updated 10/24/2022

CSE Certificate Program Courses

The following table identifies courses that qualify for the CSE certificate program. Note that this list is not inclusive and may be expanded to include other advanced courses of three credits or more as approved by the certificate program's faculty advisor. The course abbreviations in column one are consistent with the UT Undergraduate Course Catalog and descriptions of each course may be found therein.

Some courses on the approved list below may be restricted by the department offering the course. Please note that the Certificate Program CANNOT ask the department to waive prerequisites or force the department to lift restrictions on their courses. Every effort has been made to include multiple options under each category to allow students from various majors to find courses that fit within their degree program.

Highlighted courses are offered on the **SPRING 2023** course schedule.

1. Upper Division Mathematics (1 course, 3-4 credits)

M 427J	Differential Equations with Linear Algebra
M 427K	Advanced Calculus for Applications I
M 427L	Advanced Calculus for Applications II
M 340L	Matrices and Matrix Calculations
M 341	Linear Algebra and Matrix Theory
SDS 329C	Practical Linear Algebra I

2. Basic Programming (1 course 1-3 credits)

ASE 301	Introduction to Computer Programming *(course no longer offered)*
BME 303	Introduction to Computing
CHE 210	Introduction to Computing
COE 301	Introduction to Computer Programming
COE 322	Scientific Computation
C E 311K	Introduction to Computer Methods
C S 303E	Elements of Computers and Programming
C S 104C	Competitive Programming
C S 105	Computer Programming *(course no longer offered)*
C S 105C	Computer Programming: C++
C S 312	Introduction to Programming
C S 313E	Elements of Software Design
ECE 312	Software Design and Implementation I *(formerly E E 312)*
GEO 325G	Computational Applications in the Geosciences
GEO 325J	Programming in FORTRAN and MATLAB *(course no longer offered)*
MIS 304	Introduction to Problem Solving and Programming
M E 205	Introduction to Computers and Programming *(course no longer offered)*
SDS 322	Introduction to Scientific Programming
Any course from #5 (Electives)	
Any other basic programming course as approved by the Certificate Adviser	

CSE Certificate Program Courses

3. Numerical Applications (1 course, 1-3 credits)

ARE 372	Modeling of Air and Pollutant Flows in Buildings
ASE 372N	Satellite-Based Navigation
BCH 339N	Systems Biology and Bioinformatics
BIO 321G	Introduction to Computational Biology-FRI
BIO 321G	Principles of Computational Biology
BIO 337J	Computational Biology Laboratory
BME 313L	Introduction to Numerical Methods in Biomedical Engineering
BME 342	Biomechanics of Human Movement
BME 343	Biomedical Engineering Signal and Systems Analysis
BME 345	Graphics and Visualization Laboratory
BME 346	Computational Biomolecular Engineering
BME 348P	Introduction to Computational and Systems Biology
BME 350	Computational Methods for Biomedical Engineers
BME 367	Design of Artificial Organs
BME 377T	*Topic:* Computational Methods for Biomedical Engineers
BME 377T	*Topic:* Computational Modeling Bioengr and Medicine
BME 377T	*Topic:* Computational Modeling of the Cardiovascular System
BME 377T	*Topic:* Intro to Computational and Systems Biology
BME 377T	*Topic:* Intro to Mathematical & Physical Biology
CH 367C	Materials Chemistry-FRI
CH 368	*Topic:* Computational Materials-FRI
CH 369K	Techniques of Research-FRI *(for credit, MUST be course on Computational Materials)*
CHE 348	Numerical Methods in Chemical Engineering and Problem Solving
CHE 356	Optimization: Theory and Practice
COE 311K	Engineering Computation
COE 321K	Computational Methods for Structural Analysis *(formerly ASE 321K)*
COE 347	Introduction to Computational Fluid Dynamics *(formerly ASE 347)*
CSE 397	Computational Modeling in Bioengineering and Medicine *(grad level course)*
CSE 397	*Topic 6:* Introduction to Computational Oncology *(grad level course)*
C E 367R	Optimization Techniques for Transportation Engineers
C S 378	*Topic:* Big Data in Biology
C S 378	*Topic:* Energy Analytics-FRI
C S 378	*Topic:* Intro to Computational and Systems Biology
ECO 348K	*Topic 1:* Advanced Econometrics
ECO 348K	*Topic:* Applied Econometrics and Data Analysis
ECO 363C	Computational Economics
ECO 441K	Introduction to Econometrics
ECE 313	Linear Systems and Signals *(formerly E E 313)*
ECE 385V	*Topic:* Computational Neuroscience *(grad level course)*
E M 360	*Topic 13:* Applications of Finite Element Methods
E M 394F	Finite Element Methods
GEO 325K	Computational Methods
GEO 325M	Numerical Modeling in the Geosciences

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CSE Certificate Program Courses

3. Numerical Applications (cont'd)

GEO 347G	Climate System Modeling
GEO 365N	Seismic Data Processing
GEO 371C	*Topic:* Introduction to Mathematical Modeling for Geoscientists
M 374M	Mathematical Modeling in Science and Engineering
M E 218	Engineering Computational Methods
M E 318M	Programming and Engineering Computational Methods
M E 365K	Finite Element Method
M E 367S	Simulation Modeling
M E 369L	Introduction to Computational Fluid Dynamics
NEU 337	*Topic:* Computational Neuroscience
NEU 337	*Topic:* Computer Simulation of Neural Processes
NEU 337	*Topic 4:* Neuroscience Data Analysis in Python
NEU 365P	Programming and Data Analysis for Modern Neuroscience
NSC 325	*Topic:* Inventors Program Practicum *(to be approved by petition only – topic must be computational)*
ORI 367	Simulation Modeling
PGE 310	Formulation & Solution of Geosystems Engr Problems *(crs dropped Fall 2022)*
PGE 311	Numerical Methods and Programming
PGE 323M	Reservoir Engineering III
PGE 337	Introduction to Geostatistics *(crs dropped in Fall 2022)*
PGE 338	Geostatistics and Data Analysis
PGE 379	*Topic 9:* Subsurface Machine Learning
PGE 383	*Topic:* Digital Rock Petrophysics *(grad level course)*
PHY 329	Introduction to Computational Physics
SDS 339	Applied Computational Science *(crs dropped Fall 2022)*
SDS 375	*Topic:* Computational Materials-FRI
STA 372	*Topic:* Quant Finance: Model, Tools & Applics
STA 372	*Topic 6:* Optimization Methods in Finance
STA 372	*Topic 7:* Computational Finance

4. Advanced Computing (1 course, 3 credits)

BME 377T	*Topic:* Computational Modeling of the Cardiovasular System
BME 377T	*Topic:* Intro to Computational Systems and Biology
CH 354M	Introduction to Computational Methods in Chemistry
CHE 379	*Topic:* Intelligent Systems Applications in Engineering and Science
COE 321K	Computational Methods for Structural Analysis *(formerly ASE 321K)*
COE 347	Introduction to Computational Fluid Dynamics *(formerly ASE 347)*
COE 352	*Topic:* Advanced Computational Engineering
COE 379L	*Topic:* Simulation-based aerodynamics design and analysis
C E 380T	Computational Environmental Fluid Mechanics *(grad level course)*
C S 323E	Elements of Scientific Computing
C S 323H	Elements of Scientific Computing: Honors
C S 329E	*Topic:* Elements of Data Analytics
C S 329E	*Topic:* Elements of Software Engineering

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4. Advanced Computing (cont'd)

C S 330E	Elements of Software Engineering I
C S 354	Computer Graphics
C S 367	Numerical Methods
C S 373	Software Engineering
C S 377	Principles and Applications of Parallel Programming
C S 377P	Programming for Performance
C S 378	*Topic:* Big Data in Biology
C S 378	*Topic:* Intro to Computational Systems and Biology
C S 378	*Topic:* Programming for Correctness and Performance
ECE 360F	Introduction to Software Engineering *(formerly E E 360F)*
ECE 360P	Concurrent and Distributed Systems *(formerly E E 360P)*
ECE 379K	*Topic:* Engineering Programming Languages (formerly E E 379K)
ECE 380L	*Topic 5:* Engineering Programming Languages *(grad level course)*
ECE 382V	Topic: Advanced Programming Tools *(grad level course)*
ECE 422C	Software Design & Implementation II *(formerly E E 422C)*
ECE 461P	Data Science Principles *(formerly E E 461P)*
M 348	Scientific Computation in Numerical Analysis
M 368K	Numerical Methods for Applications
M E 367S	Simulation Modeling
M E 369P	Application Programming for Engineers
PGE 379	*Topic:* High Performance Computing for Engineers
PGE 379	*Topic 14:* High Performance Computational Engineering
SDS 335	Scientific & Technical Computing
SDS 374C	Parallel Computing for Science and Engineering
SDS 374D	Distributed & Grid Computing for Science & Engineering *(crs dropped in Fall 2022)*
SDS 374E	Visualization and Data Analysis for Science and Engineering
SDS 375	*Topic:* Programming for Correctness

5. Electives (≥ 1 course, ≥ 3 credits)

ASE 330M	Linear System Analysis
CSE 380	Tools and Techniques of Computational Science *(grad level course)*
CSE 383C	Numerical Analysis: Linear Algebra *(grad level course)*
CSE 383K	Numerical Analysis: Algebra and Approximation *(grad level course)*
CSE 386C	Methods of Applied Mathematics *(grad level course)*
CSE 386M	Functional Analysis in Theoretical Mechanics *(grad level course)*
CSE 393	*Topic 1:* The Finite Element Method *(grad level course)*
CSE 393F	Finite Element Methods *(grad level course)*
CSE 393N	Numerical Methods for Flow and Transport Problems *(grad level course)*
C S 329E	*Topic:* Elements of Data Analytics
C S 329E	*Topic:* Elements of Data Visualization
C S 337	Theory in Programming Practice
C S 337H	Theory in Programming Practice: Honors
C S 363D	Introduction to Data Mining *(course dropped in Fall 2022)*

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CSE Certificate Program Courses

5. Electives (cont'd)

C S 363M	Principles of Machine Learning I
C S 378, 378H	*Topic:* Introduction to Data Mining
ECE 360C	Algorithms *(formerly E E 360C)*
ECE 461L	Software Engineering and Design Laboratory *(formerly E E 461L)*
ECE 380L	*Topic 10:* Data Mining *(grad level course)*
GEO 352P	Python for Geoscience Research
GEO 366M	Mathematical Methods in Geophysics
GEO 371T	Python in Geoscience Research
M 346	Applied Linear Algebra
M 372K	Partial Differential Equations and Applications
M 376C	Methods of Applied Mathematics
M E 350R	Robot Mechanism Design
M E 366L	Operations Research Models
M E 372J	Robotics and Automation
M E 379M	*Topic:* Advanced Vehicle Powertrain Systems and Control
M E 379M	*Topic:* Data Science for Engineers
MIS 373	Topic 17: Predictive Analytics & Data Mining
NEU 340	Neural Systems III: Quantitative Tools
NEU 366M	Quantitative Methods in Neuroscience
ORI 366	Operations Research Models
SDS 322E	Elements of Data Science *(replaced SDS 348 in Fall 2021)*
SDS 348	Computational Biology and Bioinformatics *(course replaced by SDS 322E in Fall 2021)*
SDS 394	Scientific & Technical Computing *(grad level course)*
SDS 394C	Parallel Computing for Scientists and Engineers *(grad level course)*
SDS 394D	Distributed and Grid Computing for Scientists and Engineers *(grad level course)*
Any additional course from #3 (Numerical Applications) or #4 (Advanced Computing)	
Any graduate level scientific computing course, with consent of the Certificate Adviser	

6. Scientific Computing Project (1 course, 3 credits)

Must be supervised by a member of the CSEM GSC Faculty.	
CSE 370	Individual Reading & Research *(registration restricted until Scientifc Computing Project Approval form received)*
Other	Any 3 credit, advanced undergraduate level individual instruction course in a participating department. Check with academic advisor and course schedule for offerings.