Dr. John S. Eickemeyer, Chairperson

Computers are no longer huge machines hidden away in protected rooms and accessible to only a few highly-trained individuals. Instead, they are now used in almost every business, are on almost every desk, and have moved into every conceivable area of our lives. Understanding computers, their uses, and the concepts that underlie their construction are now part of a well-rounded education.

The goal of The Master’s College Computer & Information Sciences (CIS) Department is to prepare students to excel in an increasingly complex technical world while living lives that glorify God. CIS majors study computers both in theory and in practice, covering topics in software, hardware, networks, databases, the Web and more. They also learn about the impact computers are having on the world, and ways they can be used to further God’s kingdom.

Emphases
The Master’s College Department of Computer & Information Sciences offers degrees in two emphases: Computer Science (CS) and Information Systems (IS). Every CIS student completes the core CIS courses, then takes additional courses in his or her selected emphasis.

A CIS degree helps prepare students for any of a number of careers, including computer programming, web design, network administration, systems analysis, data processing management or teaching.

Computer Science
The emphasis in Computer Science is designed to give students a practical introduction to the world of computers. It focuses on the technical side of computing, presenting basic theoretical material while maintaining a practical focus. Graduates may pursue advanced degrees in Computer Science or seek work in a variety of technical positions.

Information Systems
The emphasis in Information Systems approaches computers from a more business-oriented perspective. It emphasizes business processes and how computers can be used to improve them. Analysis and design are stressed, along with an appropriate knowledge of business principles. Graduates will be prepared to pursue careers in the field of business information systems, one of the largest and fastest growing specialties in the world.

Credit by Examination
Students may receive credit by examination as follows:
- Credit may be granted for Calculus I (MA121), Calculus II (MA122) or Introduction to Computer Programming (CS111).
- Credit may be granted if the student submits proof of earned test scores of 3 or above on the appropriate AB/BC Advanced Placement tests of the College Board.
- The department reserves the right to interview and/or retest students before granting credit by examination.

Comprehensive Exam
Students graduating with a degree in Computer Science or Information Systems may be required to take a comprehensive discipline-specific examination during their senior year, prior to graduation.

Department Requirements
All CIS majors are required to earn a grade of C or better in all courses in the CIS major. A student earning a grade below C must repeat the course until a grade of C or above is earned.

CIS Core Courses
The following courses are required for all CIS majors:
- CS111 Intro. to Computer Programming & Lab... 4
- CS122 Web Design & Programming................. 3
- CS211 Data Structures & Lab.......................... 4
- CS212 Computer Hardware.......................... 3
- CS301 Computer Application Development........ 3
- CS302 Software Development........................ 3
- CS321 Operating Systems............................. 3
- CS322 Networking Principles & Architecture....... 3
Total core courses ......................................... 26

Computer Science Emphasis Courses
- CS311 Computer Organization & Architecture..... 3
- CS332 Programming Languages & Systems......... 3
- CS402 Computer Algorithms........................... 3
- CS492 Computer Science Senior Seminar............ 3
- MA121 Calculus I........................................... 4
- MA122 Calculus II.......................................... 4
- MA256 Discrete Mathematics.......................... 3
Upper Division CS Electives................................ 6
Total required units ....................................... 29
Course Offerings in Computer and Information Sciences

**COMPUTER SCIENCE**

CS100 Computer Fundamentals (3)
This course introduces students to computers and general computer applications. It is required of all students who do not earn a passing score on the Computer Literacy exam. The course covers: computer components and how they interact; proper PC operation; applications often used by both business and personal users; the impact of computers on society and careers; functions and limitations of computers; evaluating software; and a biblical perspective on issues in computing. It also includes hands-on training using computers with a variety of widely-used applications. (Lab Fee: $25.)

CS111 Introduction to Computer Programming (3)
This course introduces students to computer organization, programming, and algorithm development. The course covers data representation, storage, problem solving, and programming techniques and principles using the Java programming language. Co-requisite: CS111L.

CS111L Computer Programming Lab (1)
This lab course provides hands-on assistance and instruction in the programming work required by CS111. This course is a co-requisite to CS111.

CS122 Web Design & Programming (3)
This course introduces students to the World-Wide Web from a programmer’s perspective. The course will teach students to design and implement web pages using current technologies, such as HyperText Markup Language (HTML), Cascading Style Sheets (CSS) and JavaScript. Prerequisite: CS111 or instructor’s approval.

CS128 Introduction to Robotics (3)
This survey course is an introduction to basic robotics concepts including the types of hardware and software required to sense, navigate, and manipulate objects in the real world. Students will explore robotic systems using a Scorbot ER1II robotic work cell and put course concepts into practice using the Mindstorms NXT robot platform. This course will include robot competition events where students will apply what they have learned in the course. This introductory course is open to all students, and fulfills the Computer Proficiency GE Requirement. (Lab Fee: $75)

CS211 Data Structures (3)
This course continues development of students’ programming abilities, covering algorithmic analysis, internal search and sort methodology, and a number of commonly used data structures using the Java programming language. Prerequisite: CS111. Co-requisite: CS211L.

CS211L Data Structures Lab (1)
This lab course provides hands-on assistance and instruction in the programming work required by CS211. This course is a co-requisite to CS211.

CS212 Computer Hardware (3)
Presents computer hardware concepts, including components, their structures, and their interfaces. Integral to this class is the tight cohesion of theory (lecture) and practice (hands-on labs). Labs will cover microcomputer components, construction, problem diagnosis and resolution, maintenance, and upgrades. (Lab fee: $40.)

CS301 Computer Application Development (3)
This course teaches computer application design and development. Students will develop a multi-tiered web-based application using current technologies, such as HTML/CSS/JavaScript/Ajax (client), PHP (server), and SQL (database). Prerequisite: CS122.
CS302 Software Development (3)
This course is an introduction to the concepts and practices of software development. Topics include iterative development, gathering requirements, project planning, user stories and tasks, design, testing and continuous integration, test-driven development, debugging, and software processes. Prerequisite: CS301

CS308 Advanced Java Programming (3)
This course provides advanced training in the Java programming language. Topics will include applications & applets, object-oriented programming features, GUI (graphical user interface) components using Swing, exception handling, multithreading, files & streams, multimedia capabilities, database connectivity (JDBC), client/server programming, servlets, and JavaServer Pages (JSP). Prerequisite: CS122, CS211, and CS301; or instructor’s approval.

CS311 Computer Organization & Architecture (3)
This course introduces computer hardware organization, design, structure, and relationships. Mechanics of digital computer information storage, transfer, and control are addressed. Also explored are: fundamentals of logic design, computer arithmetic, addressing, instruction sets and assembler languages, and memory organization. Prerequisite: CS211.

CS318 C/C++ Programming (3)
An introduction to the C/C++ programming languages, which are the backbone of many technical and business programming environments. The course will cover procedural language topics, C/C++ syntax, standard function and class libraries, structures and classes in C++, file processing, exception handling, pointers and memory management, etc. Prerequisite: CS122.

CS321 Operating Systems (3)
An introductory study of the organization and architecture of computer operating systems. Major principles are discussed, including purposes, functions, interfaces, and structures. Case studies involving actual operating systems are presented. Covers preparation for Microsoft’s Operating System examination. Prerequisite: CS111.

CS322 Networking Principles & Architecture (3)
This course introduces computer networks. It includes concepts and methods of computer communications, hardware and software components, configurations, and standard layers of communication protocols. Prerequisite: CS321.

CS328 Introduction to Robotics (3)
This course will introduce students to the programming aspects of robotic systems and the concepts required to sense, navigate, and manipulate objects in the real world. Students will explore robotic systems using a Scorbot ERIII robot work cell and put course concepts into practice using the Mindstorms NXT robot platform. Students in this course will participate in robotic competitions in order to test and apply what they have learned in the course. Prerequisite: CS111 or instructor’s approval. (Lab Fee: $75)

CS332 Programming Languages & Systems (3)
Introduces programming language organization and structure. The course covers program run-time behavior and requirements; compiler and interpreter functions, and basic programming language analysis, design, and specification. It also introduces several programming language alternatives as examples. Prerequisite: CS211.

CS338 File & Database Structures (3)
An introduction to the concepts of information organization, methods of representing information both internally and externally. The course begins with a review of basic structures (stacks, queues, linked lists and trees) and moves through more complex data structures into the processing of files (sequential, relative, indexed sequential and others). Projects are completed in one or more high-level languages. Prerequisite: CS211.

CS347 Windows Programming (3)
Programming for a MS Windows environment using Visual Studio.NET and Microsoft’s Framework Class Library (FCL). This class covers topics in graphical user interface (GUI) program development, including windows, menus, mouse processing, dialogs, controls, threads, files, databases, and more. Prerequisite: CS122.

CS348 Assembly Language Programming (3)
Teaches programming in assembly language, including its relationship to computer architecture, macros, segmentation, memory management, linkages, etc. Prerequisite: CS111.

CS358 Computer Graphics Programming (3)
This course introduces programming in the specialized area of interactive computer graphics. Topics will include 3D geometric transformations, the various representation models and storage methods for 3D objects, and the techniques and models for realistic rendering. Students will apply these techniques to create an interactive computer graphics application using OpenGL. Prerequisite: CS211, MA121.

CS402 Computer Algorithms (3)
This course introduces students to the analysis of algorithms and to algorithm design techniques, including brute-force, divide/decrease/transform-and-conquer, space and time tradeoffs, dynamic programming,
greedy algorithms, backtracking, branch-and-bound, and approximation algorithms. It includes computational complexity analysis, and covers a variety of applications from classic algorithms to games and puzzles. Prerequisite: CS211 and MA122.

**CS418 Software Engineering (3)**
This course is an introduction to the concepts and practices of software engineering. Topics include the software development lifecycle: software specification, design, development, verification, validation, and management. We will also discuss tools and methods used in developing quality software.

**CS420 Seminar in Computer Science (1)**
A lecture/discussion course reviewing recent computer science topics and literature from journals available to advanced undergraduate students. Prerequisite: instructor's approval.

**CS425 Advanced Networks, Security, & Cryptography (3)**
This course covers advanced network and security topics, including TCP/IP security, firewalls, packet filtering, intrusion detection, virtual private networks, Internet Protocol Security (IPSec), encryption algorithms and techniques, private and public key encryption, password authentication, message integrity, digital signatures, administrative security policies, and other security issues involving Linux, Unix and Microsoft Windows operating systems. Instructor permission required.

**CS448 Game Programming (3)**
This course covers methodology and techniques for writing interactive computer games and similar applications. Prerequisite: CS338.

**CS458 Applied Software Project (1-3)**
Students complete an independent project, integrating knowledge gained from other courses in the development of a significant software system. The application is of the students’ choice subject to advisor approval. Prerequisite: instructor’s approval.

**CS468 Decision Support and Expert Systems (3)**
Provides an overview of operations research and quantitative techniques in supporting decision-making, including systems that attempt to model human planning processes. Topics include linear programming, queuing, simulation, modeling, forecasting, network analysis, dynamic programming, scheduling and control. Prerequisites: CS211, CS402.

**CS478 Computer Science Internship (1-4)**
Provides an applied learning experience in a supervised work environment. May include work in systems analysis and design, programming, network administration, etc. Prerequisites: junior or senior standing and instructor’s approval.

**CS488 Independent Research (1-3)**
Independent advanced study of specialized topics with faculty advisor. Prerequisite: instructor’s approval.

**CS492 Computer Science Senior Seminar (3)**
This senior seminar course is designed to integrate the field of Computer Science into a Biblical world view, including the ethical issues relating to the field. It also provides students the opportunity to demonstrate their proficiency and knowledge through a set of research and writing assignments and a standardized Major Field Test. Prerequisite: senior standing.

**CS498 Topics in Computer Science (1-3)**
A study of relevant computer science topics. May be repeated for credit if content is different. Topics may include: Systems Programming (e.g. design and construction of programming language translators, compilers, and interpreters), Operating System Internals, or Advanced Computer Graphics (such as interactive graphics, screen displays, graphical techniques and software).

**MANAGEMENT INFORMATION SYSTEMS**

**MIS312 Linux & Unix (3)**
This course focuses on Linux/Unix workstations and servers in an integrated computing environment. Students will configure, use, and administer personal workstations, file servers, DNS servers, web servers, DHCP servers, mail servers, print servers, Samba servers, and similar systems. System administration topics include user accounts and groups, permissions, file systems, the boot process, the OS kernel, TCP/IP network configuration, swap space, XWindows, kernel configuration, and related topics.

**MIS320 IS Applications (3)**
This course teaches computer applications that are accepted as standard in the business world. Emphasis is placed on the practical implementation of end user software in a business environment. The use of spreadsheet and database programs to support business processes will be studied in depth. Excel and Access will be used in this class. Prerequisite: CS100.

**MIS328 COBOL Programming (3)**
This course provides training in COBOL (Common Business Oriented Language); the most widely used programming language in the business world. Prerequisite: CS111.
MIS338 Data & File Processing (3)
An introduction to the concepts of information organization, methods of representing information both internally and externally. The course begins with a review of basic structures (stacks, queues, linked lists and trees) and moves through more complex data structures into the processing of files (sequential, relative, indexed sequential and others). Projects are completed in one or more high-level languages. Prerequisite: CS111.

MIS348 Assembly Language Programming (3)
Teaches programming in assembly language, including its relationship to computer architecture, macros, segmentation, memory management, linkages, etc. Prerequisite: CS111.

MIS358 Introduction to Web Graphics (3)
Introduces computer graphics from a designer’s perspective, as well as software tools for manipulating them. Web graphics are covered in detail, including appropriate processes and methods.

MIS368 Introduction to 3D Graphics & Animation (3)
This course introduces students to the world of three-dimensional (3D) computer graphics and animation. The software package that is used in the class is Maya, the most widely used 3D content creation and animation software. Topics include curves and polygons, surfaces, lights, cameras, rendering, effects, and more.

MIS411 Systems Analysis & Design (3)
Introduces the concepts of the systems development life cycle. Analyzes various examples, such as traditional, CASE, prototyping, and RAD. Discusses file and database structures and processing practices. Presents techniques and tools for system specifications and documentation. Prerequisite: CS111. May be taken concurrently with CS301, but not before.

MIS432 Database Management Systems (3)
Design, implementation, and management of business database systems. Includes data analysis, design, and normalization. Prerequisites: CS301.

MIS438 Advanced Database Application Development (3)
This course examines advanced concepts used to develop information systems. Topics include advanced database programming, embedded database commands in high-level languages, and expert system designed user interface concepts. Pertinent current topics used in information system development are also included. Prerequisite: MIS432.

MIS441 Web Site Administration (3)
Students will learn to install, maintain, and administer a web site. Integral to this class is the tight cohesion of theory (lecture) and praxis (hands-on labs). Each student will be responsible for and complete weekly applied projects agreed upon with the Instructor. Subject matter will include TCP/IP; security; intranets; designing, implementing, and administering databases; search services; firewalls and proxy servers; etc. Prerequisite: CS301.

MIS468 Advanced 3D Graphics and Animation (3)
This course continues the study of 3D graphics and animation begun in MIS368. Prerequisite: MIS368.

MIS478 IS Internship (1-4)
Provides an applied learning experience in a supervised work environment. May include work in systems analysis and design, programming, network administration, etc. Prerequisites: junior or senior standing and instructor’s permission.

MIS488 Independent Research (1-3)
Independent advanced study of specialized topics with faculty advisor. Prerequisite: instructor’s approval.

MIS492 IS Senior Seminar (3)
This senior seminar course is designed to integrate the field of Information Technology into a Biblical world view, including the ethical issues relating to the field. It also provides students the opportunity to demonstrate their proficiency and knowledge through a project and a set of research and writing assignments. Prerequisite: senior standing.

MIS498 Advanced Topics in Information Systems (1-3)
A study of relevant information systems topics. May be repeated for credit if content is different. Prerequisite: instructor’s approval.