

COMPUTER SCIENCE MAJOR
FOUR-YEAR PLAN (SAMPLE) – 128 hours required for degree
2007-2008

Freshman Year

First Semester

ENG 111	College Composition (MPF I)	3
MTH 151	Calculus I (MPF V & MPT MTH2)	4-5
EAS 101	Computing, Engineering & Society (1 hr)	1
CSA 174	Fund. of Programming & Problem Solving	3
	Miami Plan Fine Arts Course (MPF IIA)	3
	Miami Plan World Cultures Course (MPF IIIB)	<u>3</u>
		17-18

Second Semester

ENG 112	Composition and Literature (MPF I)	3
MTH 251	Calculus II	4
CSA 271	Object-Oriented Programming	3
MTH 231	Discrete Mathematics (MPT MTH2)	3
	Miami Plan Science Course (MPF IVA or IVB)	<u>3</u>
		16

Sophomore Year

First Semester

ECO 201	Principles of Microeconomics (MPF IIC)	3
CSA 274	Data Abstraction and Data Structures	3
	Miami Plan Foundation II Elective	3
	Miami Plan Science (MPF IVA or IVB)	4-5
	Additional MP Fine Arts, Humanities or Social Science	<u>3</u>
		16-17

Second Semester

CSA 283	Data Communications & Networking	3
CSA 278	Computer Architecture	3
CSA 385	Database Systems	3
	Miami Plan U.S. Cultures Course (MPF IIIA or 111B)	3
	Miami Plan Science (MPF IVA or IVB)	<u>4-5</u>
		16-17

Junior Year

First Semester

CSA 381	Operating Systems	3
CSA 464	Algorithms	3
COM 135	Public Express/Critical Inquiry (MPF IIB)	3
STA 301	Applied Statistics (MPT MTH2)	3
	Free Electives	<u>3</u>
		15

Second Semester

ENG 313	Technical Writing	3
CSA 361	Societal & Ethical Issues in Computing	3
STA 401	Probability	3
CSA 348	Applied Software Engineering	3
	Computer Science Electives	<u>6-9</u>
		15-18

Senior Year

First Semester

CSA 448	Senior Design Project I (MPC)	2
CSA 486	Artificial Intelligence	3
	Computer Science Electives	3-6
	Free Electives	<u>4-6</u>
		12-17

Second Semester

CSA 449	Senior Design Project II (MPC)	2
	Computer Science Elective	6
	Free Electives	<u>4-7</u>
		12-15

The outline above is just one sample of how the courses might be arranged. All Computer Science majors are assigned an academic advisor who is a faculty member in the Department of Computer Science and Systems Analysis. You should consult regularly with your advisor, who can help you understand the requirements of your major as you select courses each semester. You should also regularly look at your DAR (Degree Audit Report) to check your progress toward your degree.

Overview of the Miami Plan for Liberal Education

The Miami Plan foundation requirement (MPF) includes 6 hours of English Composition (ENG 111-112 fulfill this requirement); 12 hours of Fine Arts, Humanities, and Social Science with at least 3 hours in each of those three categories (COM 135 fulfills 3 hours of humanities, ECO 201 or 202 fulfills 3 hours of social science); 3 hours in U.S. Cultures and 3 hours in World Cultures; 9 hours of Natural Science, including one laboratory course with a minimum of 3 hours in Biological Science and 3 hours in Physical Science; and 3 hours of Mathematics, Formal Reasoning or Technology (MTH 151 fulfills this requirement). At least one of these foundation courses must provide a historical perspective (H). Foundation courses are ordinarily taken in the first two years. Consult the Miami Bulletin for information about available foundation courses.

The Miami Plan thematic sequence requirement (MPT) is 9 hours of an approved Thematic Sequence (MPT). The thematic sequence MTH2-Basic Mathematical Tools for Science is fulfilled by CSA requirements (MTH 151 or 153, MTH 231, and STA 301); the form to "declare" a thematic sequence must be submitted through the department offering the sequence.

The Miami Plan capstone requirement (MPC) is a 3-hour Senior Capstone Experience (MPC). Taking the two required 2-hour courses CSA 448 and CSA 449 fulfills the capstone requirement.

DEPARTMENT OF COMPUTER SCIENCE AND SYSTEMS ANALYSIS - COURSE DESCRIPTIONS 2007-2008

EAS 101 Computing, Engineering & Society (1) introduces computing and engineering professions and their role in society. Required for all CSA freshmen and transfer students.

MPT CSA 174 Fundamentals of Programming and Problem Solving (3) Algorithm development and refinement in problem solving. Modular programming using sequence, selection, and repetition control structures. Program debugging and testing. Formatted input/output. Data files. Fundamental data types. User-defined data types: structured and enumerated. Arrays and arrays of structures. Simple sorting and searching algorithms. Character data and string processing. Algorithm efficiency considerations. Classes, objects, and introduction to object-oriented programming.

MPT CSA 271 Object-Oriented Programming (3) The design and implementation of software using object-oriented programming techniques including inheritance, polymorphism, generic programming, object persistence, and operator overloading. Students will analyze program specifications and identify appropriate objects and classes. Additional programming topics include dynamic memory recursion, existing object libraries, and binary/ASCII file processing. Prerequisite: CSA 174 (C- or better) or equivalent.

MPT CSA 274 Data Abstraction and Data Structures (3) Data and procedural abstractions and classes. Object creation, message passing, constructors, destructor, dynamic storage allocation and garbage collection, class composition, introduction to inheritance and polymorphism. Abstract data types and their implementation as data structures. Sequential and linked storage representations; stacks, queues. Nonlinear data structures: trees and graphs. Implementation of abstract data types using object-oriented programming. Recursion, sorting, searching, algorithm complexity measurement. Prerequisites: CSA 271 (C- or better), MTH 231.

CSA 278 Computer Architecture (3) Principles of Von Neumann computer architecture. Data representation and computer arithmetic. Memory hierarchy. CPU structure and instruction sets. Assembly language programming to better understand and illustrate computer architecture concepts. Performance considerations and alternative computer architectures. Prerequisite: CSA 271.

CSA 283 Data Communications and Networks (3) An introduction to data communications, computer networks, protocols, and distributed processing as well as relevant standards and underlying theory. Topics include communication codes, transmission methods, interfacing, error detection, communication protocols, communications architectures, switching methods, and network types. Local area network and internetwork technologies are studied. The client/server model of distributed processing will be addressed. Students will design and implement data communications and network-based software.. Prerequisite: CSA 271 or permission of instructor.

CSA 348 Applied Software Engineering (3) Study of all phases of the systems development life cycle: project identification and justification, requirements analysis, data modeling, process modeling, design and specification techniques, prototyping, systems architectures, software design and construction, and object-oriented analysis and design. Prerequisite: CSA 274.

CSA 361 Societal and Ethical Issues in Computing (3) An examination of the ethical, legal, and social responsibilities of the practicing professional computer scientist. Issues addressed include computers and privacy, computer crime, public safety, intellectual property and professional codes of ethics. Key issues will normally be considered through case studies. Prerequisite: Junior Standing.

MPT CSA 372 Stochastic Modeling (3) Survey of methods of stochastic operations research including reliability, Markov processes, queuing theory, and decision theory. Computer used for modeling and solving problems, STA 401 or concurrent registration or STA 368

CSA 381 Operating Systems (3) Introduction to operating systems concepts. The operating system as a resource manager. The principles for the design and implementation of operating systems. User interface programming in current operating systems. Command languages and user interface. Process scheduling and deadlock prevention. Memory management, virtual memory, paging, and segmentation. Interrupt processing. Device management, I/O systems and I/O processing. Security and protection. Examples of operating systems including distributed and open systems. Prerequisites: CSA 274 & 278

CSA 383 Client Server Systems (3) Introduction to the basic hardware, software, and concepts necessary to design and implement enterprise-wide client server systems. The costs and benefits of client server applications are examined. Different client server architectures are presented with emphasis on the way in which Web technology and the Internet can be used to implement client-server systems. Students design and construct client-server systems using remote servers on multiple platforms and several different client platforms. Testing of GUI and performance tuning is presented. A project enables students to apply the principles and techniques presented in class. Prerequisites: CSA 274 & CSA 283, or permission of instructor.

CSA 385 Database Systems (3) Overview of database management, database system architecture, and database modeling principles. Logical database design. The relational database model, relational integrity constraints, and relational algebra. Relational commercial database management systems and languages. Interactive database processing, view processing, and database application programming. Database integrity. Relational database design by normalization. File structures for database systems. Prerequisite: CSA 274 or concurrent registration.

CSA 386 Introduction to Computer Graphics (3) Introduction to techniques to create images on the computer. Covers graphics hardware and software, animation, mathematical theory behind 2- and 3-dimensional translation, rotation, and scaling, and areas of graphics application such as computer-aided design. Programming required. Prerequisites: CSA 274 and MTH 231.

MPC CSA 448/449 Senior Design Project (2/2) Student teams conduct major open-ended research/design projects. Elements of the design process are considered as well as real-world constraints, such as economic and societal factors, marketability, ergonomics, safety, aesthetics, and ethics. 448: feasibility and design studies performed; 449: implementation, testing, and production of design. Prerequisite: CSA 348 and senior standing.

CSA 464 Algorithms (3) Review of basic data structures and algorithms. Analysis of algorithms. Problem assessment and algorithm design techniques. Algorithm implementation considerations. Concept of NP-completeness. Analysis of algorithms selected from topics relevant to computer science and software engineering (sorting, searching, string processing, graph theory, parallel algorithms, NP-complete problems, etc.) Prerequisites: CSA 274 and MTH 231.

CSA 465 Comparative Programming Languages (3) A survey of programming languages and their accompanying paradigms. Basic principles of syntax, semantics, and implementation are addressed. Imperative, functional, logic and hybrid languages will be introduced. Formal methods of definition and specification are introduced. Prerequisite: CSA 274.

CSA 467 Computer & Network Security (3) Fundamentals of network, operating system and application security. Students will study and implement a variety of security techniques including defense, response and forensics. Extensive analysis, reading and writing are integral to this course. Prerequisites: CSA 283 and CSA 383, or permission of instructor.

MPT CSA 471 Simulation (3) Use of digital computer program to simulate operating characteristics of stochastic dynamic system. Topics: problems encountered in construction of simulation programs, random number generation, random variate sampling, programming in simulation and compiler languages, problems in design of successful simulation investigations, design of simulation experiments, interpretations of simulated output, and verification and validation. Case studies and projects used. Prerequisites: STA 401, a programming language, and CSA 372.

CSA 473 Automata, Formal Languages, and Computability (3) Regular expressions. Closure properties. Sequential machines and finite state transducers. State minimization. Chomsky hierarchy grammars, pushdown acceptors and linear bounded automata. Closure properties of algorithms on grammars. Turing machine as acceptor and transducer. Universal machine. Computable and noncomputable functions. Halting problem. Prerequisites: CSA 274 and MTH 231.

CSA 474 Compiler Design (3) Examination of the nature of programming languages and programs which implement them. Compiler and interpreter design and implementation techniques. Review of grammars and languages (context free, context sensitive, regular). Design of interactive interfaces. Parsing of context free languages. Lexical analysis. Semantic analysis and code optimization. Prerequisite: CSA 274.

CSA 483 Statistical Forecasting (3) Introduction to quantitative prediction techniques using historical time series. Involves extensive use of interactive computing facilities in developing forecasting models and considers problems in design and updating of computerized forecasting systems. Cross-listed with STA 483/583. Credit not awarded for both this course and DSC 444. Prerequisite: STA 401.

CSA 484 Manufacturing Planning Systems (3) Introduction to quantitative techniques for analyzing manufacturing systems. Applies modeling and design tools used in previous courses to analysis of manufacturing and production problems and design of computerized manufacturing systems. Prerequisites: STA 401 or permission of instructor.

CSA 485 Advanced Database Systems (3) Relational calculus. Query processing and optimization. Transaction processing: failure, recovery, and concurrency. Database security. Logic-based systems. Parallel, distributed, and client/server systems. Object-oriented database systems. Emerging database technologies. Prerequisite: CSA 385

CSA 486 Introduction to Artificial Intelligence (3) Basic concepts of artificial intelligence (AI) including problem solving, search knowledge representation and rule-based systems are covered with symbolic AI language such as PROLOG or LISP. Some application areas (natural language understanding, pattern recognition, learning and expert systems) are explored. Prerequisite: CSA 274 or 606.

CSA 487 Game Design and Implementation (3) Study of architectures, algorithms, and software design patterns used in computer games. Students work with a game engine to design and implement several kinds of games. Topics include animation techniques, physics simulation, user controls, graphical methods, and intelligent behaviors. Prerequisite: CSA 386 or permission of instructor.

CSA 470 Special Topics (3)

CSA 480 Special Problems (Honors Program) (3)

CSA 491 Undergraduate Research (3)