M E M O R A N D U M

TO: Deans and Chairs

FROM: Becky Bitter, Sr. Assistant Registrar

DATE: November 28, 2018

SUBJECT: Minor Change Bulletin No. 7

The courses listed below reflect the minor curricular changes approved by the catalog editor since approval of the last Minor Change Bulletin. The column to the far right indicates the date each change becomes effective.

Subject	Course Number	Revise Drop	Current	Proposed	Effective Date
AFS	590	Revise	**Sociology of Agriculture and Food Systems** 3 Theories, concepts, debates, and methods associated with the sociology of agriculture and food systems. Typically offered Odd Years - Spring.	**Sociology of Agriculture and Food Systems** 3 Theories, concepts, debates, and methods associated with the sociology of agriculture and food systems. Typically offered Odd Years - Spring. Cooperative: Open to UI degree-seeking students.	1-19
ATH T	391	Drop	**Athletic Training Clinical Internship I** 2 May be repeated for credit; cumulative maximum 4 hours. Course Prerequisite: Concurrent enrollment in ATH T 370. Beginning techniques in management of sport injury/illness under supervision. Typically offered Fall and Spring.	--N/A--	8-19
CPT S / E E	302	Revise	**Professional Skills in Computing and Engineering** 3 Course prerequisite: Certified major in Computer Science, Computer Engineering, or Electrical Engineering; junior standing. Foundation in computing and engineering professional development. (Crosslisted course offered as CPT S 302, E E 302). Credit not granted for both CPT S/E E 302 and CPT S 401. Typically offered Fall and Spring.	**Professional Skills in Computing and Engineering** 3 Course prerequisite: Certified major or minor in Computer Science, Computer Engineering, Electrical Engineering, Software Engineering, or Data Analytics; junior standing. Foundation in computing and engineering professional development. (Crosslisted course offered as CPT S 302, E E 302). Credit not granted for both CPT S/E E 302 and CPT S 401. Typically offered Fall and Spring.	1-19

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CPT S / CS	315	Revise	**Introduction to Data Mining** 3 Course Prerequisite: CPT S 215, 223, 233, or CS 315 with a C or better. The process of automatically extracting valid, useful, and previously unknown information from large repositories. (Crosslisted course offered as CPT S 315, CS 315).	**Introduction to Data Mining** 3 Course Prerequisite: CPT S 215, 223, 233, or CS 315, with a C or better; certified major or minor in Computer Science, Computer Engineering, Electrical Engineering, Software Engineering, or Data Analytics. The process of automatically extracting valid, useful, and previously unknown information from large repositories. (Crosslisted course offered as CPT S 315, CS 315).	**1-19**
CPT S	317	Revise	**Automata and Formal Languages** 3 Course Prerequisite: CPT S 122 ~~with a C or better~~ or ~~CPTS~~ 132 with a C or better; MATH 216 with a C or better; certified major in Computer Science, Computer Engineering, or Electrical Engineering, ~~or~~ Software Engineering. Finite automata, regular sets, pushdown automata, context-free language, Turing machines and the halting problem. Typically offered Fall and Spring.	**Automata and Formal Languages** 3 Course Prerequisite: CPT S 122 or 132, with a C or better; MATH 216 with a C or better; certified major or minor in Computer Science, Computer Engineering, Electrical Engineering, Software Engineering, or Data Analytics. Finite automata, regular sets, pushdown automata, context-free language, Turing machines and the halting problem. Typically offered Fall and Spring.	**1-19**
CPT S	321	Revise	**Object-Oriented Software Principles** 3 Course Prerequisite: CPT S 223 ~~with a C or better~~ or ~~CPT S~~ 233 with a C or better; certified major in Computer Science, Computer Engineering, Electrical Engineering, ~~or~~ Software Engineering. Object-oriented programming for flexibility, efficiency, and maintainability; logic and UI decoupling; complexity analysis, data structures, and algorithms for industry-quality software.	**Object-Oriented Software Principles** 3 Course Prerequisite: CPT S 223 or 233, with a C or better; certified major or minor in Computer Science, Computer Engineering, Electrical Engineering, Software Engineering, or Data Analytics. Object-oriented programming for flexibility, efficiency, and maintainability; logic and UI decoupling; complexity analysis, data structures, and algorithms for industry-quality software.	**1-19**
CPT S	322	Revise	**[M] Software Engineering Principles I** 3 Course Prerequisite: CPT S 223 ~~with a C or better~~ or ~~CPTS~~ 233 with a C or better; certified major in Computer Science, Computer Engineering,	**[M] Software Engineering Principles I** 3 Course Prerequisite: CPT S 223 or 233, with a C or better; certified major or minor in Computer Science, Computer Engineering, Electrical	**1-19**

			Electrical Engineering, ~~or~~ Software Engineering. Introduction to software engineering; requirements analysis, definition, specification including formal methods; prototyping; design including object and function oriented design. Typically offered Fall and Spring.	Engineering, Software Engineering, <u>or Data Analytics</u>. Introduction to software engineering; requirements analysis, definition, specification including formal methods; prototyping; design including object and function oriented design. Typically offered Fall and Spring.	
CPT S	**323**	**Revise**	**Software Design** 3 Course Prerequisite: CPT S 223 ~~with a C or better~~ or ~~CPT S~~ 233 with a C or better; CPT S 322 with a C or better or concurrent enrollment; certified major in ~~Computer Science, Computer Engineering, Electrical Engineering, or~~ Software ~~Engineering~~. Practical aspects of software design and implementation using object-oriented, aspect-oriented and procedural programming. Typically offered Spring.	**Software Design** 3 Course Prerequisite: CPT S 223 or 233<u>,</u> with a C or better; CPT S 322 with a C or better or concurrent enrollment; certified major <u>or minor</u> in <u>CPT S, Cpt Engr, E E,</u> Software <u>Engr, or Data Analytics. Enrollment not allowed if credit earned in CPT S 487.</u> Practical aspects of software design and implementation using object-oriented, aspect-oriented and procedural programming. <u>Credit not granted for both CPT S 323 and 487.</u> Typically offered Spring.	**1-19**
CPT S	**350**	**Revise**	**Design and Analysis of Algorithms** 3 Course Prerequisite: CPT S 223 ~~with a C or better~~ or ~~CPT S~~ 233 with a C or better; CPT S 317 with a C or better; certified major in Computer Science, Computer Engineering, Electrical Engineering, ~~or~~ Software Engineering. Analysis of data structures and algorithms; computational complexity and design of efficient data-handling procedures.	**Design and Analysis of Algorithms** 3 Course Prerequisite: CPT S 223 or 233<u>,</u> with a C or better; CPT S 317 with a C or better; certified major <u>or minor</u> in Computer Science, Computer Engineering, Electrical Engineering, Software Engineering, <u>or Data Analytics</u>. Analysis of data structures and algorithms; computational complexity and design of efficient data-handling procedures.	**1-19**
CPT S	**355**	**Revise**	**Programming Language Design** 3 Course Prerequisite: CPT S 223 or 233, with a C or better; certified major in Computer Science, Computer Engineering, Electrical Engineering, ~~or~~ Software Engineering. Design concepts of high-level programming languages; survey of existing languages, experience using some	**Programming Language Design** 3 Course Prerequisite: CPT S 223 or 233, with a C or better; certified major <u>or minor</u> in Computer Science, Computer Engineering, Electrical Engineering, Software Engineering, <u>or Data Analytics</u>. Design concepts of high-level programming languages; survey of existing languages, experience	**1-19**

			languages. Typically offered Fall and Spring.	using some languages. Typically offered Fall and Spring.	
CPT S	**360**	**Revise**	**Systems Programming C/C++** 4 (3-3) Course Prerequisite: CPT S 223 with a C or better; CPT S 260 ~~with a C or better~~ or E E 234 with a C or better; certified major in Computer Science, Computer Engineering, Electrical Engineering, ~~or~~ Software Engineering. Implementation of systems programs, concepts of computer operating systems; laboratory experience in using operating system facilities taught in C/C++ programming language. Typically offered Fall and Spring.	**Systems Programming C/C++** 4 (3-3) Course Prerequisite: CPT S 223 with a C or better; CPT S 260 or E E 234<u>,</u> with a C or better; certified major <u>or minor</u> in Computer Science, Computer Engineering, Electrical Engineering, Software Engineering<u>, or Data Analytics</u>. Implementation of systems programs, concepts of computer operating systems; laboratory experience in using operating system facilities taught in C/C++ programming language. Typically offered Fall and Spring.	**1-19**
CPT S	**370**	**Revise**	**Systems Programming Java** 4 (3-3) Course Prerequisite: CPT S 233 with a C or better; CPT S 260 ~~with a C or better~~ or E E 234 with a C or better; certified major in Computer Science, Computer Engineering, Electrical Engineering, ~~or~~ Software Engineering. Implementation of systems programs, concepts of computer operating systems; laboratory experience in using operating system facilities. Taught in Java programming language. Typically offered Fall and Spring.	**Systems Programming Java** 4 (3-3) Course Prerequisite: CPT S 223 with a C or better; CPT S 260 or E E 234<u>,</u> with a C or better; certified major <u>or minor</u> in Computer Science, Computer Engineering, Electrical Engineering, Software Engineering<u>, or Data Analytics</u>. Implementation of systems programs, concepts of computer operating systems; laboratory experience in using operating system facilities. Taught in Java programming language. Typically offered Fall and Spring.	**1-19**
CPT S	**401**	**Revise**	**Computers and Society** 3 Course Prerequisite: Certified major in Computer Science, Computer Engineering, Electrical Engineering, ~~or~~ Software Engineering; junior standing. Skills and literacy course. Ethical and societal issues related to computers and computer networks; computers as enabling technology; computer crime, software theft, privacy, viruses, worms. Credit not granted for both CPT S 401 and CPT S/E E 302.	**Computers and Society** 3 Course Prerequisite: Certified major <u>or minor</u> in Computer Science, Computer Engineering, Electrical Engineering, Software Engineering<u>, or Data Analytics</u>; junior standing. Skills and literacy course. Ethical and societal issues related to computers and computer networks; computers as enabling technology; computer crime, software theft, privacy, viruses, worms. Credit not granted for both CPT S 401 and CPT S/E E 302.	**1-19**

CPT S	**411**	**Revise**	**Introduction to Parallel Computing** 3 Course Prerequisite: CPT S 215, 223, or 233, with a C or better; certified major in Computer Science, Computer Engineering, Data Analytics, Electrical Engineering, ~~or~~ Software Engineering. Fundamental principles of parallel computing, parallel programming experience on multicore machines and cluster computers, and design of algorithms and applications in parallel computing. Recommended preparation: CPT S 350. Typically offered Fall.	**Introduction to Parallel Computing** 3 Course Prerequisite: CPT S 215, 223, or 233, with a C or better; certified major <u>or minor</u> in Computer Science, Computer Engineering, Electrical Engineering, Software <u>Engineering, or Data Analytics</u>. Fundamental principles of parallel computing, parallel programming experience on multicore machines and cluster computers, and design of algorithms and applications in parallel computing. Recommended preparation: CPT S 350. Typically offered Fall.	**1-19**
CPT S/ CS	**415**	**Revise**	**Big Data** 3 Course Prerequisite: CPT S 215, 223, or 233, with a C or better. Big data models, databases and query languages, modern distributed database systems and algorithms. (Crosslisted course offered as CPT S 415, CS 415).	**Big Data** 3 Course Prerequisite: CPT S 215, 223, or 233, with a C or better<u>; certified major or minor in Computer Science, Computer Engineering, Electrical Engineering, Software Engineering, or Data Analytics</u>. Big data models, databases and query languages, modern distributed database systems and algorithms. (Crosslisted course offered as CPT S 415, CS 415).	**1-19**
CPT S	**421**	**Revise**	**Software Design Project I** 3 (0-9) Course Prerequisite: C or better in CPT S 321 ~~AND~~ 322; or C or better CPT S 322 ~~AND~~ CPT S 360 or 370; or C or better CPT S 322 ~~AND~~ concurrent enrollment in CPT S 360 or 370; certified in ~~Computer Sci,~~ ~~Computer~~ Engr, ~~Electrical Engr,~~ ~~or~~ Software Engr. Large-scale software development including requirements analysis, estimation, design, verification and project management. Typically offered Fall and Spring.	**Software Design Project I** 3 (0-9) Course Prerequisite: C or better in CPT S 321 and 322; or C or better CPT S 322 and CPT S 360 or 370; or C or better CPT S 322 and concurrent enrollment in CPT S 360 or 370; certified <u>major or minor</u> in <u>CPT S, Cpt Engr, E E,</u> Software Engr<u>, or Data Analytics</u>. Large-scale software development including requirements analysis, estimation, design, verification and project management. Typically offered Fall and Spring.	**1-19**
CPT S	**422**	**Revise**	**[M] Software Engineering Principles II** 3 Course Prerequisite: CPT S 321 ~~with a C or better~~ or ~~CPT S~~ 323 with a C or better; CPT S 322 with a C or better; certified major in Computer	**[M] Software Engineering Principles II** 3 Course Prerequisite: CPT S 321 or 323<u>,</u> with a C or better; CPT S 322 with a C or better; certified major <u>or minor</u> in Computer Science,	**1-19**

			Science, Computer Engineering, Electrical Engineering, ~~or~~ Software Engineering. Dependable software systems; software verification and validation, testing; CASE environments; software management and evolution. Typically offered Fall.	Computer Engineering, Electrical Engineering, Software Engineering, <u>or Data Analytics</u>. Dependable software systems; software verification and validation, testing; CASE environments; software management and evolution. Typically offered Fall.	
CPT S	423	Revise	**[CAPS] Software Design Project II** 3 (1-6) Course Prerequisite: CPT S 421 with a C or better; certified major in Computer Science, Computer Engineering, Electrical Engineering, ~~or~~ Software Engineering. Laboratory/group design project for large-scale software development, requirements analysis, estimation, design, verification techniques. Typically offered Fall and Spring.	**[CAPS] Software Design Project II** 3 (1-6) Course Prerequisite: CPT S 421 with a C or better; certified major <u>or minor</u> in Computer Science, Computer Engineering, Electrical Engineering, Software Engineering, <u>or Data Analytics</u>. Laboratory/group design project for large-scale software development, requirements analysis, estimation, design, verification techniques. Typically offered Fall and Spring.	**1-19**
CPT S	427 / 527	Revise	**Computer Security** 3 Course Prerequisite: CPT S 360 ~~with a C or better~~ or ~~CPT S~~ 370 with a C or better; MATH 216 with a C or better; certified major in Computer ~~Science~~, Computer Engineering, Electrical Engineering, ~~or~~ Software Engineering. Examines cyber vulnerabilities and attacks against computer systems and networks; includes security protection mechanisms, cryptography, secure communication protocols, information flow enforcement, network monitoring, and anonymity techniques. Credit not granted for both CPT S 427 and CPT S 527. Offered at 400 and 500 level.	**Computer Security** 3 Course Prerequisite: CPT S 360 or 370, with a C or better; MATH 216 with a C or better; certified major <u>or minor</u> in Computer Science, Computer Engineering, Electrical Engineering, Software Engineering, <u>or Data Analytics.</u> Examines cyber vulnerabilities and attacks against computer systems and networks; includes security protection mechanisms, cryptography, secure communication protocols, information flow enforcement, network monitoring, and anonymity techniques. Credit not granted for both CPT S 427 and CPT S 527. Offered at 400 and 500 level.	**1-19**
CPT S	434 / 534	Revise	**Neural Network Design and Application** 3 Course Prerequisite: CPT S 121 ~~with a C or better~~, ~~CPT S~~ 131 ~~with a C or better~~, or E E 221 with a C or better; STAT 360 with a C or better; certified major	**Neural Network Design and Application** 3 Course Prerequisite: CPT S 121, 131, or E E 221<u>,</u> with a C or better; STAT 360 with a C or better; certified major <u>or minor</u> in Computer Science, Computer	**1-19**

			in Computer Science, Computer Engineering, Electrical Engineering, ~~or~~ Software Engineering. Hands-on experience with neural network modeling of nonlinear phenomena; application to classification, forecasting, identification and control. Credit not granted for both CPT S 434 and CPT S 534. Offered at 400 and 500 level.	Engineering, Electrical Engineering, Software Engineering, or Data Analytics. Hands-on experience with neural network modeling of nonlinear phenomena; application to classification, forecasting, identification and control. Credit not granted for both CPT S 434 and CPT S 534. Offered at 400 and 500 level.	
CPT S	**437**	**Revise**	**Introduction to Machine Learning** 3 Course Prerequisite: CPT S 215 ~~with a C or better~~, ~~CPT S~~ 223 ~~with a C or better~~, or ~~CPT S~~ 233 with a C or better; certified major in Computer Science, Computer Engineering, Electrical Engineering, or Software Engineering. Topics in machine learning including linear models for regression and classification, generative models, support vector machines and kernel methods, neural networks and deep learning, decision trees, unsupervised learning, and dimension reduction. Recommended preparation: E E 221; linear algebra; multivariate calculus; probability and statistics. Typically offered Spring.	**Introduction to Machine Learning** 3 Course Prerequisite: CPT S 215, 223, or 233, with a C or better; certified major or minor in Computer Science, Computer Engineering, Electrical Engineering, Software Engineering, or Data Analytics. Topics in machine learning including linear models for regression and classification, generative models, support vector machines and kernel methods, neural networks and deep learning, decision trees, unsupervised learning, and dimension reduction. Recommended preparation: E E 221; linear algebra; multivariate calculus; probability and statistics. Typically offered Spring.	**1-19**
CPT S	**438**	**Revise**	**Scientific Visualization** 3 Course Prerequisite: CPT S 223 ~~with a C or better~~ or ~~CPTS~~ 233 with a C or better; CPT S 224 with a C or better; MATH 172 ~~with a C or better~~ or ~~MATH~~ 182 with a C or better; certified in ~~Computer Science, Computer Engineering, Elec Engr, or~~ Software Engr. Data taxonomy, sampling, plotting, using and extending a visualization package, designing visualization and domain-specific techniques.	**Scientific Visualization** 3 Course Prerequisite: CPT S 223 or 233, with a C or better; CPT S 224 with a C or better; MATH 172 or 182, with a C or better; certified major or minor in CPT S, Cpt Engr, E E, Software Engr, or Data Analytics. Data taxonomy, sampling, plotting, using and extending a visualization package, designing visualization and domain-specific techniques.	**1-19**
CPT S	**440 / 540**	**Revise**	**Artificial Intelligence** 3 Course Prerequisite: CPT S ~~122 with a C or better or CPT S 132~~ with a C or better; certified major in Computer	**Artificial Intelligence** 3 Course Prerequisite: CPT S 223 or CPT S 233, with a C or better; certified major or minor in Computer	**1-19**

			Science, Computer Engineering, Electrical Engineering, ~~or~~ Software Engineering. An introduction to the field of artificial intelligence including heuristic search, knowledge representation, deduction, uncertainty reasoning, learning, and symbolic programming languages. Credit not granted for both CPT S 440 and CPT S 540. Offered at 400 and 500 level. Typically offered Fall.	Science, Computer Engineering, Electrical Engineering, Software Engineering, <u>or Data Analytics</u>. An introduction to the field of artificial intelligence including heuristic search, knowledge representation, deduction, uncertainty reasoning, learning, and symbolic programming languages. Credit not granted for both CPT S 440 and CPT S 540. Offered at 400 and 500 level. Typically offered Fall.	
CPT S	442 / 542	Revise	**Computer Graphics** 3 Course Prerequisite: CPT S 223 with a C or better; CPT S 224 with a C or better; MATH 220 with a C or better; certified major in Computer ~~Science~~, Computer ~~Engineering~~, Electrical ~~Engineering~~, ~~or~~ Software ~~Engineering~~. Raster operations; transformations and viewing; geometric modeling; visibility and shading; color. Credit not granted for both CPT S 442 and CPT S 542. Offered at 400 and 500 level. Cooperative: Open to UI degree-seeking students.	**Computer Graphics** 3 Course Prerequisite: CPT S 223 with a C or better; CPT S 224 with a C or better; MATH 220 with a C or better; certified major <u>or minor</u> in Computer <u>Sci</u>, Computer <u>Engr</u>, Electrical <u>Engr</u>, Software <u>Engr</u>, <u>or Data Analytics</u>. Raster operations; transformations and viewing; geometric modeling; visibility and shading; color. Credit not granted for both CPT S 442 and CPT S 542. Offered at 400 and 500 level. Cooperative: Open to UI degree-seeking students.	**1-19**
CPT S	443 / 543	Revise	**Human-Computer Interaction** 3 Course Prerequisite: Junior standing; certified major in Computer Science, Computer Engineering, ~~or~~ Electrical Engineering. Concepts and methodologies of engineering, social and behavioral sciences to address ergonomic, cognitive, social and cultural factors in the design and evaluation of human-computer systems. Credit not granted for both CPT S 443 and CPT S 543. Offered at 400 and 500 level. Typically offered Spring.	**Human-Computer Interaction** 3 Course Prerequisite: Certified major <u>or minor</u> in Computer Science, Computer Engineering, Electrical Engineering, <u>Software Engineering, or Data Analytics;</u> <u>junior standing</u>. Concepts and methodologies of engineering, social and behavioral sciences to address ergonomic, cognitive, social and cultural factors in the design and evaluation of human-computer systems. Credit not granted for both CPT S 443 and CPT S 543. Offered at 400 and 500 level. Typically offered Spring.	**1-19**
CPT S	451	Revise	**Introduction to Database Systems** 3 Course Prerequisite: CPT S 215, ~~CPT S~~ 223, or ~~CPT S~~ 233, with a C or better; certified major in Computer Science,	**Introduction to Database Systems** 3 Course Prerequisite: CPT S 215, 223, or 233, with a C or better; certified major <u>or minor</u> in Computer Science, Computer	**1-19**

			Computer Engineering, Electrical Engineering, ~~or~~ Software Engineering. Introduction to database concepts, data models, database languages, database design, implementation issues. Typically offered Spring.	Engineering, Electrical Engineering, Software Engineering, or Data Analytics. Introduction to database concepts, data models, database languages, database design, implementation issues. Typically offered Spring.	
CPT S	452	Revise	**Compiler Design** 3 Course Prerequisite: CPT S 317 with a C or better; CPT S 355 with a C or better; certified major in Computer Science, Computer Engineering, ~~or~~ Electrical Engineering. Design of lexical analyzers, syntactic analyzers, intermediate code generators, code optimizers and object code generators.	**Compiler Design** 3 Course Prerequisite: CPT S 317 with a C or better; CPT S 355 with a C or better; certified major or minor in Computer Science, Computer Engineering, Electrical Engineering, Software Engineering, or Data Analytics. Design of lexical analyzers, syntactic analyzers, intermediate code generators, code optimizers and object code generators.	**1-19**
CPT S / E E	455	Revise	**Introduction to Computer Networks** 3 Course Prerequisite: CPT S 360, ~~CPT S~~ 370, or E E 234, with a C or better; certified major in Computer Science, Computer Engineering, Electrical Engineering, ~~or~~ Software Engineering. Concepts and implementation of computer networks; architectures, protocol layers, internetworking and addressing case studies. (Crosslisted course offered as CPT S 455, E E 455). Typically offered Fall.	**Introduction to Computer Networks** 3 Course Prerequisite: CPT S 360, 370, or E E 234, with a C or better; certified major or minor in Computer Science, Computer Engineering, Electrical Engineering, Software Engineering, or Data Analytics. Concepts and implementation of computer networks; architectures, protocol layers, internetworking and addressing case studies. (Crosslisted course offered as CPT S 455, E E 455). Typically offered Fall.	**1-19**
CPT S	460	Revise	**Operating Systems and Computer Architecture** 3 Course Prerequisite: CPT S 360 with a C or better; certified major in Computer Science, Computer Engineering, Electrical Engineering; ~~or~~ Software Engineering. Operating systems, computer architectures, and their interrelationships in micro, mini, and large computer systems. Typically offered Fall and Spring.	**Operating Systems and Computer Architecture** 3 Course Prerequisite: CPT S 360 with a C or better; certified major or minor in Computer Science, Computer Engineering, Electrical Engineering; Software Engineering, or Data Analytics. Operating systems, computer architectures, and their interrelationships in micro, mini, and large computer systems. Typically offered Fall and Spring.	**1-19**

CPT S	464 / 564	Revise	**Distributed Systems Concepts and Programming** 3 Course Prerequisite: CPT S 223 ~~with a C or better~~, ~~CPT S~~ 233 ~~with a C or better~~, or E E 234 with a C or better; certified major in Computer ~~Science~~, Computer ~~Engineering~~, Electrical ~~Engineering~~, ~~or~~ Software ~~Engineering~~. Concepts of distributed systems; naming, security, networking, replication, synchronization, quality of service; programming middleware. Credit not granted for both CPT S 464 and CPT S 564. Offered at 400 and 500 level. Typically offered Spring. Cooperative: Open to UI degree-seeking students.	**Distributed Systems Concepts and Programming** 3 Course Prerequisite: CPT S 223, 233, or E E 234<u>,</u> with a C or better; certified major <u>or minor</u> in Computer Science, Computer Engineering, Electrical Engineering, Software Engineering<u>, or Data Analytics</u>. Concepts of distributed systems; naming, security, networking, replication, synchronization, quality of service; programming middleware. Credit not granted for both CPT S 464 and CPT S 564. Offered at 400 and 500 level. Typically offered Spring. Cooperative: Open to UI degree-seeking students.	**1-19**
CPT S	466 / 566	Revise	**Embedded Systems** 3 (2-3) Course Prerequisite: CPT S 360 with a C or better; certified major in Computer Science, Computer Engineering, Electrical Engineering; ~~or~~ Software Engineering. The design and development of real-time and dedicated software systems with an introduction to sensors and actuators. Credit not granted for both CPT S 466 and CPT S 566. Offered at 400 and 500 level. Cooperative: Open to UI degree-seeking students.	**Embedded Systems** 3 (2-3) Course Prerequisite: CPT S 360 with a C or better; certified major <u>or minor</u> in Computer Science, Computer Engineering, Electrical Engineering; Software Engineering<u>, or Data Analytics</u>. The design and development of real-time and dedicated software systems with an introduction to sensors and actuators. Credit not granted for both CPT S 466 and CPT S 566. Offered at 400 and 500 level. Cooperative: Open to UI degree-seeking students.	**1-19**
CPT S	471 / 571	Revise	**Computational Genomics** 3 Course Prerequisite: CPT S 223 ~~with a C or better~~ or ~~CPT S~~ 233 with a C or better; CPT S 350 with a C or better; certified major in Computer Science, Computer Engineering, Electrical Engineering, ~~or~~ Software Engineering. Fundamental algorithms, techniques and applications. Credit not granted for both CPT S 471 and CPT S 571. Offered at 400 and 500 level. Typically offered Spring.	**Computational Genomics** 3 Course Prerequisite: CPT S 223 or 233<u>,</u> with a C or better; CPT S 350 with a C or better; certified major <u>or minor</u> in Computer Science, Computer Engineering, Electrical Engineering, Software Engineering<u>, or Data Analytics</u>. Fundamental algorithms, techniques and applications. Credit not granted for both CPT S 471 and CPT S 571. Offered at 400 and 500 level. Typically offered Spring.	**1-19**

CPT S	476	Revise	**Software Construction and Maintenance** 3 Course Prerequisite: CPT S 322 with a C or better; certified major in Computer Science, Computer Engineering, ~~or~~ Electrical Engineering. Software quality, construction (API design and use, object-oriented runtime issues), and maintenance (refactoring, reengineering, reverse engineering).	**Software Construction and Maintenance** 3 Course Prerequisite: CPT S 322 with a C or better; certified major <u>or minor</u> in Computer Science, Computer Engineering, Electrical Engineering, <u>Software Engineering, or Data Analytics</u>. Software quality, construction (API design and use, object-oriented runtime issues), and maintenance (refactoring, reengineering, reverse engineering).	**1-19**
CPT S	478	Revise	**Software Process and Management** 3 Course Prerequisite: CPT S 322 with a C or better; certified major in Computer Science, Computer Engineering, ~~or~~ Electrical Engineering. Software Engineering Process (definition, assessment, and improvement); Software Engineering Management; Software Configuration Management.	**Software Process and Management** 3 Course Prerequisite: CPT S 322 with a C or better; certified major <u>or minor</u> in Computer Science, Computer Engineering, Electrical Engineering, <u>Software Engineering, or Data Analytics</u>. Software Engineering Process (definition, assessment, and improvement); Software Engineering Management; Software Configuration Management.	**1-19**
CPT S	479	Revise	**Mobile Application Development** 3 Course Prerequisite: CPT S 223 or 233, with a C or better; certified major in Computer Science, Computer Engineering, ~~or~~ Electrical Engineering. Mobile application development; user interface; location and maps; sensor; camera; cross platform mobile application development tools.	**Mobile Application Development** 3 Course Prerequisite: CPT S 223 or 233, with a C or better; certified major <u>or minor</u> in Computer Science, Computer Engineering, Electrical Engineering, <u>Software Engineering, or Data Analytics</u>. Mobile application development; user interface; location and maps; sensor; camera; cross platform mobile application development tools.	**1-19**
CPT S	481	Revise	**Python Software Construction** 3 Course Prerequisite: CPT S 223 with a C or better; CPT S 224 with a C or better; certified major in Computer Science, Computer Engineering, Electrical Engineering, <u>or</u> Software Engineering. Intensive introduction	**Python Software Construction** 3 Course Prerequisite: CPT S 223 with a C or better; CPT S 224 with a C or better; certified major <u>or minor</u> in Computer Science, Computer Engineering, Electrical Engineering, Software Engineering, <u>or Data Analytics</u>.	**1-19**

				to the python language; user interface, building and using extension modules; C interfacing; construction of a major project.	Intensive introduction to the python language; user interface, building and using extension modules; C interfacing; construction of a major project.	
CPT S	483	Revise	**Topics in Computer Science** V 1-4 May be repeated for credit. Certified major in Computer Science, Computer Engineering, Electrical Engineering, ~~or~~ Software Engineering. Required background preparation varies with course offering, see instructor. Current topics in computer science or software engineering. Required preparation: Varies with course offering, see instructor.	**Topics in Computer Science** V 1-4 May be repeated for credit. Course Prerequisite: Certified major or minor in Computer Science, Computer Engineering, Electrical Engineering, Software Engineering, or Data Analytics. Required background preparation varies with course offering, see instructor. Current topics in computer science or software engineering. Required preparation: Varies with course offering, see instructor.	**1-19**
CPT S	484	Revise	**Software Requirements** 3 Course Prerequisite: CPT S 322 with a C or better; certified major in Computer Science, Computer Engineering, Electrical Engineering, ~~or~~ Software Engineering. Elicitation, analysis, specification, and validation of software requirements as well as the management of requirements during the software life cycle.	**Software Requirements** 3 Course Prerequisite: CPT S 322 with a C or better; certified major or minor in Computer Science, Computer Engineering, Electrical Engineering, Software Engineering, or Data Analytics. Elicitation, analysis, specification, and validation of software requirements as well as the management of requirements during the software life cycle.	**1-19**
CPT S / PSYCH	485	Revise	**Gerontechnology I** 3 Course Prerequisite: Certified major in Computer Science or Psychology. Introduction to the field of gerontechnology, including aging and senses, mobility and exercise, data analysis, and research methods. (Crosslisted course offered as CPT S 485, PSYCH 485). Typically offered Fall.	**Gerontechnology I** 3 Course Prerequisite: Certified major or minor in Computer Science, Computer Engineering, Electrical Engineering, Software Engineering, Data Analytics, or Psychology. Introduction to the field of gerontechnology, including aging and senses, mobility and exercise, data analysis, and research methods. (Crosslisted course offered as CPT S 485, PSYCH 485). Typically offered Fall.	**1-19**
CPT S / PSYCH	486	Revise	**Gerontechnology II** 3 Course Prerequisite: Certified major in Computer Science or Psychology.	**Gerontechnology II** 3 Course Prerequisite: Certified major or minor in Computer Science,	**1-19**

			In-depth exploration of gerontechnology, including socialization, caregiver issues, dementia, app design and data visualization. (Crosslisted course offered as CPT S 486, PSYCH 486). Typically offered Spring.	Computer Engineering, Electrical Engineering, Software Engineering, Data Analytics; or certified major in Psychology. In-depth exploration of gerontechnology, including socialization, caregiver issues, dementia, app design and data visualization. (Crosslisted course offered as CPT S 486, PSYCH 486). Typically offered Spring.	
CPT S	487 / 587	Revise	**Software Design and Architecture** 3 Course Prerequisite: CPT S 321 with a C or better; CPT S 322 with a C or better; certified major in Computer ~~Science~~, Computer ~~Engineering~~, Electrical ~~Engineering~~, ~~or~~ Software ~~Engineering~~. Software design; design principles, patterns, and anti-patterns; design quality attributes and evaluation; architectural styles, architectural patterns and anti-patterns. Credit not granted for both CPT S 487 and CPT S 587. Offered at 400 and 500 level.	**Software Design and Architecture** 3 Course Prerequisite: CPT S 321 with a C or better; CPT S 322 with a C or better; certified major or minor in Computer Sci, Computer Engr, Electrical Engr, Software Engr, or Data Analytics. Enrollment not allowed if credit already earned for CPT S 323. Software design; design principles, patterns, and anti-patterns; design quality attributes and evaluation; architectural styles, architectural patterns and anti-patterns. Credit not granted for both CPT S 487 and CPT S 587, or for both CPT S 487 and 323. Offered at 400 and 500 level.	**1-19**
CPT S	489	Revise	**Web Development** 3 Course Prerequisite: CPT S 322 with a C or better; certified major in Computer Science, Computer Engineering, Electrical Engineering, Software Engineering, or Data Analytics. Web development using markup languages, style sheet language, and scripting languages; developing and consuming web services; testing web applications.	**Web Development** 3 Course Prerequisite: CPT S 322 with a C or better; certified major or minor in Computer Science, Computer Engineering, Electrical Engineering, Software Engineering, or Data Analytics. Web development using markup languages, style sheet language, and scripting languages; developing and consuming web services; testing web applications.	**1-19**
E E / CPT S	470	Revise	**Concepts in Biotechnology** 3 Course Prerequisite: ~~[B] or~~ [BSCI] ~~GER or~~ UCORE with a C or better; concurrent enrollment in E E 415, E E 416, CPT S 421, CPT S 423,	**Concepts in Biotechnology** 3 Course Prerequisite: [BSCI] UCORE with a C or better; concurrent enrollment in E E 415, E E 416, CPT S 421, CPT S 423,	**1-19**

			ENTRP 496, ENGR 420, or ENGR 421; certified major in ~~Electrical Engineering~~, Computer ~~Science, or~~ Computer ~~Engineering~~. Fundamentals of biological sciences and biotechnology for engineers and computer scientists. (Crosslisted course offered as E E 470, CPT S 470). Typically offered Fall.	ENTRP 496, ENGR 420, or ENGR 421; certified major <u>or minor in</u> Computer <u>Sci</u>, Computer <u>Engr</u>, <u>Electrical Engr, Software Engr, or Data Analytics</u>. Fundamentals of biological sciences and biotechnology for engineers and computer scientists. (Crosslisted course offered as E E 470, CPT S 470). Typically offered Fall.	
HBM	375	Revise	**Introduction to Senior Living Management** 3 ~~Course Prerequisite: ACCTG 230.~~ Introduction to the unique aspects of managing senior housing communities. Field trip required. Typically offered Spring.	**Introduction to Senior Living Management** 3 Introduction to the unique aspects of managing senior housing communities. Field trip required. Typically offered Spring.	8-19
MBIOS	549	**Drop**	**Seminar in Immunology** 1 May be repeated for credit; cumulative maximum 2 hours. Seminar series on advances in immunology. May be repeated for credit; cumulative maximum 2 hours. Recommended preparation: MBIOS 540 or concurrent enrollment. Typically offered Spring.	--N/A--	1-19
ME	515	Revise	~~**Advanced**~~ **Heat Transfer** 3 Derivation of the energy conservation equation; laminar and turbulent forced convection heat transfer with internal and external flow; free convection. Typically offered Spring. Cooperative: Open to UI degree-seeking students.	<u>**Convective**</u> **Heat Transfer** 3 Derivation of the energy conservation equation; laminar and turbulent forced convection heat transfer with internal and external flow; free convection. Typically offered Spring. Cooperative: Open to UI degree-seeking students.	1-19
VET PATH	555	**Drop**	**Research in Progress Seminar** 1 May be repeated for credit; cumulative maximum 8 hours. Presentation of on-going student research project results. Typically offered Fall and Spring.	--N/A--	1-19