

Department of Computer Science (CPS)

College of Science and Technology

Michael C. Stinson, Chairperson

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Hari Bidasari, Ph.D., Computer Graphics **Gongzhu Hu**, Ph.D., Databases, Distributed Programming, Pattern Recognition

Patrick Kinnicutt, Ph.D., Geostatistics, Science Informatics

Roger Y. Lee, Ph.D., Ph.D., Software Engineering, Object-oriented Modeling

S. N. Jayaram Murthy, Ph.D., Multimedia, Pattern Recognition, Data Mining **Ishwar Rattan**, Ph.D., Operating Systems, Distributed Processing

Neelima Shrikhande, Ph.D., Artificial Intelligence, Computer Vision, Image Processing

Lal P. S. Singh, Ph.D., Databases, Intelligent Tutoring Systems

Michael C. Stinson, Ph.D., Neural Networks, Software Engineering

Ahmet Ugur, Ph.D., Evolutionary Programming, Generic logarithms, Biocomputing

The Program

The graduate programs in computer science are supported by a UNIX lab, 3 PC labs and dedicated laboratories for computer graphics, databases, operating systems, networks, and software engineering. In addition, the university's computer network is available.

Some graduate assistantships are available; the application deadline is February 15 for fall and October 1 for spring.

Research assistantships may be available depending on funding.

Master of Science (M.S.) in Computer Science

Minimum Totals for Graduation: 36 hours

Admissions Requirements, Retention and Termination Standards

Conditional admission may be granted upon completion of a bachelor's degree, including a two semester sequence in a modern programming language with elementary data structures (CPS 180, CPS 181), from an accredited institution with a minimum overall grade point average of 3.0 in the last two years of study, as well as in the programming courses. International students are required to demonstrate English competency. (See section on English Language Competency in this Bulletin). Regular admission is granted to students who meet the above conditional requirements and have completed the following or the equivalent:

Assembly Language and Computer Organization (CPS 210)
Advanced Data Structures and Algorithms (CPS 340)
Computer Design and Architecture (CPS 360) Programming Language Concepts (CPS 450) Introduction to Operating Systems (CPS 470) Calculus I (MTH 132) Discrete Mathematics (MTH 175)

Conditionally admitted students who have not met all these requirements will be required to get the department chairperson's permission to register in each graduate course.

CPS 502 could be taken to satisfy the prerequisite requirements in block structured language with elementary data structures. CPS 503 could be taken to satisfy the prerequisite requirements in assembly language and computer organization, design, and architecture.

Students are required to achieve a minimum grade point average of 2.5 in the above-listed courses.

Degree Requirements

Required Courses (12 hours)

CPS 542 - Analysis and Design of Algorithms 3(3-0)

CPS 691 - Graduate Seminar 3(3-0)

Six (6) credit hours from the following courses:

CPS 520 – Software Architecture 3(3-0)

CPS 541 – Databases 3(3-0)

CPS 585 – Applied Data Engineering 3(3-0)

CPS 610 – Advanced Software Design and Development 3(3-0)

CPS 685 - Pattern Recognition and Data Mining 3(3-0)

CPS 710 – Software Engineering Metrics, Models and Mgmt 3(3-0)

Select either Plan A or Plan B.

Plan A Requirement (6 hours)

The 30-hour requirements include 24 hours of coursework, a Masters thesis of 6 hours (CPS 798), and an oral examination on the thesis. For Masters thesis, a Thesis Committee shall be formed according to the procedure outlined in the Thesis, Field Study, or Dissertation section of College of Graduate Studies Bulletin.

CPS 798 - Thesis 1-6(Spec)

Plan B Requirement

The 30-hour requirements include 30 hours of coursework and a Plan B Project. A student must complete a substantial written report in computer science or an application of computer science for the Plan B project. Copies of procedures for such projects are available from the department chairperson. The project will ordinarily include a significant original programming component with a written defense of the programming component and must include evidence of scholarly and creative ability. The project must be supervised while in progress and approved by a committee of two faculty members.

Electives (12-18 hours)

At least 12 hours must have the CPS designator. Electives from related areas are selected with approval of the CPS advisor.

Total: 30 semester hours

Notes:

At least 15 semester hours of courses must be at 600-level or above.

A student who satisfied any of the course requirements prior to entering the program may be excused from that course requirement. However, the 36-hour requirement will not be affected.

Course Descriptions: CPS

CPS 501 Survey of Computer Science 3(3-0)

Computer organization, low and high level computer languages, various computer applications. Does not count toward CPS major or minor or the M.S. in Computer Science except the Teaching Minor in Computer Science on the secondary education curriculum. This course is approved for offering in a distance learning format.

CPS 502 Introduction to Problem Solving & Data Structures 3(3-0)

Structured program design and problem solving. Abstract data types. Searching and sorting. Does not count towards any degree program in Computer Science. Prerequisite: Conditional admission into CPS M.S. program. This course is approved for offering in a distance learning format.

CPS 503 Digital Design & Computer Organization Using Assembly Language 3(3-0)

Introduction to organization of a digital computer. Design of digital circuits. Assembly language programming. Does not count toward any degree program in Computer Science. Prerequisite: conditional admission into CPS M.S. program.

CPS 510 Software Systems Engineering 3(3-0)

Covers requirements analysis and techniques to develop a system from those requirements. Credit will not be given for both CPS 410 and CPS 510. Does not count for the M.S. in Computer Science. Prerequisites: CPS 340; MTH 175. This course is approved for offering in a distance learning format.

CPS 520 – Software Architecture 3(3-0)

Study of software architectural styles and quality attributes; achieving software quality; designing, documenting, and reconstructing software architectures; architecture evaluation; tools for architectural design. Prerequisite: CPS 410 or graduate status

CPS 530 Simulation of Discrete Event Systems 3(3-0)

Development of computer models for discrete systems using computer simulation languages. Performance evaluation of computer, industrial and engineering systems. Prerequisite: CPS 181; STA 282 or STA 382.

CPS 531 Distributed Programming 3(3-0)

Study of design and implementation issues in distributed programming, including event model, networking, database connectivity, remote method invocation, servlet, XML, and security. Prerequisite: CPS 340. Recommended: CPS 280J.

CPS 541 Databases 3(3-0)

Physical and logical organizations of databases, database management systems, project involving a student-designed database. Prerequisites: CPS 340 and CPS 370; or ITC 441 and permission of instructor.

CPS 542 Analysis and Design of Algorithms 3(3-0)

Models of computation. Analysis of algorithms including computing time and space requirements. Efficient algorithm design techniques. Introduction to parallel algorithms. Prerequisite: CPS 340.

CPS 560 Digital Computer Design 3(3-0)

Design of basic components of a general purpose computer such as CPU, memory, I/O systems. Instruction set design. CISC versus RISC debate. Parallel Architectures. Prerequisite: CPS 360.

CPS 565 Computer Networks I 3(3-0)

Introduction to computer networks. Point-to-point, local area and wireless networks. Protocols, routing algorithms, and congestion control in networks. Prerequisites: CPS 340, 360.

CPS 575 Computer Graphics 3(3-0)

Representation of line drawings, handwritings, and three-dimensional surfaces in computers. A plotter and graphics terminal are used. Prerequisites: CPS 181 or MTH 223.

CPS 576 Digital Image Processing 3(3-0)

Digital image fundamentals. Introduction to digital image processing concepts and techniques. Image transforms. Enhancement, segmentation, representation, and description of images. Image encoding and restoration. Prerequisites: CPS 340; MTH 175, MTH 223.

CPS 585 Applied Data Engineering 3(3-0)

Study of data engineering concepts and techniques, including data preparation, storage and warehousing, analysis and mining, security, visualization, and applications. Use of data analysis tools. Prerequisites: STA 382.

CPS 590 Computer Applications In Educational Administration 3(3-0)

Use of computers in managing educational resources and programs. Hands-on instruction in use of existing systems. How to design and implement new systems. Does not count on CPS majors or minors except for teacher certification program. Prerequisite: CPS 501.

CPS 591 Computer Application In Classroom Instruction 3(3-0)

Software evaluation and hardware selection. Modes of computer-based instruction. Introduction to CAI and authorizing systems. Simulation/gaming for instructional purposes. Does not count on CPS majors or minors except for teacher certification programs. Prerequisite: CPS 501.

CPS 592 Computer Science Content for Elementary Teachers 3(3-0)

Introduction to procedural thinking skills. Programming in BASIC and LOGO. Overview of computer architecture at a functional level. Use of binary and hexadecimal numeration systems. Does not count on CPS majors or minors except for teacher certification programs. Prerequisite: CPS 501.

CPS 596 Special Topics In Computer Science 1-6(Spec)

May be taken for credit more than once but total credit earned in CPS 596 may not exceed 6 semester hours. Prerequisite: permission of instructor.

CPS 597 Independent Study 1-6(Spec)

Open to students with permission of instructor. May be taken for credit more than once, total credit not to exceed 6 hours.

CPS 603 Computer Information Systems 3(3-0)

Growth stages of computer usage, information flow, role of MIS manager in providing information to an organization. Does not count on the M.S degree in computer science. Prerequisite: CPS 501. This course is approved for offering in a distance learning format.

CPS 610 Advanced Software Design and Development 3(3-0)

Advanced topics in software engineering. Developing a large software system using modern software engineering techniques including object-oriented programming and CASE tools. Prerequisite: CPS 410.

CPS 611 Software Verification and Validation 3(3-0)

Software verification and validation techniques are introduced and their applicability discussed. In-depth study of verification and validation area. Does not count for the MS in Computer Science. Prerequisites: CPS 510 and MTH 175.

CPS 612 Software Project Management 3(3-0)

Software engineering process, software project organization and management issues, software project economics, software quality assurance, software configuration management, software operations issues. Does not count for MS in Computer Science. Prerequisites: CPS 510. This course is approved for offering in a distance learning format.

CPS 613 Specification of Software Systems 3(3-0)

Formal models and representations. Specification techniques and tools that support them. Assessment of specification for attributes such as consistency and completeness. Does not count on the MS in Computer Science. Prerequisites: CPS 510 and MTH 175.

CPS 614 Principles and Applications of Software 3(3-0)

Covers several different methods and languages for expressing designs. The process of assessment is also covered. Does not count for the MS in Computer Science. Prerequisites: CPS 510 and MTH 175.

CPS 615 Software Generation and Maintenance 3(3-0)

Techniques for performing software generation and maintenance. Alternatives to coding, language concepts, the role of standards and style, the role of tools, performance analysis, regression analysis, other maintenance-specific subjects. Does not count for the MS in Computer Science. Prerequisites: CPS 510.

CPS 619 Continuing Registration for Final Research Project 1(1-0)

A non-credit course intended for students who have completed all program credits but still need to use university resources to complete their degree requirements.

CPS 640 Theory of Automata and Formal Languages 3(3-0)

Introduction to theory of Automata (FA, PDA, Turing Machines) and theory of formal languages (RE, CFL, CSL, etc.) and their relationships. Chomsky Hierarchy. Undecidability. Prerequisites: CPS 340.

CPS 641 Advanced Topics in Databases 3(3-0)

Conceptual models. Relational theory. Access methods, query optimization. Concurrency Integrity. Selected current topics, e.g., distributed, temporal, and object-oriented databases. Student projects; literature review. Prerequisite: CPS 541.

CPS 650 Theory and Practice of Compiler Construction 3(3-0)

Automata theory, context-free languages, syntax analysis and parsing techniques. Semantic processing for structured and/or object-oriented programming languages. Code generation and optimization. Prerequisite: CPS 450.

CPS 660 Advanced Computer Organization 3(3-0)

Calculator and minicomputer design, organization of computer software and hardware interface, concept of microprogramming and microprocessor design, multiprocessing and pipeline processing. Prerequisite: CPS 360.

CPS 665 Computer Networks II 3(3-0)

Principles, design, implementation, performance, security issues and areas of current research in computer networks. Prerequisites: CPS 565; STA 382.

CPS 670 Operating Systems 3(3-0)

Concepts, communication, synchronization, processes, and processors in distribution systems. Distributed file systems. Distributed shared memory systems. Prerequisite: CPS 470.

CPS 675 Advanced Topics in Computer Graphics 3(3-0)

Detailed study of selected advanced topics in computer graphics. Prerequisite: CPS 575.

CPS 676 Computer Vision 3(3-0)

Introduction to basic issues in computer vision, early processing, boundary detection; texture, motion and color; representation of 2-D, 3-D structures; knowledge-based vision systems. Prerequisites: CPS 576, (CPS 680 desired, but not required).

CPS 680 Artificial Intelligence 3(3-0)

Introduction to symbolic manipulation and machine intelligence. Design of AI methods in a functional programming language. Logic Programming. Machine Learning. Applications. Prerequisites: CPS 340 and CPS 410.

CPS 681 Advanced Topics in Artificial Intelligence 3(3-0)

Advanced topics in artificial intelligence including topics from expert systems, natural language processing, automated reasoning, and other areas. Prerequisite: CPS 680.

CPS 685 Pattern Recognition and Data Mining 3(3-0)

Pattern modeling, classification, recognition, and their applications in data mining. Data mining process and techniques, including data transformation, supervised induction, association discovery, and conceptual clustering. Prerequisites: CPS 410, MTH 223, STA 282, STA 382 or STA 584.

CPS 691 Graduate Seminar 3(3-0)

Current topics in computer science and technology. Literature study. Development, demonstration, and presentation of research and application projects. Technical writing. Prerequisites: 12 hours of graduate courses in CPS.

CPS 695 Professional Field Experience 1-6(Spec)

Professional field experience via internship or apprenticeship. Must be integral to the student's program of study. Does not count towards a degree in Computer Science. CR/NC only. Prerequisites: permission of graduate advisor or department chairperson.

CPS 696 Special Topics in Computer Science 1-6(Spec)

May be taken for credit more than once, but total credit earned in CPS 696 may not exceed 6 semester hours. Prerequisite: permission of instructor.

CPS 697 Independent Study 1-6(Spec)

Open to students with permission of instructor. May be taken for credit more than once, total credit not to exceed 6 hours.

CPS 710 – Software Engineering Metrics, Models and Management 3(3-0)

Study of modern software design techniques, complexity metrics, testing techniques, models, and project management. Prerequisites: CPS 520, 610

CPS 798 Thesis 1-6(Spec)

CR/NC only. Prerequisites: written permission of advisor and department chairperson.