object-oriented paradigm. Includes basic UNIX commands and editing.

0704.114 ..... 4 s.h.

#### Object Oriented Programming and Data Abstraction

(Prerequisite: Formal and declared status as a Computer Science major or minor or permission of instructor; 0704.113, or a score of 4 or 5 on the Computer Science Advanced Placement 'A' Exam, or 0704.103 and 0704.112; 1701.122 or the high school equivalent)

Objects and data abstraction. Continues from Introduction to Object-Oriented Programming to the methodology of programming from an object-oriented perspective. Through the study of object design, this course also introduces the basics of human-computer interfaces, graphics, and the social implications of computing, with an emphasis on software engineering. Includes advanced UNIX commands. In order to succeed in this course, it is strongly recommended that students have a grade of C- or higher in the prerequisite courses.

0704.222 ..... 4 s.h.

#### Data Structures and Algorithms

(Prerequisite: 1703.160; 0704.114, or A- or better in 0704.103 and A- or better in 0704.112 and co-requisite 0704.114)

This course features programs of realistic complexity. The programs utilize data structures (string, lists, graphs, stacks, trees) and algorithms (searching, sorting, etc.) for manipulating these data structures. The course emphasizes interactive design and includes the use of microcomputer systems and direct access data files. In order to succeed in this course, it is strongly recommended that students have a grade of C- or higher in the prerequisite courses.

0704.225 ..... 3 s.h.

Data Structures for Engineers

(Prerequisite: 0704.103, 1701.236)

The course features programs of realistic complexity. The programs utilize data structures (strings, lists, graphs, stacks) and algorithms (searching, sorting, etc.) for manipulating these data structures. The course emphasizes interactive design and includes the use of microcomputer systems and direct access data files.

0704.233 ..... 3 s.h.

Structured Design and Programming Using COBOL

(Prerequisite: 0701.102 or 0704.103 or 0704.113)

In this course students learn to write structured programs in COBOL. It includes a description of the language and a comparison with other languages. It emphasizes structured modular programming and documentation such as hierarchy charts (HIPO) and flow charts. Prior programming experience in any programming language is expected for this course.

0704.234 ..... 3 s.h.

Advanced Structured Design and Programming Using COBOL

(Prerequisite: 0704.233)

This course prepares students for professional proficiency in the COBOL programming language, and includes structured and modular programming, top-down design, hierarchy charts and flow diagrams, table handling, sorting, searching, report preparation, character manipulation, sequential and ISAM files, programming standards and the transaction-master update problem.

0704.305 ..... 4 s.h.

Web Programming

(Prerequisite: 0704.222, 0701.205)

This course introduces the student to some of the underlying software components of the World Wide Web as it currently exists. Topics include markup languages, scripting languages, programming languages such as Java, and other software components of the Web. In order to succeed in this course, it is strongly recommended that students have a grade of C- or higher in the prerequisite courses.

0704.315 ..... 3 s.h.

Programming Languages

(Prerequisite: 0704.222, 0706.205)

A study of the fundamental principles underlying the design of programming languages. Students will study two or more languages from contrasting programming paradigms such as Functional, Object-Oriented, Logical, or Concurrent. In order to succeed in this course, it is strongly recommended that students have a grade of C- or higher in the prerequisite courses.

0704.325 ..... 3 s.h.

Programming in Ada

(Prerequisite: 0704.222)

Students will gain an understanding of the major concepts of the programming language Ada. They will learn how the constructs of the Ada language can be used to produce software which is portable, readily maintained and modified, and efficiently designed. Students will do several programming projects in Ada and will be exposed to problems in the design of real-time systems and concurrent programming. In order to succeed in this course, it is strongly recommended that students have a grade of C- or higher in the prerequisite courses.

0704.380 ..... 3 s.h.

Object Oriented Design

(Prerequisite: 0707.340)

This course will introduce important concepts, such as inheritance and polymorphism, which are crucial tools needed for crafting object-oriented solutions to real-world problems. Design patterns that commonly

occur in design situations will be covered. A formal notation for describing and evaluating object-oriented designs, such as the Unified Modeling Language (UML), will be taught. Students will apply the concepts to design and implement object-oriented solutions to one or more reasonably sized real-world problems.

0704.390 ..... 3 s.h.

Operating Systems

(Prerequisite: 0704.222, 0706.205)

The course concentrates on the design and functions of the operating systems of multi-user computers. Its topics include time sharing methods of memory allocation and protection, files, CPU scheduling, input-output management, interrupt handling, deadlocking, and recovery and design principles. The course discusses one or more operating systems for small computers, such as UNIX. In order to succeed in this course, it is strongly recommended that students have a grade of C- or higher in the prerequisite courses.

0704.392 ..... 3 s.h.

System Programming and Operating System Internals

(Prerequisite: 0704.390, 0701.205)

This course examines the system kernel of a modern operating system, including the file structure and implementation, the process structure and process scheduling, memory management policies, and the I/O subsystem. This course also covers the system call interface to the system kernel and various inter-process communication schemes.

0704.400 ..... 3 s.h.

Computer Science Senior Project

(Prerequisite: 0704.315, 0707.340)

This is an advanced programming course in which students work on large-scale individual or team programming projects and make a formal presentation of their work. The course discusses program development, methodologies, and strategies.

0704.401 ..... 3 s.h.

Compiler Design

(Prerequisite: 0704.315, 0707.210)

This course presents theory of compiler design, syntax-directed translation, and code generation. Students design a compiler for a subset of a high-level programming language.

0704.430 ..... 3 s.h.

Database Systems: Theory and Programming

(Prerequisite: 0707.340)

This course focuses on the design of DBMS and their use to create databases. The course covers both the theoretical concepts and the implementation aspects of database systems with a special emphasis on relational database systems, SQL, and programming (in a modern programming language such as C++ or Java) using a real database Application Programming Interface (such as JDBC or ODBC).

0706 Hardware and Computer Organization

0706.205 ..... 3 s.h.

Computer Organization

(Prerequisite: 0704.103 or 0704.113; 1703.160)

This course provides an introduction to computer organization. Students are exposed to the register level architecture of a modern computer and its assembly language. The topics include machine level data representation, Von Neumann architecture and instruction execution cycle, memory hierarchy, I/O and interrupts, instruction sets and types, addressing modes, instruction formats and translation. This course is not open to students who have taken 0704.204 Assembly Language Programming. In order to succeed in this course, it is strongly recommended that students have a grade of C- or higher in the prerequisite courses.

0706.310 ..... 3 s.h.

### Principles of Digital Computers

(Prerequisite: 0706.205, co-requisite 0706.311)

This course provides an introduction to the fundamentals of computer hardware systems. The topics include digital logic, combinational circuits, sequential circuits, memory system structure, bus and inter-connection structure, computer arithmetic and the ALU unit, I/O system structure, hardwired control unit, microprogrammed control unit, and alternative computer architectures. This course is not open to students who have taken 0706.370 Digital Design and Lab. In order to succeed in this course, it is strongly recommended that students have a grade of C- or higher in the prerequisite courses.

0706.311 ..... 1 s.h.

### Digital Computer Laboratory

(Prerequisite: 0706.205, co-requisite 0706.310)

This lab course provides the student with hands-on experience in the design and implementation of digital components. State-of-the-art systems are used to design, test, and implement digital circuits: Combinational circuits, sequential circuits, registers, counters, datapath, arithmetic/logic units, control units, and CPU design. This course is taken concurrently with Principles of Digital Computer. In order to succeed in this course, it is strongly recommended that students have a grade of C- or higher in the prerequisite courses.

0706.410 ..... 3 s.h.

### Data Communications and Networking

(Prerequisite: 0707.340, 1702.360, or permission from the instructor)

Students in this upper-division course will study the principles of data communications and important network architectures and protocols. Its topics include: the advantages of networking, major network architectures, protocol reference models and stacks, the Data Link Layer, the Network Layer, the Transport Layer, and the Internet. Additional topics may include: local, metropolitan and wide area networks; wireless, telephone and cellular networks; network security; and network programming. Students complete a networking team project.

0706.412 ..... 3 s.h.

### Advanced Computer Architecture

(Prerequisite: 0706.310 and 0706.311)

This is an advanced course in computer architecture designed to expand the knowledge gained by students in the Principles of Digital Computers course. The topics include various performance enhancement techniques such as DMA, I/O processor, cache memory, multiport memories, RISC, pipelining, and various advanced architectures such as high-level language architecture, data-flow architecture, and multiprocessor and multi-computer architectures. This course also allows detailed examination of one or two contemporary computers.

0706.415 ..... 3 s.h.

### Wireless Networks, Protocols and Applications

(Prerequisite: 0706.410 or permission of instructor)

This course prepares students to understand wireless networks systems and the underlying communications technologies that make them possible. The course covers descriptive material on wireless communications technologies, and important deployed and proposed wireless networks and systems. Wireless system performance and Quality of Service capabilities are addressed. Students will prepare and deliver technical presentations on state-of-the-art topics in wireless networks and systems.

### 0707 Theory Methodology and Applications

0707.210 ..... 3 s.h.

### Foundations of Computer Science

(Prerequisite: 1701.122 or 1701.130 or 1701.131; 1703.160; co-requisite 0704.222)

This course provides an introduction to the theoretical foundations of computer science, including finite

automata, context-free grammars, Turing machines, and formal logic. In order to succeed in this course, it is strongly recommended that students have a grade of C– or higher in the prerequisite courses.

0707.310 ..... 3 s.h.

Robotics

(Prerequisite: 0704.103 or 0704.113; 0704.222 or 0901.202; 1701.210 or 1701.235)

This course provides an introduction to the fundamentals of robotics. Students will study robot manipulators and mobile robots, robot sensors, and robot cognition. Students will also gain experience programming in small groups, and programming in a domain where noisy and imprecise data is commonplace. In order to succeed in this course, it is strongly recommended that students have a grade of C– or higher in the prerequisite courses.

0707.321 ..... 3 s.h.

Principles of Software Engineering

(Prerequisite: 0704.222 or 0909.242, 1506.202, 1702.360)

An introduction to the discipline of Software Engineering. Students will explore the major phases of the Software Lifecycle, including analysis, specification, design, implementation and testing. Techniques for creating documentation and using software development tools will be presented. Students will gain experience in these areas by working in teams on mini-projects. In order to succeed in this course, it is strongly recommended that students have a grade of C– or higher in the prerequisite courses.

0707.322 ..... 3 s.h.

Software Engineering Practicum

(Prerequisite: 0707.321)

Students will apply their knowledge from Principles of Software Engineering to develop a software system, working in a team. The project will be taken through each of the major software development phases, and student teams will create appropriate deliverables for each phase.

0707.340 ..... 3 s.h.

Design and Analysis of Algorithms

(Prerequisite: 0704.222, 0707.210)

In this course, students will learn to design and analyze efficient algorithms for sorting, searching, graphs, sets, matrices, and other applications. Students will also learn to recognize and prove NP-Completeness. In order to succeed in this course, it is strongly recommended that students have a grade of C– or higher in the prerequisite courses.

0707.360 ..... 3 s.h.

Computer Graphics

(Prerequisite: 1701.210, 0704.315)

This junior/senior level course covers such topics as fundamentals of graphics devices; use of graphics language/packages; windowing and clipping; geometrical transformation in 2- and 3-D; raster display algorithms; hidden line and surface elimination; animation.

0707.422 ..... 3 s.h.

Theory of Computing

(Prerequisite: 0704.222, 0707.210, 1701.131)

This is an advanced course in the theoretical foundations of computer science, building on the introduction provided in the Foundations of Computer Science course. It studies models of computing, such as finite automata and Turing machines, formal languages, and computability, as well as the fundamentals of complexity theory and NP-completeness. In order to succeed in this course, it is strongly recommended that students have a grade of C– or higher in the prerequisite courses.

0707.450 ..... 3 s.h.

Artificial Intelligence (AI)

(Prerequisite: 0707.210, 0704.222, 1703.160)

AI studies methods for programming “intelligent” behavior in computers. Students study the data representation methods and algorithms used in AI, and survey research areas such as puzzle solving, game-playing, natural language processing, expert systems, and learning. In addition to readings, discussion, and problem solving in AI, students will be expected to program in one of the languages commonly used in AI, such as LISP or Prolog. In order to succeed in this course, it is strongly recommended that students have a grade of C– or higher in the prerequisite courses.

0707.460 ..... 3 s.h.

Computer Vision

(Prerequisite: 1701.210, 1702.360, 0704.222)

This course examines the fundamental issues in computer vision and major approaches that address them. The topics include image formation, image filtering and transforms, image features, mathematical morphology, segmentation, camera calibration, stereopsis, dynamic vision, object recognition and computer architectures for vision. In order to succeed in this course, it is strongly recommended that students have a grade of C– or higher in the prerequisite courses.

0799 Computer Science

0799.300 ..... 3 s.h.

Computer Field Experience

(Prerequisite: permission of instructor)

Students are assigned projects in a professional environment.

4901 Computer Science

4901.265 ..... 3 s.h.

Computers and Society

(Prerequisite: 1506.202)

This interdisciplinary course focuses upon the effects of computer systems on individuals and institutions. How computer systems are developed and operated will be related to an analysis of current trends in American society. A study of present and probably future applications of computers in such areas as management, economic planning, data collection, social engineering, education and the military will be followed by an exploration of the relationship of computer systems to problem solving orientations, bureaucratization, centralization of power, alienation, privacy, autonomy and people’s self-concept. This course is open to students at any level who satisfy the prerequisite and have course work in computer science or sociology or permission of instructor.

4901.266 ..... 3 s.h.

Computers and Society – WI

(Prerequisite: 1506.202)

Same as 4901.265. The course offered as writing intensive.