GRAPHICS CONCENTRATION

CSC/CPE 471	Introduction to Computer Graphics	4
Select from the following:		8
CSC 473	Advanced Rendering Techniques	
CSC 474	Computer Animation	
CSC/CPE 476	Real-Time 3D Computer Graphics Software	
CSC 572	Computer Graphics	
Tracks [1,2]		
Select courses from one of the following tracks:		8
GPU/Systems Track		
CSC 473	Advanced Rendering Techniques	
or CSC 474	Computer Animation	
or CSC 476	Real-Time 3D Computer Graphics Software	
or CSC 572	Computer Graphics	
Technical Electives (select from the lists in Technical Electives Guidelines below) [1]		
Art Track		
CSC 350 & CSC 450	Computing for Interactive Arts Capstone I and Computing for Interactive Arts Capstone II	
or ART 376	The Art of Mixed Reality	
or ART 384	Digital 3D Modeling and Design	
CSC 371	Game Design	
or CSC 377	Introduction to Mixed Reality	
or CSC 378	Interactive Entertainment Engineering	
Mathematics/Statistics Elective		
Select from the following:		4
MATH 241	Calculus IV	
MATH 248	Methods of Proof in Mathematics	
MATH 306	Linear Algebra II	
MATH 334	Combinatorial Math	
MATH 335	Graph Theory	
MATH 437	Game Theory	
MATH 470	Selected Advanced Topics	
STAT 305	Introduction to Probability and Simulation	
STAT 323	Design and Analysis of Experiments I	
STAT 324	Applied Regression Analysis	
STAT 330	Statistical Computing with SAS	
STAT 331	Statistical Computing with R	
STAT 334	Applied Linear Models	
STAT 416	Statistical Analysis of Time Series	
STAT 418	Categorical Data Analysis	
STAT 419	Applied Multivariate Statistics	
STAT 434	Statistical Learning: Methods and Applications	
Total units		**24**

1 Consultation with advisor is recommended prior to selecting technical electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

2 An additional 4 units of CPE/CSC Technical Electives is needed if CPE/CSC 123 (http://catalog.calpoly.edu/search/?P=CSC%20123) is not taken in the major.

Technical Electives Guidelines

Courses used to satisfy any other Major, Support, or General Education requirement are not allowed to count toward the Technical Electives requirement. Credit/No Credit grading is not allowed.

Select Technical Electives from the following: [1,2]	
CSC 305	Individual Software Design and Development
CSC 309	Software Engineering II
CSC 313	Teaching Computing
CSC 321	Introduction to Computer Security
CSC 323	Cryptography Engineering
CSC 325	Introduction to Privacy: Policy and Technology
CSC 344	Music Programming
CSC 366	Database Modeling, Design and Implementation
CSC 369	Introduction to Distributed Computing
CSC 371	Game Design
CSC 377	Introduction to Mixed Reality
CSC 378	Interactive Entertainment Engineering
CSC 400	Special Problems [2]
CSC 402	Software Requirements Engineering
CSC 405	Software Construction
CSC 409	Current Topics in Software Engineering
CSC 410	Software Evaluation
CSC 421	Binary Exploitation: Tools and Techniques
CSC 422	Network Security
CSC 424	Software Security
CSC/CPE 425	Wireless Security
CSC 429	Current Topics in Computer Security
CSC 431	Compiler Construction
CSC 436	Mobile Application Development
CSC 437	Dynamic Web Development
CSC 448	Bioinformatics Algorithms
CSC/CPE 454	Implementation of Operating Systems
CSC/CPE 458	Current Topics in Computer Systems
CSC 466	Knowledge Discovery from Data
CSC 468	Database Management Systems Implementation
CSC/CPE 469	Distributed Systems
CSC 473	Advanced Rendering Techniques
CSC 474	Computer Animation

CSC/CPE 476	Real-Time 3D Computer Graphics Software
CSC 477	Scientific and Information Visualization
CSC 478	Current Topics in Computer Graphics
CSC 480	Artificial Intelligence
CSC 481	Knowledge Based Systems
CSC 482	Speech and Language Processing
CSC 484	User-Centered Interface Design and Development
CSC 486	Human-Computer Interaction Theory and Design
CSC 487	Deep Learning
CSC 490	Selected Advanced Topics [2]
CSC 493	Cooperative Education Experience [2]
CSC 496	Selected Advanced Laboratory [2]
CSC 508	Software Engineering I
CSC 509	Software Engineering II
CSC 513	Computing Education Research and Practice
CSC/CPE 515	Computer Architecture
CSC 521	Computer Security
CSC 522	Advanced Network Security
CSC 524	System Security
CSC 530	Languages and Translators
CSC 540	Theory of Computation II
CSC 549	Advanced Algorithm Design and Analysis
CSC 550	Operating Systems
CSC 560	Database Systems
CSC/CPE 564	Computer Networks: Research Topics
CSC 566	Topics in Advanced Data Mining
CSC/CPE 569	Distributed Computing
CSC 570	Current Topics in Computer Science
CSC 572	Computer Graphics
CSC 580	Artificial Intelligence
CSC 581	Computer Support for Knowledge Management
CSC 582	Computational Linguistics
CSC 587	Advanced Deep Learning
CPE 315	Computer Architecture
CPE 400	Special Problems for Undergraduates
CPE 416	Autonomous Mobile Robotics
CPE 419	Applied Parallel Computing
CPE 428	Computer Vision
CPE 442	Real Time Embedded Systems
CPE 464	Introduction to Computer Networks
CPE 465	Advanced Computer Networks
Up to 4 units may be taken from the Approved External Electives listed below:	
AERO 450	Introduction to Aerospace Systems Engineering
ART 376	The Art of Mixed Reality
ART 384	Digital 3D Modeling and Design
BUS 310	Introduction to Entrepreneurship
CHEM 216	Organic Chemistry I
CHEM 217	Organic Chemistry II
CHEM 218	Organic Chemistry III
CHEM 312	Organic Chemistry: Fundamentals and Applications
ECON 339	Econometrics
EE 201 & EE 251	Electric Circuit Theory and Electric Circuits Laboratory
EE 314	Introduction to Communication Systems
EE/CPE 336	Microprocessor System Design
EE 424	Introduction to Remote Sensing
ENVE 542	Sustainable Environmental Engineering
IME 301	Operations Research I
IME 314	Engineering Economics
IME 315	Financial Decision Making for Engineers
IME 356	Manufacturing Automation
IME 403	Software Product Management
MATH 241	Calculus IV
MATH 242	Differential Equations I
MATH 248	Methods of Proof in Mathematics
MATH 341	Theory of Numbers
MATH 350	Mathematical Software
MATH 412	Introduction to Analysis I
ME 211	Engineering Statics
ME 212	Engineering Dynamics
ME 405	Mechatronics
PHIL 412	Epistemology
PHIL 422	Philosophy of Mind
PSY 329	Research Methods in Psychology
PSY 333	Quantitative Research Methods for the Behavioral Sciences
PSY 357	Cognition
STAT 305	Introduction to Probability and Simulation
STAT 323	Design and Analysis of Experiments I
STAT 324	Applied Regression Analysis
STAT 330	Statistical Computing with SAS
STAT 331	Statistical Computing with R
STAT 334	Applied Linear Models
STAT 416	Statistical Analysis of Time Series
STAT 418	Categorical Data Analysis
STAT 419	Applied Multivariate Statistics
STAT 434	Statistical Learning: Methods and Applications

[1] A total of 0-4 technical elective units (depending on Track) selected from upper-division and graduate CSC and CPE courses open to those in the major and not otherwise required by the major.
An additional 4 units of CPE/CSC Technical Electives is needed if CPE/CSC 123 (http://catalog.calpoly.edu/search/?P=CSC%20123) is not taken in the major.

[2] Up to a combined 4 units may be taken from CPE 400, CSC 400 (http://catalog.calpoly.edu/search/?P=CSC%20400), CSC 490 (http://catalog.calpoly.edu/search/?P=CSC%20490), CSC 493, or CSC 496 (http://catalog.calpoly.edu/search/?P=CSC%20496).