

Cover Sheet: Request 13476

CNT 4007 Computer Network Fundamentals

Info

Process	Course Modify Ugrad/Pro
Status	Pending at PV - University Curriculum Committee (UCC)
Submitter	Richard Newman nemo@ufl.edu
Created	1/4/2019 3:09:42 PM
Updated	9/11/2020 2:05:20 PM
Description of request	Change laboratory designation from "C" to none; reduce credit hours from 4 to 3; modify course description to reflect these changes and the teaching approach currently used.

Actions

Step	Status	Group	User	Comment	Updated
Department	Approved	ENG - Computer and Information Science and Engineering 011914001	Arunava Banerjee		3/15/2019
No document changes					
College	Conditionally Approved	ENG - College of Engineering	Heidi Dublin	Conditionally Approved by the HWCOE Curriculum Committee. Resubmit with other related items when updates have been made. Notes from meeting: Syllabus needs to be uploaded and include detailed explanation of why it's moving from a 4 to 3 credit course.	4/10/2019
No document changes					
Department	Approved	ENG - Computer and Information Science and Engineering 011914001	Arunava Banerjee	Syllabus has been uploaded as requested by CoE CC.	4/16/2019
No document changes					
College	Approved	ENG - College of Engineering	Heidi Dublin	Approved. Department indicates items have been addressed.	8/20/2019
No document changes					
University Curriculum Committee	Commented	PV - University Curriculum Committee (UCC)	Lee Morrison	Added to the September agenda.	9/13/2019
No document changes					
University Curriculum Committee	Recycled	PV - University Curriculum Committee (UCC)	Casey Griffith	Please address concerns noted in UCC review subcommittee comments/email.	9/17/2019
No document changes					
College	Recycled	ENG - College of Engineering	Heidi Dublin	Please see comments. Resubmit when ready.	9/23/2019
No document changes					

Step	Status	Group	User	Comment	Updated
Department	Approved	ENG - Computer and Information Science and Engineering 011914001	Arunava Banerjee	Syllabus has been uploaded. The concern at UCC that the degree total credit would drop from 120 to 119 is not true. Curriculum plan has been uploaded to demonstrate this.	4/25/2020
cnt4007_syllabus.doc					4/24/2020
V8-CSEUndergradCurriculum-TrackChanges.docx					4/25/2020
College	Approved	ENG - College of Engineering	Heidi Dublin		4/27/2020
No document changes					
University Curriculum Committee	Commented	PV - University Curriculum Committee (UCC)	Lee Morrison	Added to the UCC September agenda.	9/11/2020
No document changes					
University Curriculum Committee	Pending	PV - University Curriculum Committee (UCC)			9/11/2020
No document changes					
Statewide Course Numbering System					
No document changes					
Office of the Registrar					
No document changes					
Student Academic Support System					
No document changes					
Catalog					
No document changes					
College Notified					
No document changes					

Course|Modify for request 13476

Info

Request: CNT 4007 Computer Network Fundamentals

Description of request: Change laboratory designation from "C" to none;

reduce credit hours from 4 to 3;

modify course description to reflect these changes and the teaching approach currently used.

Submitter: Richard Newman nemo@ufl.edu

Created: 1/4/2019 3:00:08 PM

Form version: 1

Responses

Current Prefix

Enter the current three letter code (e.g., POS, ATR, ENC).

Response:

CNT

Course Level

Select the current one digit code preceding the course number that indicates the course level at which the course is taught (e.g., 1=freshman, 2=sophomore, etc.).

Response:

4

Number

Enter the current three digit code indicating the specific content of the course based on the SCNS taxonomy and course equivalency profiles.

Response:

007

Lab Code

Enter the current lab code. This code indicates whether the course is lecture only (None), lab only (L), or a combined lecture and lab (C).

Response:

C

Course Title

Enter the current title of the course as it appears in the Academic Catalog.

Response:

Computer Network Fundamentals

Effective Term

Select the requested term that the course change(s) will first be implemented. Selecting "Earliest" will allow the change to be effective in the earliest term after SCNS approval. If a specific term and year are selected, this should reflect the department's expectations. Courses cannot be changed retroactively, and therefore the actual

effective term cannot be prior to SCNS approval, which must be obtained prior to the first day of classes for the effective term. SCNS approval typically requires at least 6 weeks after approval of the course change at UF.

Response:
Earliest Available

Effective Year

Select the requested year that the course change will first be implemented. See preceding item for further information.

Response:
Earliest Available

Requested Action

Indicate whether the change is for termination of the course or any other change. If the latter is selected, all of the following items must be completed for any requested change.

Response:
Other (selecting this option opens additional form fields below)

Change Course Prefix?

Response:
No

Change Course Level?

Note that a change in course level requires submission of a course syllabus.

Response:
No

Change Course Number?

Response:
No

Change Lab Code?

Note that a change in lab code requires submission of a course syllabus.

Response:
Yes

Current Lab Code

Response:
C

Proposed Lab Code

Response:
None

Change Course Title?

Response:
No

Change Transcript Title?

Response:
No

Change Credit Hours?

Note that a change in credit hours requires submission of a course syllabus.

Response:
Yes

Current Credit Hours

Response:
4

Proposed Credit Hours

Response:
3

Change Variable Credit?

Note that a change in variable credit status requires submission of a course syllabus.

Response:
No

Change S/U Only?

Response:
No

Change Contact Type?

Response:
No

Change Rotating Topic Designation?

Response:
No

Change Repeatable Credit?

Note that a change in repeatable credit status requires submission of a course syllabus.

Response:
No

Maximum Repeatable Credits

Enter the maximum credits a student may accrue by repeating this course.

Response:
3

Change Course Description?

Note that a change in course description requires submission of a course syllabus.

Response:
Yes

Current Course Description

Response:
Credits: 4; Prereq: COP 4600.
Fundamental concepts, principles and standards of computer networks. Topics are introduced in bottom-up approach, starting from physical layer in OSI system architecture with a stronger focus on data link, mac, network and transport layers. (M)

Proposed Course Description (50 words max)

Response:

Credits: 3; Prereq: COP 4600.

Fundamental concepts, principles and standards of computer networks. Topics are introduced in top-down approach, starting with the application layer in the OSI system architecture with a stronger focus on application, transport, and network layers. (M)

Change Prerequisites?

Response:

No

Change Co-requisites?

Response:

No

Rationale

Please explain the rationale for the requested change.

Response:

The department no longer includes a combined laboratory with the course, as students do relevant exercises and projects using their own machines. Hence, the lab designation of "C" should be removed and the credit hours reduced from 4 to 3.

In addition, the department now teaches the course in a top-down approach rather than the bottom-up approach used previously, so the text of the course description should reflect this change.

Computer Network Fundamentals

CEN 4007

Credits: 3

Class Periods: TBD

Location: TBD

Academic Term: TBD

Instructor:

Richard Newman

nemo-at-ufl-dot-edu

Office Phone Number: 352-392-1200

Office Hours: TBD

Teaching Assistants:

Please contact through the Canvas website

- TBD, office hours TBA

Course Description

Credits: 4; Prereq: COP 4600.

Fundamental concepts, principles and standards of computer networks. Topics are introduced in top-down approach, starting with the application layer in the OSI system architecture with a stronger focus on application, transport, and network layers. (M)

Course Pre-Requisites / Co-Requisites

COP 4600 Operating Systems

Course Objectives

This course is an introductory survey of the design and implementation of computer networks. We will focus on the concepts and fundamental design principles that have contributed to the global Internet's scalability and robustness and will survey the underlying technologies --- e.g., HTTP, DNS, TCP/IP Protocols, Ethernet, and routers --- that have led to the Internet's phenomenal success.

Topics include: application/transport/network/data-link layer protocols, congestion/flow/error control, routing, addressing, multicast, packet scheduling, switching, internetworking, and networking programming interfaces. There will be both written and programming assignments.

The successful student will be able to:

- Describe the layers of the OSI reference architecture and explain the role of each
- Describe relevant metrics and estimate values for a given network scenario
- Describe packet formats and explain how the fields are used
- Compare network designs and select the best one for a given usage
- Capture and analyze network traffic
- Explain reliable transmission challenges and estimate transmission reliability
- Explain the difference between routing and forwarding and explain routing protocols
- Develop a networked application

Materials and Supply Fees

n/a

Professional Component (ABET):

State the contribution of the course to meeting the professional components of the ABET-accredited degree. Applicable only to ABET course within the degree program.

Relation to Program Outcomes (ABET):

Outcome	Coverage*
a. Apply knowledge	Medium
b1. Conduct experiments	Medium
b2. Statistical design of experiments	
c. Design	High
d. Function on teams	Low
e. Solve problems	High
f. Professional and ethical responsibility	Low
g. Communicate	Low
h1. Economic impact	Low
h2. Global, societal, and environmental impact	Low
i. Lifelong learning	Medium
j. Contemporary issues	Medium
k. Techniques, skills, and tools for degree program	High

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not part of the course.

Required Textbooks and Software

- Computer Networking: A Top-Down Approach, 7/e
- James F. Kurose & Keith W. Ross
- 2016 Addison Wesley
- ISBN 0132856204

Recommended Materials

- Textbook website: http://gaia.cs.umass.edu/kurose_ross/
- Wireshark labs: <http://www-net.cs.umass.edu/wireshark-labs/>

Attendance Policy, Class Expectations, and Make-Up Policy

Attendance is not required for most classes, but is mandatory for quizzes and examinations. Participation in online homework discussions will be included in your grade also.

Cell phones and pagers must be silent during class. Reading emails, facebook, etc. is appropriate at some other time and place.

Questions are encouraged - raise your hand to be recognized. Try to formulate the question before asking it, and wait to see if it is answered in a few minutes so we can maintain flow. Lengthy discussions will be deferred to office hours.

Most weeks there will be a timed, on-line quiz taken in class, or homework discussion post due Sunday, with responses due Tuesday.

The lowest quiz will be dropped. Quizzes submitted more than 10 minutes late will be docked one point, and none will be accepted after the deadline. If you will not be in class when a quiz is given, you must obtain permission from the instructor ahead of time.

Homework assignments will be posted, and you are required to post a response to all of the questions, then comment on at least one other response. In-class challenges will be collected in class.

There will be several exercises using wireshark, due on Monday. You will be required to submit screenshots and answer some questions for each of these.

There will also be two programming projects.

Projects and exercises are all to be done on an individual basis, unless otherwise indicated. Late penalty is one point per partial day late.

You are encouraged to discuss both textbook material and projects with others in the class. However, you may NOT share code or report text.

Homeworks and exercises may be accepted after the due date at a penalty of one point per partial day until submissions are no longer accepted (typically 2 days to one week after the due date). It is wise to start on these early in case you find them more difficult than you anticipated.

There will be three incremental examinations during the term. If you score well enough on these, then you will be excused from the final examination.

Makeups for assignments are only allowed for students with excused absences, with prior communication with the instructor whenever possible. Excused absences must be consistent with university policies in the undergraduate catalog) and require appropriate documentation (<https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>).

Course Schedule

- Week 1: 1.1-1.3 Introduction
- Week 2: 1.4-1.7 Metrics and estimation/wireshark laboratory 1 due/quiz 1
- Week 3: 2.1-2.2 Application layer, HTTP/quiz 2
- Week 4: 2.3-2.5 FTP, SMTP, DNS/wireshark laboratory 2 due/quiz 3
- Week 5: 2.6-2.8 P2P, sockets/wireshark laboratory 3 due/quiz 4
- Week 6: 3.1-3.4 Transport layer, UDP/exam 1
- Week 7: 3.4-3.5 Reliable delivery, TCP/wireshark laboratory 4 due/quiz 5
- Week 8: 3.5-3.7 TCP, congestion control/wireshark laboratory 5 due/quiz 6
- Week 9: 3.7-3.8 Congestion control/exam 2
- Week 10: 4.1-4.3 Network layer, routing/project 1/quiz 7
- Week 11: 4.4-4.5 IP, routing protocols/wireshark laboratory 6 due
- Week 12: 4.5-4.6 Routing protocols, RIP, OSPF/quiz 8
- Week 13: 4.7-4.8 Broadcast, BGP/wireshark laboratory 7 due
- Week 14: 5.1-5.5 Link layer/project 2/quiz 9
- Week 15: 5.6-5.8 Link layer/wireshark laboratory 8 due/exam 3
- Week 16: Final examination by invitation 5/2/2019 10:00 am – 12:00 pm

Evaluation of Grades

Assignment	Points each	Percentage of Final Grade
Homework Sets	3	5
Quizzes	10	5
Exercises	10	20
Projects	30	20
Exams	20	50
		100

Grading Policy

The following is given as an example only. Percentages needed to achieve a particular grade may be adjusted downward to reflect examination curving.

Percent	Grade	Grade Points
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu/evals>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

University Honesty Policy

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see:

<http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html>

Commitment to a safe and inclusive learning environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination.

It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@ufl.edu

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the Office of Title IX Compliance, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu.

Campus Resources:

Health and Wellness

U Matter, We Care:

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://lss.at.ufl.edu/help.shtml>.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.
<https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.
<https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.

About this program

- College: Herbert Wertheim College of Engineering
- Degree: Bachelor of Science in Computer Science
- Credits for Degree: 120

Overview

Students in the engineering computer science (EG-CSE) program will satisfy the same requirements for general education and obtain the same engineering pre-professional background in mathematics and science as other engineering students. The program contains a strong technical component comprising a set of required courses covering essential areas in computing and a set of technical electives enabling students to deepen their knowledge in chosen areas of computer science and engineering.

In addition, the program includes a set of interdisciplinary electives in an area of the student's choice from anything the university offers. Students may choose an established minor, a predefined track or if nothing meets their needs, they can work with an advisor to develop their own program. Thus, students will not need to wait for an interdisciplinary program to be established; they can create their own.

To answer the demands of industry for employees with both technical competence and the ability to communicate effectively, the program requires communication courses beyond the usual general education requirements for engineering.

DEPARTMENT REQUIREMENTS

Students must complete all critical-tracking courses with minimum grades of C in each course and the critical-tracking GPA must be at least 2.5. A minimum grade of C is required in all other courses that are prerequisites to a required course: CDA 3101, COP 3503, COP 3530, COP 4600, COT 3100 and MAS 3114. In addition, CISE requires all computer science students to maintain a cumulative, upper-division and department grade point average minimum of 2.0.

Students who do not meet these requirements will be placed on academic probation and will be required to prepare a probation contract with a CISE advisor. Students are normally given two terms to remove their deficit points; however, students who do not satisfy the conditions of the first term of probation may be dismissed from the department.

PLACEMENT

Students who have scored at least a 4 or 5 on the AP Computer Science exam are eligible to start the programming fundamentals sequence with COP 3503. Students will need to see an advisor in the major to adjust their degree audit.

Critical Tracking

Critical Tracking records each student's progress in courses that are required for entry to each major. Please note the critical-tracking requirements below on a per-semester basis.

Equivalent critical-tracking courses as determined by the State of Florida Common Course Prerequisites may be used for transfer students.

SEMESTER 1

- Complete 1 of ~~5~~7 critical-tracking courses with a minimum grade of C within two attempts: ~~CHM 2045 or CHM 2095~~, MAC 2311, MAC 2312, MAC 2313, COP 3502, PHY 2048, PHY 2049
- 2.5 GPA required for all critical-tracking courses
- 2.0 UF GPA required

SEMESTER 2

- Complete 1 additional critical-tracking course with a minimum grade of C within two attempts
- 2.5 GPA required for all critical-tracking courses
- 2.0 UF GPA required

SEMESTER 3

- Complete 2 additional critical-tracking courses with minimum grades of C within two attempts
- 2.5 GPA required for all critical-tracking courses
- 2.0 UF GPA required

SEMESTER 4

- Complete 2 additional critical-tracking courses with minimum grades of C within two attempts
- 2.5 GPA required for all critical-tracking courses
- 2.0 UF GPA required

SEMESTER 5

- Complete all ~~7~~ critical-tracking courses with minimum grades of C in each course within two attempts
- 2.5 GPA required for all critical-tracking courses
- 2.0 UF GPA required

Semester 6

- Complete COP 3503 and COT 3100
- 2.0 UF and Departmental GPA

Semester 7

- Complete COP 3530
- 2.0 UF and Departmental GPA

Semester 8

- Complete COP 4600 and COP 4020
- 2.0 UF and Departmental GPA

Model Semester Plan

Students are expected to complete the general education international (GE-N) and diversity (GE-D) requirements. This is often done concurrently with another general education requirement (typically, GE-C, H or S).

To remain on track, students must complete the appropriate critical-tracking courses, which appear in bold. These courses must be completed by the terms as listed above in the Critical Tracking criteria.

This semester plan represents an example progression through the major. Actual courses and course order may be different depending on the student's academic record and scheduling availability of courses. Prerequisites still apply.

Semester 1		
Select one of the following two		<u>3</u>
CHM 2045	General Chemistry 1 (Critical Tracking; GE-P)	
CHM 2095	Chemistry for Engineers (Critical Tracking; GE-P)	
CHM 2045L	General Chemistry 1 Laboratory (GE-P)	1
MAC 2311	Analytic Geometry & Calculus 1 (Critical Tracking ; GE-State Core M)	4
COP 3502	Programming Fundamentals 1 (Critical Tracking)	3
IDS 1161	What is the Good Life (GE-UF Core H)	3
ENC 1101	Expository and Argumentative Writing (State Core GE Composition; Writing Requirement: 6,000 words) If you do not place out of ENC, take it this semester	3
GE - State Core Humanities		<u>3</u>
GE - State Core Social/Behavioral		<u>3</u>
Total		16
Semester 2		
MAC 2312	Analytic Geometry & Calculus 2 (Critical Tracking ; GE-M)	4
PHY 2048	Physics with Calculus 1 (Critical Tracking ; GE-State Core P)	3
PHY 2048L	Physics Lab	1
COP 3503	Programming Fundamentals 2	3
COT 3100	Applications of Discrete Structures	3
Total		14

Commented [mp1]: remove

Commented [mp2]: remove

<u>Summer</u>	
<u>State Core Social/Behavioral</u>	<u>3</u>
<u>ENC 3246 Professional Communication for Engineers (GE State Core C)</u>	<u>3</u>
<u>Interdisciplinary Elective 1</u>	<u>3</u>
<u>Total</u>	<u>9</u>

Commented [mp3]: Remove

<u>Semester 3</u>		
<u>State Core Gen Ed Social and Behavioral Sciences</u>		
	<u>3</u>	
MAC 2313	Analytic Geometry & Calculus 3 (Critical Tracking; GE-M)	4
PHY 2049	Physics with Calculus 2 (Critical Tracking; GE-P)	3
PHY 2049L	Physics Lab	1
<u>CDA 3101</u>	<u>Introduction to Computer Organization</u>	<u>3</u>
COP 3530	Data Structures and Algorithms	<u>3</u>
	<u>Interdisciplinary Elective 1</u>	<u>3</u>
Total		<u>17</u>
<u>Semester 4</u>		
CEN 3031	Introduction to Software Engineering	3
Technical Elective 1		3
MAS 3114 or MAS 4105	Computational Linear Algebra or Linear Algebra	3 or 4
<u>CIS 4301</u>	<u>Information & Database Systems 1</u>	<u>3</u>
<u>ENC 3246</u>	<u>Professional Communication for Engineers (Gen Ed Composition; Writing Requirement: 6,000 words)</u>	<u>3</u>
Gen Ed Social and Behavioral Sciences with Diversity or International		3
Total		<u>15</u>

Commented [mp5]: Move from semester 5 to 4

Commented [mp6]: Move ENC 3246 to semester 8

Commented [mp7]: Up from 12-13

Semester 5		
COT 4504	Numerical Analysis: a Computational Approach	3
CIS 4304	Information & Database Systems I	3
CDA 3104	Introduction to Computer Organization	3
COP 4020	Programming Language Concepts	3
Technical Elective 2		3
STA 3032	Engineering Statistics	3
Interdisciplinary Elective 2		3
State Core Gen. Ed. Humanities with Diversity or International		3
Total		15
Semester 6		
COP 4600	Operating Systems	3
EEL 3701C	Digital Logic and Computer Systems	3
ENC 1102	Argument and Persuasion (Gen Ed Composition; Writing Requirement: 6,000 words)	3
EGN 4034		4
Technical Elective 3		3
Technical Elective 4		3
Interdisciplinary Elective 3		3
Total		15
Summer		
Pursue Internship/Co-op if desired		

Commented [mp8]: Remove: Not required anymore

Commented [mp9]: Remove: Move from semester 5 to 4

Commented [mp10]: Remove: Move from semester 5 to 3

Commented [mp11]: Include in the core course list

Commented [mp12]: Remove: not required course

Commented [mp13]: Down from 17

Semester 7		
CNT 4007C	Computer Network Fundamentals	34
EGS 4034	Professional Ethics	1
or		
CGS 3065	Legal & Social Issues in Computing	3
Interdisciplinary Elective 4		3
Technical Elective 5		3
Technical Elective 6		3
Total		13+3 or 15

Commented [mp14]: Reduce from 5 to 3

Semester 8		
CIS 4914 or CIS 4913C	Senior Project Integrated Product and Process Design 2	3 3
STA 3032	Engineering Statistics	
ENC 3246	Professional Communication for Engineers (Gen Ed Composition; Writing Requirement: 6,000 words)	<u>3</u>
Interdisciplinary Elective 5		<u>3</u>
Technical Elective 7		3
GE-Humanities or Social/Behavioral or Biological/Physical		<u>3</u>
Total		<u>15</u> 12

Commented [mp15]: Reduce from 6 to 3

CSE Degree recognizes the following specialization areas (tracks) upon completion of the requirements of each specialization area. The requirements for each specialization area are listed in parenthesis. The courses listed in bold face indicate required core courses for that specialization area. CSE Degree does not require completion of any specialization area.

Specialization Areas

Graphics & vision (2 required + 1 elective)

- **COT 4501 - Numerical Analysis**
- **CAP 4730 - Intro to Computer Graphics**
- CIS 4930 Intro to Computer Vision Image Processing Signal processing
- CIS 4930 - Special Topics Computer Graphics
- CIS 4930 - HUM CTRD COMP GRAPHIC
- CIS 4930 3D Imaging & Visualization in Computer Graphics
- CIS 4930 - Comp Geometry

HCC (2 required + 1 elective)

- **CEN 4722 - User Experience Design**
- **CEN 4721 - Human Computer Interaction**
- CEN 4725 - Natural User Interaction
- CIS 4930 - 3D Audio
- CIS 4930 - Dialog Systems: Natural Language
- CIS 4930 - Virtual Reality
- CIS 4930 - HUM CTRD COMP GRAPHIC
- CIS 4930 - Comp Science Education Research
- CIS 4930 - Affective Computing
- CIS 4930 - Brain Computer Interface
- CIS 4930 - VR for Social Good

Software Engineering (2 required + 1 elective)

- **COP 4331 - Object-oriented Programming**
- **CEN 4072 - Software Testing and Verification**
- CIS 4930 - Design Patterns
- CIS 4930 - IOS DEV WITH SWIFT
- CIS 4930 - Android Programming
- CIS 4930 - Mobile Computing
- CEN 4722 - User Experience Design

- [CEN4721 Human Computer Interaction](#)
- [CIS 4930 - WEB APP DEVELOPMENT](#)
- [CIS 4930 - Concurrent Programming](#)

[Systems Security \(3 required\)](#)

- [**CIS 4360 - Computer and Information Security**](#)
- [**CNT 4409 - Network and Systems Security**](#)
- [**CIS 4362 - Introduction to Cryptology**](#)
- [CIS4204 - Penetration Testing: Ethical Hacking](#)
- [CIS 4930 - MALWARE REV ENGINR](#)
- [CIS 4930 - Computer Crime](#)
- [CIS4930 - ENTERPRISE DEFENSE](#)
- [CIS4930 - CRYPTOGRAPHIC ANONYMITY](#)