

**Computer Science**  
**NORTHERN ARIZONA UNIVERSITY COLLEGE OF ENGINEERING AND NATURAL SCIENCES**  
**2006-2007 Program of Study for the Bachelor of Science in Computer Science**

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.

<i><b>FALL</b></i>		<i><b>FRESHMAN YEAR</b></i>		<i><b>SPRING</b></i>			
CS 126	Intro to Comp Science	3	_____	CS 136	Software Techniques	3	_____
MAT 136	Calculus I	4	_____	MAT 137	Calculus II	4	_____
_____	Liberal Studies	3	_____	ENG 105	Critical Reading/Writing	4	_____
_____	Liberal Studies	3	_____	_____	Science Elective I (with Lab)	4	_____
_____	Liberal Studies/ Diversity	3	_____			<u>15</u>	
_____	First Year Experience	1	_____				
		<u>17</u>	_____				

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

<i><b>FALL</b></i>		<i><b>SOPHOMORE YEAR</b></i>		<i><b>SPRING</b></i>			
MAT 226	Discrete Mathematics	3	_____	CENE 225	Engineering Analysis OR	3	_____
CS 200	Introduction to Computer Organization	3	_____	STA 270	Applied Statistics	3	_____
_____	Science Elective II with lab	4	_____	CS 249	Data Structures	3	_____
_____	Liberal Studies	3	_____	_____	Science Elective	4	_____
		<u>13</u>	_____	_____	Liberal Studies /Diversity	3	_____
				_____	Liberal Studies	<u>3</u>	_____
						<u>16</u>	

<i><b>FALL</b></i>		<i><b>JUNIOR YEAR</b></i>		<i><b>SPRING</b></i>			
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	Linear Algebra <b>OR</b>	3	_____
_____	CS elective	3	_____	MAT 362	Numerical Analysis	3	_____
_____	CS elective	3	_____	ENG 302W	Technical Writing	3	_____
_____	Tech elective	<u>3</u>	_____	_____	CS elective	<u>3</u>	_____
		<u>16</u>	_____			<u>15</u>	

<i><b>FALL</b></i>		<i><b>SENIOR YEAR</b></i>		<i><b>SPRING</b></i>			
CS 421	Algorithms	3	_____	CS 486C	Capstone Experience	4	_____
_____	CS elective	3	_____	_____	CS elective	3	_____
_____	CS elective	3	_____	_____	Tech elective	4	_____
_____	Tech elective	3	_____	_____	Liberal Studies	<u>3</u>	_____
_____	Liberal Studies	3	_____			<u>14</u>	
		<u>15</u>	_____				

**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), CSE 486C (Sr. capstone)

Social and Political Worlds	Aesthetic & Humanistic Inquiry	Cultural Understanding
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**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

For ABET-CAC 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. 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 are given below:

### Option 1.

- PHY 161/161Lab (4): satisfies 4 hours of NAU Lab Science
- PHY 262/262Lab (4) : satisfies 4 hours of NAU Science and Applied Science
- 4 additional hours of science.

### Option 2.

- CHM 151/151Lab (4): satisfies 4 hours of NAU Lab Science
- CHM 152/152Lab (4) : satisfies 4 hours of NAU Science and Applied Science
- 4 additional hours of science.

### Option 3.

- BIO 181(with lab) (4): satisfies 4 hours of NAU Lab Science
- BIO 182 (with lab) (4): completes the two semester lab science requirement of ABET-CAC 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):

<u>Course</u>	<u>Course Title</u>
CS courses not required at the 300 level	
CS 410	Logic Design Theory
CS 450	Introduction to Parallel Computing
CS 455	Modeling in Reactive Systems
CS 460	Computer Networks
CS 470	Introduction to Intelligent Systems
CS 477	Advanced User Interfaces
CS 481	Compilers
CS 485	Undergraduate Research
CS 497*	Independent Study
CIS 410	Advanced Database Concepts Concepts (Prerequisite CIS 310 can be taken as an Tech elective.)
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.)

## TECH ELECTIVES

Computer science majors are required to complete 10 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 10 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 already required in the CS program: MAT 136, MAT 137, MAT 316, MAT 226

Tech electives: (At least 6 units must be at the upper division level.)

9 units MAT or STA courses numbered 200 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:

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

Tech electives: 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:

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

Tech electives:

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:

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

Tech electives:

- One additional lab course (1-4 hours).
- 6-9 hours of nonduplicating coursework, 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:**

Courses that satisfy units already required in the CS program:

EE 188

Tech Electives (plus 2 additional credit hours):

EE 280 plus 8 credit hours from EE 200-level and higher courses.

Two Computer Science General Electives:

6 credit hours from EE 300-level and higher courses

### **Minor in Linguistics:**

Courses that satisfy units already required in the CS program:

CS 126, CS 136, CS 396

Tech Electives:

3 additional courses selected from a variety of disciplines as described in NAU Catalog entry for Interdisciplinary Minor in Linguistics.