GRADUATE STUDIES
SUMMARY OF PROPOSED CATALOG CHANGES

PROGRAM: _____Computer Science_____ FOR CATALOG YEAR: 20-21

<u>PROGRAM MODIFICATIONS</u> (revised program description or admission requirements, change to total required credits, change in program course lists, revised faculty list)

none

<u>NEW COURSES</u> (New Course Proposal needed)

none

<u>MODIFIED COURSES</u> (titles, descriptions, credits)
With few taking 400/500 courses, the 500 courses have not kept up with change in the 400's. We cleaned it up for the upcoming catalog.

CS 533 — update to match CS 433 prerequisite: CS 333 and CS 360
CS 536 — update description to match CS 436
CS 550 — update prerequisite to match CS 450 and 500 option: CS 452 or CS 552
CS 552 —— duplicate CS 452 description and prerequisite, including 500 alternatives, i.e., CS 314, CS 411 or CS 511, and CS 418 or CS 518
CS 555 — update credits to match CS 455 and delete referring to variable credit.
CS 556 — update prerequisite to match CS 456: CS 314 and CS 336
CS 557 — update prerequisite to CS 456 or CS 556
CS 558 — update prerequisite to CS 457 or CS 557
CS 559 — update prerequisite to CS 411 or CS 511
CS 569 — update prerequisite to CS 411 or CS 511 and delete "and graduate standing"

<u>SUSPENDED COURSES</u>

none

<u>DELETED COURSES</u>

CS 581, 582 and 583 from discontinued PSM program

ATTACHMENTS:

See pdf copy of course listing.

Southern OREGON UNIVERSITY

Joanie Keller-Hand <kellerhaj@sou.edu>

* clarification for "or equivalent"

Catalog Changes

Sherry Ettlich <ettlich@sou.edu> Thu, Nov 7, 2019 at 2:27 PM
To: Joan Keller-Hand <kellerhaj@sou.edu>
Cc: Patrick Stubbins <stubbinsp@sou.edu>

Hi Joan,
I'm including Patrick since this should go in the main catalog copy for CS under the prerequisite heading. I recommend using the same wording found in mathematics catalog copy for consistency across programs. Below is the revised language for the prerequisites paragraph found on the first page of the catalog copy for computer science. The heading and first three sentences are copied from the current catalog. The last two sentences are the addition grad council requested.

> Prerequisites
> The SOU computer system checks prerequisites when processing a student's request to register. Students must have a C- or better in all prerequisite courses. In addition, students must have a B or better in CS 256 and CS 257. On rare occasions, a student may have a reasonable substitution for the stated prerequisite that is not recognized by the computer system. In those situations, the student should see the Computer Science Chair for clearance before trying to register for the course.

Let me know if you need anything else.
Sherry

Sherry Ettlich, Ph.D.
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Southern Oregon University 2019-20 Catalog

Course Descriptions

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- See Course Prerequisites Policy

Computer Science

CS 109 - Practicum

1 to 2 credits
Credits to be arranged. Repeatable for a maximum of 9 credits.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

CS 199 - Special Studies

1 to 18 credits
Credits to be arranged. Repeatable.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

CS 200 - Introduction to Computer Science

4 credits
Introduces computer science including the foundational skills for programming. Intended for non-majors.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

CS 209 - Practicum

1 to 6 credits
Credits to be arranged. May not be repeated for additional credit.

Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 210 - Web Development I

4 credits

~~Provides an introduction to web design. Students learn how to create web pages using XHTML and a web~~

Updated Description: Provides an introduction to the tools and technologies used in web development. Students learn how to create personalized web pages using HyperText Markup Language (HTML) and Cascading Style Sheets (CSS).

Approved for University Studies (Explorations Strand G - Sciences-Non Lab).

Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 220 - Introduction to Game Programming

4 credits

Introduces the design and programming techniques used to create computer games. Examines how user interface design, graphics, sound, data structures, and artificial intelligence are combined in highly interactive applications. Prerequisite(s): CS 256 with a B or better.

Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 256 - Computer Science I

4 credits

Provides an introduction to the fundamentals of computer programming, computer architecture, and software development. Intended for computer science majors. Prerequisite(s): MTH 111 with a C- or better (or appropriate SOU placement level).

~~*Graded (A-F) only*~~

Remove A-F restriction to allow non-majors to take P/NP. Will still require B or better to continue in sequence.

- ## CS 257 - Computer Science II

4 credits

Introduces object-oriented programming. Reinforces the fundamental control and data structures of computer science and introduces data abstraction, classes, objects, polymorphism, and inheritance. Prerequisite(s): CS 256 with a B or better; and MTH 112 with a C- or better or appropriate SOU placement level.

Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 258 - Computer Science III

4 credits

Covers pseudocode, program documentation, input, output, generic methods, exception handling, and an object-oriented introduction to data structures. Prerequisite(s): CS 257 with a B or better; and MTH 251 with a C- or better

or appropriate SOU placement level.

Grade mode designated on a CRN basis each term. Students should consult current term schedule.

CS 333

Functionally and content-wise this is aligned with other 300-level courses. Renumber CS 295 to CS 333 to keep sequencing with CS 433 and also eliminate the need to keep making an exception for CS 295 when looking at UD groupings.

- ~~CS 295~~ - Web Development II

4 credits

Focuses on web application development. Students learn how to create dynamically generated web pages using server-side scripting. Language concepts include searching databases, filtering and displaying results, form processing, passing data between pages, user authentication, session tracking, and other techniques for enhanced functionality. Prerequisite(s): CS 210 and CS 257 with a B or better.

Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- CS 310 - Information Technology: Legal and Ethical Issues

4 credits

Inquires into the ethical and legal implications of the products, activities, and behaviors of digital technology users, emphasizing U.S. laws and technology. Examines digital works, copyright laws, software, business practice patents, and a few significant court cases that raise fundamental constitutional issues. Enables students to understand the complex laws surrounding digital technology and to be able to form sound ethical and legal positions in the digital world. Approved for University Studies (Integration - Strand I). Prerequisite(s): Completion of all lower division University Studies requirements (Cross-listed with PHL 310.)

Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- CS 312 - Simulation

4 credits

Examines the theoretical and practical foundations of computer simulation. Studies simulations of discrete and continuous systems. Assigns projects using standard higher programming languages, as well as currently available simulation languages. Prerequisite(s): CS 257 with a B or better.

Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- CS 314 - Computer Organization

4 credits

Combinational and sequential Boolean logic used to create basic hardware circuitry: elementary logic, adders, and memory. Uses assembly language to illustrate machine architecture and how features in higher level programming languages are processed. Prerequisite(s): CS 257 with a B or better.

** This course was formerly offered under a different number; students who took the following course(s) will not receive additional credit unless the course is stated to be repeatable in the description above:* CS 275.

Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 315 - Computer Imaging

4 credits
Introduces basic image-processing techniques, file formats, display methods, and the importance of imaging in the business and scientific communities. Topics include point, area, and geometric processing techniques; convolution techniques; and image enhancement. Prerequisite(s): CS 257 with a B or better.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 316 - Computer Graphics I

4 credits
Introduces computer graphics and develops a graphics kernel system for use in several graphics projects. Presents the use of matrices to affect transformations of graphics displays, perspective, clipping, scaling, and hidden line techniques. Prerequisite(s): CS 367.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 336 - Networks I

Updated Description: Surveys the technologies used on the Internet and in enterprise internetworks. Studies the different types of delay on networks, including transmission, processing, queuing, and propagation delay. Covers the TCP/IP protocol model and prepares students to configure, maintain, and secure company networks that use Ethernet, wireless networking, and TCP/IP.

4 credits
~~Surveys local area network (L~~
~~setup and administration, communication models (e.g., TCP and OSI), and protocols~~. Prerequisite(s): CS 257 with a B or better.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 346 - Computer Forensics

4 credits
Surveys the technologies, techniques, and responsibilities of a criminal or civil investigation involving computers, networks, Internet service providers, and electronic evidence. Explores the ways a computer or a computer network can be associated with a crime. Examines rules of evidence and proof. Emphasizes maintaining an evidentiary trail through computer data and network activity. Reviews the responsibilities of the computer forensics investigator, the fragility of computer evidence, and the techniques used to protect evidence. Approved for University Studies (Integration - Strand H). Prerequisite(s): Completion of all lower division University Studies requirements. Junior standing or above. (Cross-listed with CCJ 346.)
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 356 - Programming Topics

2 to 4 credits
Explores programming in different languages. Topics are based on interest and need. Repeat credit is allowed for different topics. Prerequisites and credits determined by topic. Prerequisite(s): CS 257 with a B or better (some topics may require additional prerequisites).

Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 360 - Databases

4 credits
Introduces the concepts necessary for designing and implementing database systems. Emphasizes data modeling, normalization, and SQL. Prerequisite(s): CS 257 with a B or better.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 367 - C and UNIX

4 credits
Explores concepts of the UNIX operating system and the C programming language. Students learn how to use UNIX and how to program in C on UNIX. Prerequisite(s): CS 257 with a B or better.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 380 - .Net Development

4 credits
Discusses the .net framework and the Visual Studio.net programming environment. Topics include object-oriented programming concepts in .net, database interactions, GUI development, web applications, creating dynamic link libraries, and stand-alone programs.

Prerequisite(s): CS 257 with a B or better.
** This course was formerly offered under a different number; students who took the following course(s) will not receive additional credit unless the course is stated to be repeatable in the description above:* CS 280.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 399 - Special Studies

1 to 18 credits
Credits to be arranged. Repeatable.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 401 - Research

1 to 6 credits
Credits to be arranged. Repeatable. Prerequisite(s): Junior standing or above.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 403 - Thesis

1 to 9 credits
Credits to be arranged. Repeatable. Prerequisite(s): Junior standing or above.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 405 - Reading and Conference

1 to 6 credits
Credits to be arranged. Repeatable. Prerequisite(s): Junior standing or above.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 407 - Seminar

1 to 4 credits
Credits to be arranged. Repeatable. Prerequisite(s): Junior standing or above.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 409 - Practicum

1 to 15 credits
Credits to be arranged. Repeatable for a maximum of 15 credits. Prerequisite(s): Junior standing or above.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 411 - Algorithms and Data Structures

4 credits
Develops data structures, with an emphasis on algorithms, characteristics, and applications. Examines alternative algorithms for manipulating data structures and their complexity. Applications include data management systems, file organization, information retrieval, and list processing. Prerequisite(s): CS 258, CS 367 and MTH 252 with a C- or better or appropriate SOU placement level. Junior standing or above.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 415 - Foundations of Emerging Computer Applications

4 credits
Covers the background needed for students to make contributions in an emerging application area. Topics may include digital signal processing, data mining, and security. Focuses specifically on those foundational concepts that students need to be able to create or enhance digital solutions. May be repeated for credit with different topic. Prerequisite(s): CS 258 (some topics may require additional prerequisites). Junior standing or above.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 418 - Theory of Computation

4 credits

Covers formal language and automata theory from finite state automata to Turing machines. Presents the Chomsky hierarchy of languages and the relationship between languages and automata. Prerequisite(s): CS 411. Junior standing or above.

Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 426 - UNIX System Administration

4 credits

Introduces UNIX and shell programming, start-up and shut down, user administration, file systems, controlling processes, adding disks and cron, configuring the kernel, SLIP, PPP, and security. Prerequisite(s): CS 336 and CS 367; Junior standing or above.

Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 433 - Corporate Web Development

4 credits

Introduces XML, XSL, and XQL. Examines e-commerce, digital money, and data encryption. Students are required to work on an e-commerce project as part of the course. Prerequisite(s): ~~CS 295~~ and CS 360. Junior standing or above.

Update prerequisite to match renumbering CS 295 to CS 333: "CS 333 and CS 360"

Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 436 - Networks II

4 credits

Updated Description: Continues Networks I. Offers an in-depth study of network architectures and implementation. Topics may include Internet access, distributed programming methods, routing, congestion control, security, RPC, name resolution, message-based distributed applications, and Internet architectures.

~~Continues Netw~~

~~distributed prog~~

~~distributed applications, and Internet architectures.~~ Prerequisite(s): CS 336. Junior standing or above.

Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 446 - Wireless Networks

4 credits

Examines the world of wireless communication. Starting with the fundamentals of the generation and propagation of electromagnetic waves, it surveys information transmission techniques such as spread spectrum and phase shift keying, wireless LANs, personal networks, and cellular and satellite systems. Prerequisite(s): CS 336.

Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 450 - Compilers

4 credits

Introduces compiler construction. Students create a compiler for a mini-language. Topics include grammars, lexical analysis, parsers, parser generators, code generation, and code optimization. Prerequisite(s): CS 452. Junior standing or above.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 452 - Programming Languages

4 credits
Formal definition of programming languages and parsing. Contrasts functional and imperative languages. Discusses variables, precedence, infix, prefix, postfix notation, data types, scope of declarations, storage allocation, binding time, and concurrency. Prerequisite(s): CS 314, CS 411, and CS 418.
** This course was formerly offered under a different number; students who took the following course(s) will not receive additional credit unless the course is stated to be repeatable in the description above:* CS 352.
Graded (A-F) only

- ## CS 455 - Topics in Computer Science

2 to 4 credits
Explores selected topics in computer science. Topics are offered based on interest and need. Repeat credit is allowed for varying topics. Prerequisite(s): CS 258 (some topics may require additional prerequisites). Junior standing or above.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 456 - Security I

4 credits
Introduces the many facets of computer security and information assurance. Explores the security organization and infrastructure within an organization along with policies, standards, and procedures. Covers cryptographic protocols, modes, and algorithms, including DES, AES, RSA, and Kerberos. Prerequisite(s): CS 314 and CS 336.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 457 - Security II

4 credits
Covers techniques and principles of design and configuration of secure workstations, servers, and LANs. Presents system and LAN intrusion detection and data assurance monitoring. Discusses the basics of virtual private networks and perimeter protection, as well as systems and tools used for implementation. Prerequisite(s): CS 456.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 458 - Security III

4 credits
Studies the threats to computer systems connected to the Internet. Examines how crackers find a system and its vulnerabilities then use those vulnerabilities to compromise the system, including the use of viruses. Looks at various tools used to attack and defend systems, as well as resources to detect and analyze intrusions. Address both wired and wireless systems security. Prerequisite(s): CS 457.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 459 - Operating Systems

4 credits
Explores operating systems and components, operating characteristics, user services, and limitations. Covers implementation techniques for processing input-output and interrupt handling; overall structure of multiprogramming systems or multiprocessor configurations; and details of addressing techniques, core management, file system design and management, system accounting, and other user-related services. Prerequisite(s): CS 411. Junior standing or above.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 460 - Advanced Databases

4 credits
Introduces integrity constraints and triggers, stored procedures, indexing and index structures, transactions, concurrency, locking, and web databases. Students usually work on a major project during the term. Prerequisite(s): CS 360. Junior standing or above.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 462 - Database Administration

4 credits
Examines the tasks involved in administering a large and complex database management system (DBMS). Teaches hands-on techniques for installing, setting up, and maintaining a production database. Students use a popular DBMS (e.g., Oracle) to understand the concepts of managing structures, logs, data files, and users. Also prepares students to take the appropriate database administration (DBA) certification exams. Prerequisite(s): CS 360. Junior standing or above.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 467 - Secure Programming Practices

4 credits
Explores software system threats, vulnerabilities, and controls from the programming perspective. Topics include threat-vulnerability analysis, buffer overflows, access control, race conditions, and input validation. Prerequisite(s): CS 258 and CS 360
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 469 - Systems Analysis

4 credits
Covers object-oriented software system analysis techniques using Unified Modeling Language (UML). Explores software development methodologies, project planning and management, requirements analysis, and testing. Topics include use cases, conceptual data models, the analysis class model, and alternative design strategies.
Prerequisite(s): CS 411, Junior standing or above, and at least a 2.5 GPA in required courses that meet electives and upper division core requirements.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 470 - Capstone Project I

4 credits
Provides a problem for students to analyze and solve through the design of a solution, the creation and implementation of a software solution, and documentation of the entire process. Prerequisite(s): CS 469. Junior standing or above.
Graded (A-F) only

- ## CS 471 - Capstone Project II

4 credits
The Capstone II goal is for students to finish the work started in Capstone I by creating and implementing the software solution and completing the documentation. The documentation should address project maintenance and the operating procedures required to run the students' software. Prerequisite(s): CS 470. Junior standing or above.
Graded (A-F) only

- ## CS 501 - Research

1 to 6 credits
Credits to be arranged. Repeatable.
Graded (A-F) only.

- ## CS 503 - Thesis

1 to 9 credits
Credits to be arranged. Repeatable.
Graded (A-F) only.

- ## CS 505 - Reading and Conference

1 to 6 credits
Credits to be arranged. Repeatable.
Graded (A-F) only.

- ## CS 507 - Seminar

1 to 4 credits
Credits to be arranged. Repeatable.
Graded (A-F) only.

- ## CS 509 - Practicum

1 to 15 credits
Credits to be arranged. Repeatable for a maximum of 15 credits.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 511 - Algorithms and Data Structures

4 credits
Develops data structures, with an emphasis on algorithms, characteristics, and applications. Examines alternative algorithms for manipulating data structures and their complexity. Applications include data management systems, file organization, information retrieval, and list processing. Prerequisite(s): CS 258, CS 367 and MTH 252 with a C- or better or appropriate SOU placement level.
Grade mode designated on a CRN basis each term. Students should consult current term schedule.

- ## CS 515 - Foundations of Emerging Computer Applications

4 credits
Covers the background needed for students to make contributions in an emerging application area. Topics may include digital signal processing, data mining, and security. Focuses specifically on those foundational concepts that students need to be able to create or enhance digital solutions. May be repeated for credit with different topic. Prerequisite(s): CS 258 (some topics may require additional prerequisites).
Graded (A-F) only

- ## CS 518 - Theory of Computation

4 credits
Covers formal language and automata theory from finite state automata to Turing machines. Presents the Chomsky hierarchy of languages and the relationship between languages and automata. Prerequisite(s): CS 411 or CS 511.
Graded (A-F) only.

- ## CS 526 - UNIX System Administration

4 credits
Introduces UNIX and shell programming, start-up and shut down, user administration, file systems, controlling processes, adding disks and cron, configuring the kernel, SLIP, PPP, and security. Prerequisite(s): CS 336 and CS 367
Graded (A-F) only.

- ## CS 533 - Corporate Web Development

4 credits
Introduces XML, XSL, and XQL. Examines e-commerce, digital money, and data encryption. Students are required to work on an e-commerce project as part of the course. Prerequisite(s): CS 295.
Graded (A-F) only.

Update to match CS 433 prerequisite: "CS 333 and CS 360"

- ## CS 536 - Networks II

Updated Description: Continues Networks I. Offers an in-depth study of network architectures and implementation. Topics may include Internet access, distributed programming methods, routing, congestion control, security, RPC, name resolution, message-based distributed applications, and Internet architectures.

4 credits
~~Continues Ne~~
~~distributed p~~
~~distributed applications, and Internet architectures.~~ Prerequisite(s): CS 336.
Graded (A-F) only.

- ## CS 546 - Wireless Networks

4 credits
Examines the world of wireless communication. Starting with the fundamentals of the generation and propagation of electromagnetic waves, it surveys information transmission techniques such as spread spectrum and phase shift keying, wireless LANs, personal networks, and cellular and satellite systems. Prerequisite(s): CS 336.
Graded (A-F) only

- ## CS 550 - Compilers

4 credits
Introduces compiler construction. Students create a compiler for a mini-language. Topics include grammars, lexical analysis, parsers, parser generators, code generation, and code optimization. Prerequisite(s): CS 452 ~~and CS 411~~.
Graded (A-F) only.

Match CS 450 prerequisite and, Similar to other 400-level prerequisites, update prerequisite to CS 452 or CS 552.

- ## CS 555 - Topics in Computer Science

Insert CS 552 - Programming Languages.
Duplicate CS 452 description and prerequisites.

~~2 to~~ 4 credits Match CS 455
Explores selected topics in computer science. Topics are offered based on interest and need. Repeat credit is allowed for varying topics. ~~Prerequisites and credits are determined by topic~~. Prerequisite(s): CS 258 (some topics may

require additional prerequisites).
Graded (A-F) only.

- ## CS 556 - Security I

4 credits
Introduces the many facets of computer security and information assurance. Explores the security organization and infrastructure within an organization along with policies, standards, and procedures. Covers cryptographic protocols, modes, and algorithms, including DES, AES, RSA, and Kerberos. Prerequisite(s): CS 336.
Graded (A-F) only

Match CS 456 prerequisite: "CS 314 and CS 336"

- ## CS 557 - Security II

4 credits
Covers techniques and principles of design and configuration of secure workstations, servers, and LANs. Presents system and LAN intrusion detection and data assurance monitoring. Discusses the basics of virtual private networks and perimeter protection, as well as systems and tools used for implementation. Prerequisite(s): CS 456.
Graded (A-F) only

Similar to other 400-level prerequisites, update prerequisite to CS 456 or CS 556.

- ## CS 558 - Security III

4 credits
Studies the threats to computer systems connected to the Internet. Examines how crackers find a system and its vulnerabilities then use those vulnerabilities to compromise the system, including the use of viruses. Looks at various tools used to attack and defend systems, as well as resources to detect and analyze intrusions. Address both wired and wireless systems security. Prerequisite(s): CS 457.
Graded (A-F) only

Similar to other 400-level prerequisites, update prerequisite to CS 457 or CS 557.

- ## CS 559 - Operating Systems

4 credits
Explores operating systems and components, operating characteristics, user services, and limitations. Covers implementation techniques for processing input-output and interrupt handling; overall structure of multiprogramming systems or multiprocessor configurations; and details of addressing techniques, core management, file system design and management, system accounting, and other user-related services.
Prerequisite(s): CS 411
Graded (A-F) only.

Similar to other 400-level prerequisites, update prerequisite to CS 411 or CS 511.

- ## CS 560 - Advanced Databases

4 credits

Introduces integrity constraints and triggers, stored procedures, indexing and index structures, transactions, concurrency, locking, and web databases. Students usually work on a major project during the term. Prerequisite(s): CS 360.
Graded (A-F) only.

- ## CS 562 - Database Administration

4 credits
Examines the tasks involved in administering a large and complex database management system (DBMS). Teaches hands-on techniques for installing, setting up, and maintaining a production database. Students use a popular DBMS (e.g., Oracle) to understand the concepts of managing structures, logs, data files, and users. Also prepares students to take the appropriate database administration (DBA) certification exams. Prerequisite(s): CS 360.
Graded (A-F) only.

- ## CS 567 - Secure Programming Practices

4 credits
Explores software system threats, vulnerabilities, and controls from the programming perspective. Topics include threat-vulnerability analysis, buffer overflows, access control, race conditions, and input validation. Prerequisite(s): CS 258 and CS 360
Graded (A-F) only

- ## CS 569 - Systems Analysis

4 credits
Covers object-oriented software system analysis techniques using Unified Modeling Language (UML). Explores software development methodologies, project planning and management, requirements analysis, and testing. Topics include use cases, conceptual data models, the analysis class model, and alternative design strategies.
Prerequisite(s): CS 411 and graduate standing.
Graded (A-F) only.

Similar to other 400-level prerequisites, update prerequisite to CS 411 or CS 511. Also remove "and graduate standing" since required for 500-level.

- ## ~~CS 581 - Topics in the Foundations of Computer Science~~

Delete 3 graduate courses left over from old PSM Degree

~~4 credits~~
~~Covers selected topics in the foundations of computer science. Sample topics include analysis of algorithms, computational models, and programming languages. Repeatable.~~
~~*Graded (A-F) only*~~

- ## ~~CS 582 - Topics in Information Systems~~

~~4 credits~~

~~Explores selected topics in information systems. Sample topics include database systems, networking and the Internet, and creating business frameworks. Repeatable.~~
~~*Graded (A-F) only*~~

- ## ~~CS 583 - Topics in Software Engineering~~

~~4 credits~~
~~Covers selected topics in software engineering. Sample topics include metrics, design methodologies, and quality assurance. Repeatable.~~
~~*Graded (A-F) only*~~

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