**Department of Computer and Electrical Engineering and Computer Science**

**School of Natural Sciences, Mathematics, and Engineering**

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**Program Description**

Computer Science is a constantly evolving discipline. To quote the Association for Computing Machinery, “Computer Science is not simply concerned with the design of computing devices-nor is it just the art of numerical calculation. . . . Computer Science is concerned with information in much the same sense that Physics is concerned with energy; it is devoted to the representation, storage, manipulation, and presentation of information in an environment permitting automatic information systems.”

The Computer Science major at CSUB has three tracks. The Computer Science track follows the guidelines recommended by the Association for Computing Machinery (ACM) and the Accreditation Board for Engineering and Technology (ABET). The Computer Information Systems track is intended for training application programmers or for those who wish to apply computer science in another discipline. The Information Security Track is intended for students who wish to pursue a career in information assurance and security, either with government agencies or with industry. Students in the three tracks will take different advanced courses of their choice. A Computer Science minor is also offered.

The Hardware track has been replaced by the Computer Engineering degree, effective Fall 2011. New students will no longer be allowed to declare this track. Existing students should consult the catalog that they entered under or a department advisor for the graduation requirements of this track.

The Computer and Electrical Engineering and Computer Science Department moved into a new building in Fall 2008 together with the Mathematics Department and have received almost a threefold increase in space. The department administers its own local area network which includes multiple Unix/Linux servers, two software programming labs, a walk-in lab, one advanced workstation lab, an isolated network lab, an AI/isolation lab, a DSP/communications lab, one digital electronics hardware lab, and a robotics lab. There is also a departmental library available to students. An important goal of the department is to enable students to work much more closely with faculty than they would be able to at larger universities. A detailed description of student learning goals and objectives can be found at http://www.cs.csub.edu/index.php?t=1&p=academic\_info/program\_info/index.

**Requirements for the Bachelor of Science Degree in Computer Science**

A. **Computer Science Track**

This track follows the guidelines of the Association for Computing Machinery (ACM) and the Accreditation Board for Engineering and Technology (ABET). Students in this track will take advanced courses of their choice.

**Total Units Required to Graduate 180-181 units**

**Major Requirements 129 units**

CMPS Courses 87

Cognates 42

**Minor Requirement 0 units**

**Other University Requirements 47-52 units**

CSUB 101 2

American Institutions 5

Area A 15

Area B1, B2, B3 0\*

Area C 10

Area D 10\*\*

Theme 1 0\*

Theme 2 0\*

Theme 0\*\*

GRE 5

GWAR (Exam) or Class 0-5

**Additional Units** **0-4 units**

\*B1, B2, B3, B4, Theme 1, Theme 2 satisfied in major

\*\*Computer Science General Education ABET Reductions (see Notes)

See http://www.csub.edu/schedules.shtml for current list of courses satisfying university-wide requirements.

**Note:** One (1) quarter unit of credit normally represents one hour of in-class work and 2-3 hours of outside study per week.

**Requirements for the Major in Computer Science Track**

1. **Introductory courses** (16 units):

CMPS 150 (or 215), 221, 222, 223

2. **Intermediate courses** (55 units):

CMPS 224, 295, 312, 320, 321, 335, 342, 350, 356, 360, 376

3. **Advanced courses** (16 units):

CMPS 490A, 490B

*Two courses from the following:*

**Algorithms and Complexity**

CMPS 411

**Architecture and Organization**

CMPS 420, 421, 422

**Intelligent Systems**

CMPS 432, 456, 457

**Programming Languages**

CMPS 410, 450

**Operating Systems, Security and Computer Networks**

CMPS 445, 451, 460, 475, 476

**Software Engineering and Database Systems**

CMPS 435, 442, 465

**Visual Computing**

CMPS 371, 471, 472, 473

**CMPS 477 Special Topics in Computer Science**

Depending on topic, this course may count for one of the sub-areas above.

4. **The following math/physics courses** (37 units):

MATH 201, 202, 203 or MATH 231, 232, 233, MATH 230 or 330, and MATH 340, PHYS 221, 222.

5. **General Education Courses and Notes:**

 CMPS 490A, 490B satisfies Theme 1.

 PHIL 316 must be taken and will satisfy Theme 2 and the Computer Science Ethics requirement.

 PHYS 221 will satisfy Areas B1 and B3.

 Area B2 is waived for Computer Science majors.

 For Computer Science majors, HIST 231 or 232 will (double) count for both 5 units of Area C as well as for American Institutions.

 The Computer Science ABET 3c. and 3h. Student Outcomes waive 5 units in Area D and waive 5 units of Theme 3.

B. **Computer Information Systems Track**

This track is intended for training application programmers or for those who wish to apply computer science in another discipline.

**Total Units Required to Graduate 180 units**

**Major Requirements 112 units**

CMPS Courses 102

Cognates 10

**Minor Requirement 0 units**

**Other University Requirements 52-57 units**

CSUB 101 2

American Institutions 5

Area A 15

Area B 5\*

Area C 10

Area D 10\*\*

Theme 1 0\*

Theme 2 0\*

Theme 3 0\*\*

GRE 5

GWAR (Exam) or Class 0-5

**Additional Units 11-16 units**

\*B2, B4, Theme 1, Theme 2 satisfied in major

\*\*Computer Science General Education ABET Reductions (see Notes)

See http://www.csub.edu/schedules.shtml for current list of courses satisfying university-wide requirements.

**Note:** One (1) quarter unit of credit normally represents one hour of in-class work and 2-3 hours of outside study per week.

**Requirements for the Major in Computer Information Systems Track**

1. **Introductory courses** (21 units):

CMPS 150 (or 215), 211, 221, 222, 223

2. **Intermediate courses** (50 units):

CMPS 295, 312, 335, 342, 350, 356, 360, 371, 376, 394

3. **Advanced courses** (11 units):

CMPS 435 or 442 or 450 or 456 or 460 or 471 or 476 and CMPS 490A, 490B

4. **Required Mathematics courses** (10 units):

MATH 140, 192

Higher level mathematics courses (MATH 201 or higher) may be used for either of the mathematics requirements.

5. **Electives from** (20 units):

CMPS 215, 216, 280, or any other 300-400 level computing course taken with the consent of the program advisor. Courses from other departments relevant to CIS (not exceeding 10 units) may be taken with the written consent of the program advisor. A minor in another department can be used to offset some electives upon approval of a Computer Science Department advisor.

6. **General Education Courses and Notes:**

 CMPS 490A, 490B satisfies Theme 1.

 PHIL 316 must be taken and will satisfy Theme 2 and the Computer Science Ethics requirement.

 Area B2 is waived for Computer Science majors.

 For Computer Science majors, HIST 231 or 232 will (double) count for both 5 units of Area C as well as for American Institutions.

 The Computer Science ABET 3c. and 3h. Student Outcomes waive 5 units in Area D and waive 5 units of Theme 3.

C. **Computer Information Security Track**

This track is intended for students who wish to pursue a career in information assurance and security, either with government agencies or with industry.

**Total Units Required to Graduate 180 units**

**Major Requirements 118 units**

CMPS Courses 68

Cognates 50

**Minor Requirement 0 units**

**Other University Requirements 52-57 units**

CSUB 101 2

American Institutions 5

Area A 15

Area B 5\*

Area C 10

Area D 10\*\*

Theme 1 0\*

Theme 2 0\*

Theme 3 0\*

GRE 5

GWAR (Exam) or Class 0-5

**Additional Units 5-10 units**

\*B2, B4, Theme 1, Theme 2, Theme 3 satisfied in major.

\*\*Computer Science General Education ABET Reductions (see Notes).

**Requirements for the Major in Computer Information Security Track**

1. **Introductory courses** (16 units):

CMPS 150 (or 215), 221, 222, 223

2. **Intermediate courses** (30 units):

CMPS 295, 312, 335, 350, 360, 376

3. **Advanced courses** (21 units):

CMPS 490A, 490B

*Choose at least 15 units from the following list (one course must be 400-level):*

(CMPS 215 and 216) or 340 or 342 or 445 or 451 or MATH/CMPS 475, or CMPS 476

4. **Required Cognate courses** (30 units):

PHIL 316 must be taken and will satisfy General Education Theme 2 and the Computer Science Ethics requirement. MATH 201, 202, 203 or MATH 231, 232, 233, MATH 230 or 330 and MATH 340

5. **Global Intelligence and National Security (GINS)**

**Cognate Courses** (20 units):

Information Security majors must satisfy the GINS minor requirements as a cognate for this concentration, with the following additional requirements:

 GINS course (10 units)

 PLSI 304 and CRJU 440

 GINS Strategic Language (up to 10 units) may be used for the cognate. See the GINS major description for the current list of strategic languages.

 The courses used to satisfy the upper-division Intelligence Analytical Tools requirement and the lower-division MATH/CMPS cognate option for the GINS minor cannot include any course used to satisfy the major requirements.

 If the Geographical Information Systems (GIS) Tools course is not available, CMPS 371, 471, ECE 446 or 447 may be substituted for the GIS Tolls requirement.

6. **General Education Course and Notes:**

 CMPS 490A, 490B satisfies Theme 1.

 PHIL 316 must be taken and will satisfy Theme 2 and the Computer Science Ethics requirement.

 PLSI 304 must be taken and will satisfy Theme 3.

 Area B2 is waived for Computer Science majors.

 For Computer Science majors, HIST 231 or 232 will (double) count for both 5 units of Area C as well as for American Institutions.

 The Computer Science ABET 3c. and 3h. Student Outcomes waive 5 units in Area D.

D. **Computer Science Hardware Track**

The Hardware Track has been replaced by the Computer Engineering degree, effective Fall 2011. New students will no longer be allowed to declare this track. Existing students should consult the catalog that they entered under or a department advisor for the graduation requirement of this track.

**Requirements for a Minor in Computer Science**

A Minor in Computer Science will require the student to take a total of at least 20 units of 200-level or higher course work as well as satisfy the additional requirements:

a. CMPS 223 (which requires CMPS 221 or the equivalent).

b. One course chosen from the following: CMPS 215, 222, 224 or 295.

c. At least 10 units of upper division course work in computer science (normally two courses) chosen with the help of a computer science advisor. MATH 305 may be substituted for one computer science course.