Computer Science

NORTHERN ARIZONA UNIVERSITY COLLEGE OF ENGINEERING AND NATURAL SCIENCES

2007-2008 Program of Study for the

Bachelor of Science in Computer Science (BSCS)

This is a suggested program of study. Courses can be taken in any sequence, if prerequisites and corequisites are satisfied. You must earn a C or better in each course listed as a prerequisite for any CS/EE/EGR/ME/CENE course you take. See the catalog description of each course for prerequisites and corequisites. Please be aware that some courses are not offered every semester.

	FALL			***FRESHMAN YEAR***			***SPRING***		
CS 126	Intro to Comp Science	3	____	CS 136	Software Techniques	3	____
CS126R	Intro to CS Recitation	1		MAT 137	Calculus II	4	____
MAT 136	Calculus I	4	____	ENG 105	Critical Reading/Writing	4	____
_____	Liberal Studies	3	____	_____	Science Elective I (with Lab)	4	____
_____	Liberal Studies/ Diversity	3	____			15	
_____	First Year Experience	1	____				
		15	____				

(The prerequisite for CS 126 is a previous programming course at the high school or college level (e.g. CS 122).

	FALL			***SOPHOMORE YEAR***			***SPRING***		
MAT 226	Discrete Mathematics	3	____	CENE 225 STA 270	Engineering Analysis OR Applied Statistics	3	____
CS 200	Introduction to Computer Organization	3	____	CS 249	Data Structures	3	____
_____	Science Elective II with lab	4	____	_____	Science Elective	4	____
_____	Liberal Studies	3	____	_____	Liberal Studies /Diversity	3	____
_____	Liberal Studies	3		_____	Liberal Studies	3	
		16				16	

	FALL			***JUNIOR YEAR***			***SPRING***		
CS 315	Automata Theory	3	____	CS 396	Prin. of Languages	3	____
CS 386	Software Engineering	3	____	CS 480	Operating Systems	3	____
CS 301	Social & Ethical Issues in CS	1	____	MAT 316 MAT 362	Linear Algebra ***OR*** Numerical Analysis	3	____
_____	CS elective	3	____	ENG 302W	Technical Writing	3	____
_____	CS elective	3	____	_____	CS elective	3	____
_____	Tech elective	3	____			15	
		16					

	FALL			***SENIOR YEAR***			***SPRING***		
CS 421	Algorithms	3	____	CS 486C	Capstone Experience	4	____
_____	CS elective	3	____	_____	CS elective	3	____
_____	CS elective	3	____	_____	Tech elective	3	____
_____	Tech elective	3	____	_____	Liberal Studies	3	____
_____	Liberal Studies	3	____				
		15				13	

LIBERAL STUDIES REQUIREMENT (ABET accreditation and NAU requirements.)

1. 24 total elective credits are required in the NAU liberal studies categories of Social and Political Worlds, Aesthetic and Humanistic Inquiry, and Cultural Understanding. At least 6 hours must be completed in two of the three categories. (CS prefix courses are not permitted.)
2. 4 hours of NAU lab science and 3 hours of NAU science/ applied science as specified on the next page.
3. A 2-course lab science sequence as specified on the next page.
4. ENG 105, MAT 136 (foundations), ENG 302W (Jr. writing requirement), CS 486C (Sr. capstone)

Social and Political Worlds	Aesthetic & Humanistic Inquiry	Cultural Understanding

Other requirements: NAU has both a three credit U.S. ethnic and a three credit global diversity requirement. These credits should be selected from the approved list, which may also satisfy liberal studies or major requirements.

SCIENCE ELECTIVES

The B.S. in Computer Science degree requires a total of 12 credit hours of science coursework. Within this, several further restrictions apply: (a) for ABET accreditation, a student must complete a two semester sequence of lab science where both courses come from either the same science: biology, chemistry or physics; (b) for NAU liberal studies requirements, a student must complete 4 hours of Lab Science and at least 3 hours of Science and Applied Science credits.
Three options that satisfy these constraints are given below:

Option 1.

- PHY 161(3cr)+161Lab(1cr): satisfies 4 hours of NAU Lab Science
- PHY 262(3cr)+262Lab(1cr) : satisfies 4 hours of NAU Science and Applied Science
- 4 additional hours of science.

Option 2.

- CHM 151(4cr)+151Lab (1cr): satisfies 5 hours of NAU Lab Science
- CHM 152(3cr)+152Lab (1cr) : satisfies 4 hours of NAU Science and Applied Science
- 3 additional hours of science.

Option 3.

- BIO 181(3cr)+BIO181Lab(1cr): satisfies 4 hours of NAU Lab Science
- BIO 182 (includes lab) (4cr): completes the two semester lab science requirement of ABET but carries no NAU Science and Applied Science credit.
- 4 additional hours of science must be taken, at least three of which must qualify as NAU Science and Applied Science.

COMPUTER SCIENCE ELECTIVES

Computer Science majors are required to complete at least 18 hours of computer science electives and 9 hours of Tech electives selected in consultation with the student's academic advisor. Any CS elective may be substituted for an Tech elective. Courses that satisfy the computer science elective requirement are listed below. Note that some of the courses come from departments other than computer science. Advanced permission is needed in order to have courses not shown below counted as CS electives.

Computer science electives currently include the following (all carry three hours credit):

Course	Course Title
CS 345	Principles of Database Systems
CS 412	Enterprise Web Computing
CS 413	Virtual Worlds
CS 430	Computer Graphics
CS 445	Data Mining
CS 460	Computer Networks
CS 465	Distributed Systems
CS 470	Introduction to Intelligent Systems
CS 477	Advanced User Interfaces
CS 481	Compilers
CS 485*	Undergraduate Research
CS 497*	Independent Study
CS 499**	Topics in Computer Science
EE 414	Computer Architecture
EE 442	Image Processing
EE 448	Digital Signal Processing (Prerequisite EE 348 can be taken as an Tech elective.)

* NOTE: No more than six hours of Undergraduate Research and Independent Study may be submitted as computer science electives.

** NOTE: CS499 is used generically to test out new courses before adding them permanently to our offering. CS499 may be repeated for credit, so long as the course subtitle (topic) is different.

TECH ELECTIVES

Computer science majors are required to complete 9 hours of Tech electives, selected in consultation with the student's academic advisor. These can be selected from courses with the prefixes EE, MAT, PHY, CHM, and BIO as well as from CS general electives at the 200 level or above**.** Courses with other prefixes can be selected with permission of your advisor. Computer scientists work in collaboration with professionals in a wide variety of disciplines. The Tech elective requirement is meant to encourage computer science students to minor in an additional field of interest or to pick up additional expertise in one or more additional fields of interest. Several examples of how the 9 hours of Tech electives can be used to satisfy minors are given on the next page.

A few examples of how to integrate a minor into the Computer Science curriculum.

Minor in Mathematics:

Courses in the minor already required in CS program: MAT 136, MAT 137, MAT 316, MAT 226

Select your 9 credits of Tech electives to satisfy remaining minor requirements:

3 units MAT or STA courses numbers 200+.

6 units MAT or STA courses numbered 300 level or above (except MAT 301, 401, and 402).

Minor in Chemistry:

With consultation from your chemistry minor advisor you would select 18-24 units of chemistry. The following 20 hours of chemistry courses give one possibility. This plan satisfies the 12 units of science electives required in the CS program as well as the additional 9 units of required Tech electives in the computer science program.

Courses that satisfy science units already required in the CS program:

Use Chemistry courses to fill science requirements, e.g.:

CHM 151, CHM 151L, CHM 152, CHM 152L, CHM 235

Select your Tech electives as follows: CHM 238, plus two of CHM 320, 350, 360

Minor in Physics:

With consultation from your physics minor advisor you would select 18-24 units of physics. The following 20 hours of physics courses give one possibility. This plan satisfies the 12 units of science electives required in the CS program as well as the additional 9 units of required Tech electives in the computer science program.

Courses that satisfy science units already required in the CS program:

Use Physics courses to fill science requirements, e.g.:

PHY 161, PHY 161L, PHY 262, PHY 262L, PHY 263

Select your Tech electives as follows:

Nine hours of additional courses in physics, all at or above the 200 level

Minor in Biology:

Courses that satisfy science units already required in the CS program:

Use Biology courses to fill science requirements, e.g.:

BIO 181, BIO 182, plus at least one of BIO 300 (3 hours), BIO 366, or BIO 372.

Select your Tech electives as follows:

- One additional lab course (1-4 hours, 200+ level).
- 6-9 hours of non-duplicating coursework, 200+ level, which may include up to 3 hours of BIO 300. (Please note that you can use BIO 205 *or* 220 but not both; also BIO 100 and 310 may not be used.)

Minor in Electrical Engineering:

Take EE 188+1ab as foundation to EE minor

Select your 9-credits of Tech Electives + 3 additional credits:

EE 280+lab plus 8 credit hours of EE 200-level and higher courses.

Select two Computer Science Electives as follows:

6 credit hours from 300-level and higher EE courses listed on Page 2 under Computer Science electives.

Minor in Linguistics:

Courses required for minor already required in the CS program:

CS 126, CS 136, CS 396

Select your Tech Electives as follows:

3 additional courses selected from a variety of disciplines as described on page 365 of the NAU Catalog (Interdisciplinary Minor in Linguistics).