Case studies in community, agriculture, recreation, and resources studies. Concepts and skills needed to interpret and evaluate published research.

Master's Professional Project
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 9 credits in all enrollments for this course. R: Open only to master's students in the Department of Community, Agriculture, Recreation and Resource Studies. Master's project, non-thesis research, practicum or other professional development capstone experiences.

Master's Thesis Research
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to master's students in the Department of Community, Agriculture, Recreation and Resource Studies. Master's thesis research.

Doctoral Dissertation Research
Fall, Spring, Summer. 1 to 12 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to doctoral students in the Department of Community, Agriculture, Recreation and Resource Studies. Doctoral dissertation research.

Survey of Research Methods
Spring, 3(3-0) R: Open only to graduate students in the Department of Community, Agriculture, Recreation and Resource Studies. Methodological approaches and research techniques applied in multidisciplinary research in community, agriculture, recreation, and resources studies. Concepts and skills needed to interpret and evaluate published research.

Case Studies in Community, Agriculture, Recreation and Resource Studies
Spring, 3(3-0) P.M. (ACR 800 and ACR 802) R: Open only to graduate students in the Department of Community, Agriculture, Recreation and Resource Studies. Case studies in community, agriculture, recreation and tourism, natural resources and environmental systems. Use of multi-disciplinary teams in addressing complex policy, planning, development, and management issues.

Master's Professional Project
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 9 credits in all enrollments for this course. R: Open only to master's students in the Department of Community, Agriculture, Recreation and Resource Studies. Master's project, non-thesis research, practicum or other professional development capstone experiences.

Master's Thesis Research
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to master's students in the Department of Community, Agriculture, Recreation and Resource Studies. Master's thesis research.

Doctoral Dissertation Research
Fall, Spring, Summer. 1 to 12 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to doctoral students in the Department of Community, Agriculture, Recreation and Resource Studies. Doctoral dissertation research.

Survey of Research Methods
Spring, 3(3-0) R: Open only to graduate students in the Department of Community, Agriculture, Recreation and Resource Studies. Methodological approaches and research techniques applied in multidisciplinary research in community, agriculture, recreation, and resources studies. Concepts and skills needed to interpret and evaluate published research.
422 Computer Networks
Fall, Spring. 3(3-0) P: (STT 351 or ECE 280) and (CSE 320 or ECE 331) and (CSE 410 or concurrently) R: Open only to students in the Department of Computer Science or the Computer Engineering or LBS Computer Science major or the LBS Computer Science coordinate major or the Computer Science disciplinary minor. SA: CPS 422


435 Software Engineering
Fall. 3(3-0) P: (CSE 320 and CSE 331 and CSE 335) R: Open only to students in the Department of Computer Science or the Computer Engineering or LBS Computer Science major or the LBS Computer Science coordinate major or the Computer Science discipline minor. SA: CSE 470

Software lifecycle including specification, design, coding, testing, and verification of a software product. Stepwise refinement and traceability. Software maintenance and documentation.

440 Introduction to Artificial Intelligence
Fall. 3(3-0) P: (CSE 331 or CSE 335) R: Open only to students in the Department of Computer Science and Engineering or the Computer Engineering major or the LBS Computer Science field of concentration or the LBS Computer Science coordinate major or the Computer Science disciplinary major. SA: CSE 440


444 Information Technology Project Management
Spring. 3(3-0) Interdepartmental with Information Technology Management, Telecommunication. Administered by The Eli Broad College of Business. P: (ITM 311) R: Open only to seniors in the Specialization in Information Technology.

Practical training and experiences in design, testing, and launch of new information technologies and systems.

450 Translation of Programming Languages
Spring. 3(3-0) P: (CSE 331 or CSE 335) and (CSE 320 or ECE 331) R: Open only to students in the Department of Computer Science and Engineering or the Computer Engineering major or LBS Computer Science field of concentration or the LBS Computer Science coordinate major or the Computer Science disciplinary minor. SA: CSE 450


452 Organization of Programming Languages
Fall. 3(3-0) P: (CSE 337 or CSE 335) and (CSE 320 or ECE 331) R: Open only to students in the Department of Computer Science and Engineering or Computer Engineering major or the LBS Computer Science coordinate major or the LBS Computer Science field of concentration or the Computer Science disciplinary minor. SA: CPS 452


460 Computability and Formal Language Theory
Fall, Spring. 3(3-0) P: (CSE 331) R: Open only to students in the Department of Computer Science and Engineering or Computer Engineering major or LBS Computer Science coordinate major or the LBS Computer Science field of concentration or the Computer Science disciplinary minor. SA: CSE 360

Formal models of computation such as finite state automata, pushdown automata and Turing machines. Formal definitions of languages, problems, and language classes including recursive, recursively enumerable, regular, and context free languages. The relationships among various models of computation, language classes, and problems. Church's thesis and the limits of computability. Proofs of program properties including correctness.

471 Media Processing and Multimedia Computing
Fall. 3(3-0) P: (CSE 320) and (CSE 331 or CSE 335) R: Open only to students in the Department of Computer Science and Engineering or Computer Engineering major or the LBS Computer Science field of concentration or the LBS Computer Science coordinate major or the Computer Science disciplinary minor.


472 Computer Graphics
Spring. 3(3-0) P: (CSE 314) and (CSE 331 or CSE 335) R: Open only to juniors or seniors or graduate students in the Department of Computer Science and Engineering or to juniors or seniors in the Computer Engineering major or the LBS Computer Science field of concentration or the LBS Computer Science coordinate major. SA: CPS 472


475 Introduction to Computational Linguistics
Fall. 3(3-0) Interdepartmental with Linguistics. Administered by Department of Linguistics and Germanic, Slavic, Asian and African Languages. P: (CSE 232 and LIN 401)

Computer science of linguistic theories and their application in natural language processing systems. Stochastic and categorical automata for morphological analysis. Rule systems for grammars. Parsing algorithms for syntactic and semantic analysis, with implications for cognitive models of human sentence processing. Probabilistic models of linguistic events.

480 Database Systems
Spring. 3(3-0) P: (CSE 331) and (CSE 320 or ECE 331) R: Open only to students in the Department of Computer Science and Engineering or the Computer Engineering major or the LBS Computer Science field of concentration or the LBS Computer Science coordinate major or the Computer Science disciplinary minor. SA: CPS 480

Storage of and access to physical databases including indexing, hashing, and range accesses. Relational data models, database design principles, query languages, query optimization, transaction processing and recovery techniques. Object-oriented and distributed databases.

490 Independent Study in Computer Science
Fall, Spring. 1 to 3 credits. A student may earn a maximum of 3 credits in all enrollments for this course. R: Open only to students in the Department of Computer Science or the Computer Engineering major. Approval of department; application required. SA: CPS 490

Supervised individual study in an area of computer science.

491 Selected Topics in Computer Science
Fall, Spring. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Open only to students in the Department of Computer Science or the Computer Engineering major. Approval of department. SA: CPS 491

Topics selected to supplement and enrich existing courses and lead to the development of new courses.

498 Collaborative Design [W]
Spring. 3(3-0) P: (CSE 335 and CSE 410) and (CSE 420 or CSE 422 or CSE 435 or CSE 440 or CSE 450 or CSE 452 or CSE 460 or CSE 471 or CSE 472 or CSE 480) and completion of Tier I writing requirement. R: Open only to majors in the Department of Computer Science and Engineering. SA: CSE 449, CSE 478, CSE 479

Development of a comprehensive software and/or hardware solution to a problem in a team setting with emphasis on working with a client. Participation in a design cycle including specification, design, implementation, testing, maintenance, and documentation. Issues of professionalism, ethics, and communication.

802 Pattern Recognition and Analysis
Spring. 4(4-0) RB: (CSE 330 and MTH 314 and STT 441) R: Open only to Computer Science or Electrical Engineering majors. SA: CPS 802


803 Computer Vision
Fall. 3(3-0) RB: (CSE 331 and MTH 314 and STT 351) R: Open only to Computer Science or Electrical Engineering majors. SA: CPS 803

985  Artificial Neural Networks  
Fall. 3(3-0) Interdepartmental with Electrical and Computer Engineering. Administered by Department of Electrical and Computer Engineering. SA: CPS 885  

989  Independent Study  
Fall, Spring. Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to Computer Science or Electrical Engineering majors. Approval of department. SA: CPS 890  
Independent study of some topic, system, or language not covered in a regular course.

991  Selected Topics  
Fall, Spring. 1 to 3 credits. A student may earn a maximum of 9 credits in all enrollments for this course. R: Open only to Computer Science or Electrical Engineering majors. SA: CPS 891  
Selected topics in computer science of current interest and importance but not covered in a regular course.

998  Master's Project  
Fall, Spring. Summer. 1 to 4 credits. A student may earn a maximum of 12 credits in all enrollments for this course. R: Open only to Computer Science majors. Approval of department. SA: CPS 898  
Master's degree Plan B individual student project: original research, research replication, or survey and reporting on a topic such as system design and development, or system conversion or installation.

999  Master's Thesis Research  
Fall, Spring. Summer. 1 to 8 credits. A student may earn a maximum of 24 credits in all enrollments for this course. R: Open only to Computer Science majors. Approval of department. SA: CPS 899  
Master's thesis research.

914  Formal Methods in Software Development  
Fall. 3(3-0) P:M: (CSE 814) RB: Undergraduate courses in software engineering and in logic. R: Open only to students in the Department of Computer Science and Engineering. SA: CPS 914  
Current research in selected areas of software engineering such as: approaches for the incorporation of formal methods in software development; current projects using formal methods in software engineering; object-oriented analysis and development techniques; and approaches for the incorporation of user-interface analysis and design in software development.

920  Selected Topics in High Performance Computer Systems  
Spring of odd years. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course. P:M: (CSE 822) R: Open only to Computer Science and Engineering majors or approval of Department. SA: CPS 920  
Design of high performance computer systems. Seminar format.

921  Advanced Topics in Digital Circuits and Systems  
Fall, Spring. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course. Interdepartmental with Electrical and Computer Engineering. Administered by Department of Electrical and Computer Engineering. SA: EE 921  
Topics vary each semester.

921A  Testable and Fault-tolerant Digital Systems  
Fall of odd years. Spring of odd years. 3(3-0) Interdepartmental with Electrical and Computer Engineering. Administered by Department of Electrical and Computer Engineering. RB: (ECE 809 and ECE 813) SA: EE 921A  

921B  Embedded Architectures  
Fall of odd years. Spring of odd years. 3(3-0) Interdepartmental with Electrical and Computer Engineering. Administered by Department of Electrical and Computer Engineering. RB: (ECE 809 and ECE 813) SA: EE 921B  
Embedded computers and architectures for real-time computation and/or robust control. ASICs, Bit-slice architectures. Systolic arrays. Neural networks. Genetic algorithms. Implementation technologies and design issues.

921C  Electronic Systems Packaging  
Fall of odd years. Spring of odd years. 3(3-0) Interdepartmental with Electrical and Computer Engineering. Administered by Department of Electrical and Computer Engineering. RB: A basic background in electronics and electromagnetics. VLSI packaging technology, thermal management, electrical design, switching noise, multi-chip packaging, materials, device assembly, RF device packaging and, and electrical testing.

COUNSELING, CEP EDUCATIONAL PSYCHOLOGY AND SPECIAL EDUCATION

Department of Counseling, Educational Psychology and Special Education

College of Education

150  Reflections on Learning  
Fall, Spring. Summer. 3(3-0) Interdepartmental with Teacher Education. Administered by Department of Teacher Education. Students' experiences as learners in comparison to psychological, sociological, and anthropological theories and assumptions about learning and teaching in and out of school.

240  Diverse Learners in Multicultural Perspective  
Fall, Spring. Summer. 3(2-2) Interdepartmental with Teacher Education. Not open to students with credit in TE 250. Communicative, linguistic, physical, sensory, behavioral, affective, and cognitive differences in learning in multicultural classrooms. Factors that mediate access to knowledge.