

CALIFORNIA STATE UNIVERSITY, BAKERSFIELD
ACADEMIC SENATE

NEW CONCENTRATION: INFORMATION SECURITY
RES 1213022

AAC/BPC

RESOLVED: that the Academic Senate recommends that the President approve the proposed Computer Science concentration in Information Security.

RATIONALE: The Budget and Planning Committee has reviewed the proposal and finds it fiscally responsible. The Academic Affairs Committee has reviewed the proposal and found that all curricular matters have been appropriately addressed.

Distribution List:

President Horace Mitchell
Provost Soraya Coley
AVP Undergraduate Studies Carl Kemnitz
NMSE Dean Julio Blanco
Chair Marc Thomas

Approved by the Senate on May 23, 2013
Sent to the President for approval on May 30, 2013
Approved by the President on June 19, 2013

PROPOSAL FOR A NEW MINOR, CONCENTRATION or EMPHASIS

Proposals to add a new minor, concentration or emphasis must receive appropriate campus approval prior to implementation. In addition, the Chancellor's Office must be notified of the campus approval prior to implementation. All attachments are to be added to this cover sheet and remain with the proposal through the required steps of evaluation. Please consult with the Associate Vice President of Academic Programs for questions or assistance.

This new proposal is a (check one):

- Minor - Is this minor available to all undergraduate students? Yes No, only in _____
- Concentration Emphasis within the degree of Computer Science
- Title Information Security effective (term): Fall 2013
- Use the following degree code _____ instead of the major degree code for reporting (note the necessary criteria and degree codes)

Originating Department or Individual: CEE/CS

If a department formally approved the attached proposal, attach the appropriate memorandum and approval date.

Signature: Marc Orsma date: Feb 11, 2013

Curriculum Committee(s): Interschool programs should attach comments or approval from relevant school or department curriculum committees before being submitted to the Academic Affairs Committee, acting as the University Curriculum Committee. A memorandum and approval date from the curriculum committee must be attached. If any revisions were required or agreed to, a revised copy of the proposal must be attached.

Chair Signature: Ray LaFaver date: 1/19/13

School Dean(s): I have reviewed this proposal and send it forward for university-wide review with my comments attached. These comments include my analysis of the resource commitments that must be made to support the program and the origin(s) of those resources.

Dean Signature: Kamellah date: 1/23/13

AVP of Academic Programs: I have reviewed this proposal and send it forward to the Provost.

AVP Signature: Carl Kew date: 2/11/13

Date of Senate Approval: _____ Date of President Approval: _____

Please attach the final Academic Senate Resolution, as signed by the President and return to the Office of Academic Programs, which will notify the Chancellor's Office and the appropriate campus departments. A copy of this form and final electronic catalog copy must be sent to the Director of Academic Operations and Support.

Proposal for a New Information Security Concentration for the Bachelor of Science in Computer Science

Table of Contents

1. Program Identification	1
2. Program Overview and Rationale	2
3. Curriculum	5
4. Need for the Proposed Program	11
5. Student Demand	13
6. Existing Support Resources	14
7. Additional Support Resources Required	14

1. Program Identification

1a. Full and exact degree designation and title.

Bachelor of Science Degree with a Major in Computer Science and a Concentration in Information Security

1b. Term and academic year of intended implementation.

Fall 2013

1c. Total number of units required for graduation. This will include all requirements, not just major requirements.

Pending Chancellor's Office approval of Computer Science General Education reductions:

180 units with GEAR exam, 185 units with GEAR class

This total number of units is in line with the other concentrations in Computer Science and with other Information Security/Assurance concentrations based on Computer Science curriculum (see comparison tables in 3c and 4b).

1d. How this program supports the campus mission and will not impede the successful operation and growth of existing academic programs.

This program was designed by an interdisciplinary group of faculty, with feedback from community members, and supports the campus commitment to advance intellectual development and to community engagement. Information assurance and security is a fast-growing area of computer science and information technology. The proposed concentration utilizes the strengths of existing programs in

Computer Science and in Global Intelligence and National Security to produce well-rounded students with a diverse perspective on issues of information security. Students who participate in the program will have a myriad of educational and career opportunities, both locally and nationally.

2. Program Overview and Rationale

2a. Rationale.

CSUB currently offers two degree programs with relevance to the information security field: a B.S. in Computer Science and a B.A. in Global Intelligence and National Security (GINS). The Computer Science degree is housed in the School of Natural Sciences, Mathematics, and Engineering. The Global Intelligence and National Security degree is a multidisciplinary program primarily overseen by faculty in the School of Social Sciences and Education. CSUB has also been designated as an “Intelligence Community - Academic Centers of Excellence” (IC-ACE) by the Office of the Director of National Intelligence (ODNI) as part of the GINS program.

The B.S. in Computer Science is designed to follow the curriculum guidelines set forth by the Association for Computing Machinery (ACM) and the Accreditation Board for Engineering and Technology (ABET). Due to high general education requirements at CSUB, the program only allows students to take one upper division elective because the remaining units are used to cover the required computer science core. Despite this limitation, there is a strong demand for existing and additional information security courses by students within the degree program (see 5a for student survey results).

The B.A. in Global Intelligence and National Security (GINS) prepares students for academic and professional careers in areas related to homeland security and intelligence. The faculty involved in the development of this program have been actively involved in the GINS program as members of the GINS faculty advisory committee. There is also a GINS community advisory committee composed of key stakeholders in the community, including the Resident Agents in Charge of the local field offices of the D.E.A. and F.B.I., and local emergency responders and law enforcement. Additionally, the GINS program has been working with members of the GINS community advisory committee this past year to provide GINS students with internships at federal and local agencies.

This program was designed to take advantage of the unique opportunity presented at CSUB by the presence and interaction of these two programs. By building on the foundation provided by these two programs, the proposed concentration can be developed at very little cost. Additionally, most Information Security degrees focus purely on the technical aspects of computer and network security. However, members of the GINS community advisory committee emphasized the importance of students having both a technical background and a GINS background in order to be competitive for federal employment. The focus of the program is to provide our students an appreciation and knowledge of the political challenges and security threats that confront the USA, as well as the technical skills to be part of the growing field of information security professionals (see 5b for workforce demand).

Information security is also a national high-priority topic area, with a push to increase the number of information security professionals who work for federal, state, and local government agencies. The faculty involved in the development of this concentration have recently been awarded a capacity building grant as part of the NSF SFS Federal Cyber Service. This grant supports high school and community

outreach, student research in information security, and the development of a new model of information security and assurance education. The proposed concentration is the foundation of this new educational model which utilizes a Computer Science core and an in-depth GINS cognate to produce students who understand threat issues on a variety of levels and from a variety of perspectives.

2b. Proposed Catalog Description.

Note: Some General Education reductions for the Computer Science degree are pending Chancellor's Office Approval. This catalog description reflects the proposed reductions in Area B2 and Area D, which brings the concentration down to 180 units with the GVAR exam.

Requirements for the Bachelor of Science Degree in Computer Science with a Concentration in Information Security

Total Units Required to Graduate		180-185 units
Major Requirements		128 units
Major Courses	68	
Cognates	30	
GINS Cognates	30	
Minor Requirements		0 units
Other University Requirements		52-57 units
CSUB 101	2	
US History	5	
Area A	15	
Area B	5*	
Area C	10*	
Area D	10*	
Theme 1	0*	
Theme 2	0*	
Theme 3	0*	
GRE	5	
GVAR (Exam or Class)	0-5	
Additional Units		0 units

* Computer Science General Education reductions are described in General Education Notes below.

1. Introductory Courses (16 units)

- CMPS 150 – Introduction to Unix (or CMPS 215 – Unix Programming Environment)
- CMPS 221 – Programming Fundamentals
- CMPS 222 – Object-Oriented Programming
- CMPS 223 – Data Structures and Algorithms

2. Intermediate Courses (30 units)

- CMPS 295 – Discrete Structures
- CMPS 312 – Algorithm Analysis and Design
- CMPS 335 – Software Engineering (project should have security focus)
- CMPS 350 – Programming Languages
- CMPS 360 – Operating Systems
- CMPS 376 – Computer Networks

3. Advanced Courses – Information Security Focus (22 units)

- CMPS 490A and 490B – Senior Project (project should have security focus)
- Choose at least 15 units from the following list (one course must be 400-level):*

CMPS 215 – Unix Prog. Environment **AND** CMPS 216 – Unix System Administration
CMPS 340 – Introduction to Digital Forensics
CMPS 342 – Database Systems
CMPS 445 – Data Mining and Visualization
CMPS 451 – Vulnerability Analysis
MATH/CMPS 475 – Applied Cryptography
CMPS 476 – Advanced Computer Networks and Computer Security
Another 300-/400-level CMPS, ECE or MATH elective may be taken with the consent of a program advisor.

4. Required Cognate Courses (30 units)

PHIL 316 – Professional Ethics (Theme 2)
MATH 201 – Calculus I **OR** MATH 231 – Calculus I for Engineering
MATH 202 – Calculus II **OR** MATH 232 – Calculus II for Engineering
MATH 203 – Calculus III **OR** MATH 233 – Calculus III for Engineering
MATH 330 – Linear Algebra **OR** MATH 230 – Linear Algebra for Engineering
MATH 340 – Probability Theory

5. Global Intelligence and National Security (GINS) Cognate Courses (30 units)

PLSI 304 – International Relations (Theme 3)
CRJU 440 – Terrorism

One GINS Intelligence Analytical Tools course selected from the following list:

GEOL 450 – Geographical Information Systems for Natural Sciences
CRJU 494 – Profiling Violence (Theme 3)

Another GINS Intelligence Analytical Tools course may be used with the consent of a program advisor.

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

At least 15 units of GINS Focus Area courses selected from the following list:

Up to 10 units of GINS strategic language courses.
HIST 325 – History of European Colonialism (Theme 2)
HIST 340 – Latin America
HIST 358 – America's Rise to Globalism
HIST 413 – The Middle East in World History
HIST 426 – China since 1800
PLSI 302 – American Foreign Policy
PLSI 303 – Global Security Issues
PLSI 308 – Government and Politics of China (Theme 3)
PLSI 309 – Government and Politics of Latin America
PLSI 323 – Government and Politics of the Middle East
PLSI 328 – Media, Propaganda, and Public Opinion (Theme 3)
PLSI 376 – Politics of International Terrorism
SOC 450 – Globalization and Social Change (Theme 3)

Other GINS Focus Area courses may be used with the consent of a program advisor.

6. General Education Notes for 2013/15 Catalog

- The Theme 1 requirement is satisfied for all Computer Science majors.
- PHIL 316, which is a required cognate course, satisfies the Theme 2 requirement.
- PLSI 304, which is a required cognate course, satisfies the Theme 3 requirement.
- MATH 201 and above satisfies the Area B4 requirement.
- Area B2 is waived for Computer Science majors.
- US History double-counts for 5 units of Area C for Computer Science majors.

- ABET student outcomes 3c and 3h waive 5 units of Area D for Computer Science majors.

3. Curriculum

3a. Goals for the (1) program and (2) student learning outcomes.

Assessment for the concentration will follow the CEE/CS department's assessment framework for the Computer Science degree, which follows the standards laid out by ABET (Accreditation Board for Engineering and Technology). There are no differences between the Computer Science program goals ("program educational objectives") and student learning outcomes ("program outcomes") and those of a concentration, as ABET accredits the entire program, not specific concentrations.

The CEE/CS department is currently in the process of refining its ABET assessment plan. The most current version of the Program Educational Objectives and Program Outcomes can be found at http://www.cs.csubak.edu/PDFs/all_abet.pdf

Program Educational Objectives for Computer Science

1. To produce graduates who are scholastically competitive in computer science, and who will engage in the productive practice of computer science to identify and solve significant problems across a broad range of application areas.
2. To produce graduates who apply their computer science knowledge and skills for the overall benefit of a diverse society.
3. To produce graduates who will enhance the economic well-being of both Kern County and the State of California through a combination of technical expertise, leadership, and entrepreneurship.
4. To produce graduates who can work and communicate effectively, either independently or in a team, to solve problems using computers and computer science principles.
5. To produce graduates who will reflect the diversity of our service area and who will enhance their intellectual development and technical skills through lifelong learning.

Program Outcomes for Computer Science (ABET "Criterion 3")

- 3a. An ability to apply knowledge of computing and mathematics appropriate to the discipline.
- 3b. An ability to analyze a problem, and identify and define the computing requirements and specifications appropriate to its solution.
- 3c. An ability to design, implement and evaluate a computer-based system, process, component, or program to meet desired needs.
- 3d. An ability to function effectively on teams to accomplish a common goal.
- 3e. An understanding of professional, ethical, legal, security, and social issues and responsibilities.
- 3f. An ability to communicate effectively with a range of audiences.
- 3g. An ability to analyze the local and global impact of computing on individuals, organizations, and society.
- 3h. Recognition of the need for and an ability to engage in continuing professional development.
- 3i. An ability to use current techniques, skills, and tools necessary for computing practice.

3j. An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.

3k. An ability to apply design and development principles in the construction of software systems of varying complexity.

3b. Plans for assessing program goals and student learning outcomes.

The CEE/CS department is currently in the process of updating its ABET assessment plans. The most recent plans for assessing the required core courses and the overall goals and outcomes of the degree program can be found at http://www.cs.csubak.edu/PDFs/all_abet.pdf

3c. Other concentrations or emphases and how their curriculum overlaps that proposed.

The following comparison table compares the current concentrations in Computer Science, the Computer Science (CS) concentration and the Computer Information Systems (CIS) concentration, to the proposed concentration in Information Security (IS). Also included in the comparison is the CIS concentration from the 2009/11 catalog (Old CIS), as the core used for the IS concentration was based on this previous CIS concentration, and the 2009/11 Computer Science concentration (Old CS).

	Old CIS	CIS	Old CS	CS	IS
CMPS 150 – Intro to Unix	X	X	X	X	X
CMPS 211 – Web Design		X			
CMPS 221 – Procedural Programming	X	X	X	X	X
CMPS 222 – Object-Oriented Programming	X	X	X	X	X
CMPS 223 – Data Structures	X	X	X	X	X
CMPS 224 – Assembly			X	X	
CMPS 295 – Discrete Structures	X	X	X	X	X
CMPS 312 – Algorithm Analysis	X	X	X	X	X
CMPS 320 – Digital Circuits			X	X	
CMPS 321 – Computer Architecture			X	X	
CMPS 335 – Software Engineering	X	X	X	X	X
CMPS 342 – Database Systems	X	X	X	X	Elective
CMPS 350 – Programming Languages	X	X	X	X	X
CMPS 356 – Artificial Intelligence	X	X	X	X	
CMPS 360 – Operating Systems	X	X	X	X	X
CMPS 371 – Computer Graphics		X			
CMPS 376 – Computer Networks	X	X	X	X	X
CMPS 394 – Java		X			
Subtotal Major Core	56	71	71	71	46
MATH 191 – Pre-calc I	X	X			
MATH 140 or MATH 192	X	X			
MATH 201/231 – Calculus I			X	X	X
MATH 202/232 – Calculus II			X	X	X
MATH 203/233 – Calculus III			X	X	X
MATH 330/325 – Linear Algebra			X	X	X
MATH 340 – Probability			X	X	X
PHYS 221 – Physics I			X	X	
PHYS 222 – Physics II			X	X	
PHIL 316 – Professional Ethics (Theme 2)	X	X	X	X	X

	Old CIS	CIS	Old CS	CS	IS
Subtotal Cognates	15	15	42	42	30
Electives & Additional Cognates	40	25	5	10	15+30 GINS
Senior Project	5	7	5	7	7
Total Core Units	116	118	123	130	128
CSUB 101	2	2	2	2	2
Three Area A Goals	15	15	15	15	15
Goal B1, B3	5	5	--	--	5
Goal B2, B3	5	--	5	--	--
Goal B4	--	--	--	--	--
Three Area C Goals	15	10	15	10	10
Area D Goals (from D1, D2, D4, D5)	10	5	10	5	5
Goal D3 / American Institutions	5	5	5	5	5
US History	5	5	5	5	5
Theme 1	--	--	--	--	--
Theme 2	--	--	--	--	--
Theme 3	5	--	5	--	--
Gender, Race, Ethnicity	5	5	5	5	5
GWAR	Exam	Exam	Exam	Exam	Exam
Subtotal General Education	72	52	67	47	52
Total Units to Graduation (w/ GWAR Exam)	188	180	190	180	180

3d. A list of all courses required for the program.

Existing Courses

- CMPS 150 – Introduction to Unix (1) [Prereq: None]
- CMPS 221 – Programming Fundamentals (5) [Prereq: ELM exempt or MATH 85]
- CMPS 222 – Object-Oriented Programming (5) [Prereq: CMPS 221]
- CMPS 223 – Data Structures and Algorithms (5) [Prereq: CMPS 221]
- CMPS 295 – Discrete Structures (5) [Prereq: CMPS 221]
- CMPS 312 – Algorithm Analysis and Design (5) [Prereq: CMPS 223 and CMPS 295]
- CMPS 335 – Software Engineering (5) [Prereq: CMPS 223]
- CMPS 350 – Programming Languages (5) [Prereq: CMPS 223]
- CMPS 360 – Operating Systems (5) [Prereq: CMPS 223]
- CMPS 376 – Computer Networks (5) [Prereq: CMPS 223]
- CMPS 490 – Senior Project (5) [Prereq: Senior standing in CMPS]
- MATH 201 (or MATH 231) – Calculus I (5) [Prereq: MATH 192 or Calculus Readiness Test]
- MATH 202 (or MATH 232) – Calculus II (5) [Prereq: MATH 201 or MATH 231]
- MATH 203 (or MATH 233) – Calculus III (5) [Prereq: MATH 202 or MATH 232]
- MATH 330 (or MATH 230) – Linear Algebra (5) [Prereq: (MATH 203 or MATH 233) and (CMPS 221 or MATH 222). Co-req: (CMPS 295 or MATH 300)]
- MATH 340 – Probability Theory (5) [Prereq: (MATH 203 or MATH 233). Co-req: (CMPS 295 or MATH 300)]
- PHIL 316 – Professional Ethics (5) [Prereq: B4 and Areas A & C. Junior status]
- PLSI 304 – International Relations (5) [Prereq: B4 and Areas A & D. Junior status]

CRJU 440 – Terrorism (5) [Prereq: None]

New Courses (with descriptions)

None

3e. List of elective courses that can be used to satisfy requirements for the program.

Existing Courses

The following existing courses in CEE/CS and Mathematics can be used as electives for the Information Security electives component of the concentration (15 units):

- CMPS 215 – Unix Programming Environment (3) [Prereq: None]
- CMPS 216 – Unix System Administration (3) [Prereq: CMPS 215]
- CMPS 340 – Introduction to Digital Forensics (5) [Prereq: None. CMPS 150 or 215 recommended]
- CMPS 342 – Database Systems (5) [Prereq: CMPS 295]
- CMPS 445 – Data Mining and Visualization (5) [Prereq: CMPS 312]
- CMPS 451 – Vulnerability Analysis (5) [Prereq: CMPS 350]
- MATH/CMPS 475 – Applied Cryptography (5) [Prereq: CMPS 221 and (CMPS 295 or MATH 300)]
- CMPS 476 – Advanced Computer Networks and Computer Security (5) [Prereq: CMPS 376]

The following existing courses can be used as electives for the Global Information and National Security component of the concentration. These electives are selected from the list of electives for the minor in GINS that have been offered at CSUB in the last five years. Courses in BOLD are recommended (but not required) courses for Information Security students (20 units):

- CMPS 340 – Introduction to Digital Forensics (5) [Prereq: None. CMPS 150 or 215 recommended]
- CMPS 371 – Computer Graphics (5) [Prereq: CMPS 223]
- CMPS/ECE 446 – Image Processing (5) [Prereq: CMPS 223 and ECE 304]
- CMPS/ECE 447 – Computer Vision (5) [Prereq: CMPS 223]
- CMPS 471 – Advanced Computer Graphics (5) [Prereq: CMPS 371]
- CRJU 494 – Profiling Violence (5) [Prereq: B4 and Areas A & D. Junior status]**
- ECON 311 – Pacific Rim Economics (5) [Prereq: B4 and Areas A & D. Junior status]
- ECON 320 – Geographical Information Systems in the Social Sciences (5) [Prereq: None]
- ECON 410 – International Economic Development (5) [Prereq: One ECON course or permission of instructor. B4 and Areas A & D. Junior status]
- GEOL 450 – Geographical Information Systems for Natural Sciences (5) [Prereq: 20 units of upper-division science coursework or permission of instructor]**
- HIST 309 – Europe Since 1914 (5) [Prereq: B4 and Areas A & C. Junior status]
- HIST 325 – History of European Colonialism, 1500-1970 (5) [Prereq: B4 and Areas A & C. Junior status]**
- HIST 327 – History of African Colonial Independence (5) [Prereq: None]
- HIST 340 – Latin America (5) [Prereq: None]**
- HIST 358 – America’s Rise to Globalism, 1917-1964 (5) [Prereq: None]**
- HIST 413 – The Middle East in World History, 600-1453 (5) [Prereq: None]**

HIST 423 – Modern Japan (5) [Prereq: None]
 HIST 425 – China from 900 to 1800 (5) [Prereq: None]
HIST 426 – China since 1800 (5) [Prereq: B4 and Areas A & C. Junior status]
 HIST 442 – Colonial Mexico (5) [Prereq: None]
 HIST 443 – Modern Mexico (5) [Prereq: B4 and Areas A & C. Junior status]
 HIST 454 – Rebellion in America (5) [Prereq: None]
 HIST 481 – History of Southern Africa (5) [Prereq: None]
 PHIL/PLSI 333 – Political Philosophy and Thought (5) [Prereq: None]
 PHIL 411 – Marx, Marxism and Post-Marxism (5) [Prereq: None]
PLSI 302 – American Foreign Policy (5) [Prereq: None]
PLSI 303 – Global Security Issues (5) [Prereq: None]
PLSI 308 – Government and Politics of China (5) [Prereq: B4 and Areas A & D. Junior status]
PLSI 309 – Government and Politics of Latin America (5) [Prereq: None]
PLSI 323 – Government and Politics of the Middle East (5) [Prereq: None]
 PLSI 324 – Politics of Mexico (5) [Prereq: None]
PLSI 328 – Media, Propaganda, and Public Opinion (5) [Prereq: B4 and Areas A & D. Junior status]
PLSI 376 – Politics of International Terrorism (5) [Prereq: None]
 PLSI 404 – Politics of International Commerce (5) [Prereq: None]
 RS 310 – Judaism (5) [Prereq: None]
 RS 316 – Islam (5) [Prereq: B4 and Areas A & C. Junior status]
 RS 320 – India (5) [Prereq: B4 and Areas A & C. Junior status]
 RS 321 – Introduction to Buddhism (5) [Prereq: None]
 RS 323 – China and Japan (5) [Prereq: B4 and Areas A & C. Junior status]
 RS 379 – Religion, Conflict, and Peacemaking (5) [Prereq: None]
 SOC 439 – Latin American Experience (5) [Prereq: None]
 SOC 444 – Social Change and Social Movements (5) [Prereq: None]
SOC 450 – Globalization and Social Change (5) [Prereq: B4 and Areas A & D. Junior status]

New Elective Courses (with descriptions)

The following are two new elective courses under the Information Security electives. See the separate petition for new courses for details on these two courses:

CMPS 445 Data Mining and Visualization (5) Knowledge discovery in and visualization of large datasets, including data warehouses and text-based information systems. Topics covered include data mining concepts, information retrieval, analysis methods, storage systems, visualization, implementation and applications. Each week lecture meets for 200 minutes and lab meets for 150 minutes. **Prerequisite: CMPS 312**

CMPS 451 Vulnerability Analysis (5) Identification and quantification of security weaknesses in programs, systems and networks. Topics covered include professional ethics, static binary analysis, dynamic binary analysis, anti-analysis techniques, risk assessment, penetration testing, vulnerability classification and mitigation techniques. Each week lecture meets for 200 minutes and lab meets for 150 minutes. **Prerequisite: CMPS 350**

3f. List of any other new courses that are: (1) needed to initiate the program and (2) needed during the first two years after implementation.

None

3g. Planned provisions for articulation of the proposed program with community college programs.

The lower-division requirements of the proposed concentration are a subset of the existing lower-division requirements for the Computer Science concentration under the Computer Science degree. Thus the proposed concentration will be covered by existing lower-division transfer agreements between CSUB and community colleges.

Existing agreements with Bakersfield College (BC) provide the following course equivalencies:

BC Course	CSUB Course(s)
ENGR B19C/C++ or COMSB25	CMPS 221
COMSB35	CMPS 222 and CMPS 223
COMSB41	CMPS 215
MATH 6A	MATH 201
MATH 6B	MATH 202
MATH 6C	MATH 203+MATH 204

3h. Advising roadmaps that have been developed.

The proposed concentration contains three electives in Information Security and four electives in Global Intelligence and National Security. These electives are collectively referred to as Elective 1 through Elective 7 in the roadmaps.

Freshman Entering in Odd Years (e.g. 2013/14)

<u>Year 1 (odd)</u>	<u>Fall (18)</u> A2 – ENGL 110 B4 – MATH 201 CSUB 101 CMPS 221 CMPS 150	<u>Winter (15)</u> A1 – COMM 108 MATH 202 CMPS 222	<u>Spring (15)</u> CMPS 295 MATH 203 CMPS 223
<u>Year 2 (even)</u>	<u>Fall (15)</u> A3 MATH 330 CMPS 312	<u>Winter (15)</u> D3 – PLSI 101 MATH 340 CMPS 350	<u>Spring (15)</u> C1 2 nd Area D CMPS 335
<u>Year 3 (odd)</u>	<u>Fall (15)</u> 2 nd Area C Elective 1 Theme 2 – PHIL 316	<u>Winter (15)</u> CMPS 376 Elective 2 Elective 3	<u>Spring (15)</u> B1 CRJU 440 Elective 4
<u>Year 4 (even)</u>	<u>Fall (15)</u> Theme 3 – PLSI 304 CMPS 360 Elective 5	<u>Winter (13)</u> US History Elective 6 CMPS 490A	<u>Spring (14)</u> GRE Elective 7 CMPS 490B

Freshman Entering in Even Years (e.g. 2014/15)

<u>Year 1 (even)</u>	<u>Fall (18)</u> A2 – ENGL 110 B4 – MATH 201 CSUB 101 CMPS 221 CMPS 150	<u>Winter (15)</u> CMPS 295 MATH 202 CMPS 222	<u>Spring (15)</u> A1 – COMM 108 MATH 203 CMPS 223
<u>Year 2 (odd)</u>	<u>Fall (15)</u> A3 MATH 330 CMPS 312	<u>Winter (15)</u> D3 – PLSI 101 MATH 340 CMPS 350	<u>Spring (15)</u> C1 2 nd Area D CMPS 335
<u>Year 3 (even)</u>	<u>Fall (15)</u> 2 nd Area C Theme 2 – PHIL 316 Elective 1	<u>Winter (15)</u> CRJU 440 Elective 2 Elective 3	<u>Spring (15)</u> B1 CMPS 376 Elective 4
<u>Year 4 (odd)</u>	<u>Fall (15)</u> Theme 3 – PLSI 304 Elective 5 US History	<u>Winter (13)</u> CMPS 360 Elective 6 CMPS 490A	<u>Spring (14)</u> GRE Elective 7 CMPS 490B

3i. Provision for meeting accreditation requirements.

As noted in 3a, ABET accredits degree programs, not individual concentrations. There would be no additional provisions needed for this concentration.

4. Need for the Proposed Program

4a. List of other California State University campuses currently offering similar programs.

CSU Sacramento has an Information Assurance and Security concentration under their Computer Science program. This is the closest match to our proposed program, but does not contain the Global Intelligence and National Security cognates as this proposed program does (see comparison in 4b).

CSU Dominguez Hills has a Homeland Security concentration under their Computer Technology program. This degree program is Computer Information Systems (CIS) based, and therefore is not as mathematically rigorous as the proposed concentration (see comparison in 4b).

CSU Monterey Bay has a Network and Security concentration under their Computer Science and Information Technology program. This concentration focuses primarily on network administration and security, instead of being a generalized information security concentration.

4b. Comparison to other institutions offering Information Security or Assurance concentrations.

This table compares the proposed curriculum to other institutions with concentrations or degree programs that are based on Computer Science (CS) or Computer Information Systems (CIS). The proposed curriculum is not compared to institutions with concentrations or degree programs based on Business Administration or Management Information Systems (MIS), as the core curriculum varies too greatly

from the core Computer Science curriculum. Institutions in **BOLD** are designated as Centers of Academic Excellence for Information Assurance Education (CAE/IAE) by the National Security Agency (NSA).

Institution	CSUB	CSU Sac State	CSU Dom. Hills	Illinois State	George Wash. U	Georgetown
Based on CS or CIS?	CS	CS	CIS	CS	CS	CS
Linux	X	X	elective		elective	
HTML			X			
Proc. Programming	X	X	X	X	X	X
OO Programming	X	X	X	X	X	X
Data Structures	X	X	X	X	X	X
Assembly		X	X		X	
Discrete Structures	X	X		X	X	X
Algorithm Analysis	X	X		X	X	X
Software Engineering	X	X	X	Elective	X	X
Programming Lang.	X	X	elective	X	X	X
OS	X	X	Combo Course	X	X	X
Networks	X	X		Elective	elective	elective
Digital Circuits			X			X
Architecture		X		X		X
Graphics		X				
Artificial Intelligence						
Database	elective	X		Elective		elective
Digital Forensics	elective	X	X			elective
Data Mining	elective			Elective		elective
Vulnerability Analysis	elective					
Cryptography	elective	X			X	
General Security	elective	X	X	X	X	elective
Network Security	elective		X	Elective	X	elective
OS Security		elective	X	X		
Secure Sys. Design		elective				
Quality Testing		elective				
Information Warfare						elective
System Admin.	elective		X		elective	
Pre-Calculus			X			
Elem. Statistics			X			
Calculus I	X	X		X	X	X
Calculus II	X	X		X	X	X
Calculus III	X	elective		X	X	elective
Linear Algebra	X	elective		X		elective
Probability Theory	X	X		X	X	elective
Differential Equations		elective				elective
Number Theory		elective				elective
Mech. Physics		X		X	X	
Modern Physics		X		X	X	
Global Intelligence	X					
Professional Ethics	X	X	X	X	X	
Total (Quarter Units)	128	130-134	102	128	150	126

4c. Community participation in the planning process.

Interested members of the Global Intelligence and National Security Community Advisory Committee were consulted during the development of this concentration. The feedback of agents from federal

agencies was particularly important in developing this concentration, so that graduates can be highly competitive in applying to such agencies after graduation.

5. Student Demand

5a. Evidence of student interest in enrolling in the proposed program.

An unscientific survey of Computer Science students was conducted. 17 students responded to the survey. Of those respondents, 16 indicated an interest in an Information Security degree. Students were also asked to indicate which electives they would be interested in taking. 15 students indicated interest in Applied Cryptography (MATH/CMPS 475), Vulnerability Analysis (proposed CMPS 451), and Adv. Networks and Computer Security (CMPS 476). 14 students indicated interest in Digital Forensics (CMPS 340). 8 students indicated interest in Data Mining (proposed CMPS 445).

Additionally, the enrollment in CMPS 476 has nearly doubled in each of the last three offerings (5 students in Spring 2008, 10 students in Spring 2010, 19 students in Spring 2012). This is a very strong interest in a 400-level elective CMPS course, where the expected enrollment is around a half-dozen students.

5b. Professional uses of the proposed program.

Information security is also a national high-priority topic area, with a push to increase the number of information security professionals who work for federal, state, and local government agencies. Students from this proposed program would be particularly well-suited for government law enforcement and national security agencies, as the program combines both technical skills and multi-disciplinary courses in global intelligence.

The private sector is also increasingly hiring computer scientists, system administrators and other technical professions with information security training. Several economic media outlets report that demand is exceeding the supply of properly trained information security professionals. According to a 2011 report from Dice.com, information security job postings have increased by 79% from September 2009 to September 2011. The 2012 career impact survey of information security professionals by (ISC)² showed less than 4% of respondents were currently unemployed and only 7% were unemployed at any point during 2011. Additionally, over 30% indicated that their employers had increased the number of new hires in the last 12 months. Of the 25% of respondents who indicated they had hiring responsibilities, over 62% indicated they would be seeking additional information security employees in the next 12 months and over 50% had difficulty finding qualified candidates.

5c. The expected number students in the program.

Two CEE/CS students are already voluntarily participating in the both the CEE/CS and GINS program as Intelligence Community students. We do not anticipate many transfers from upper division students due to the differences between the proposed concentration and the existing concentrations, but lower division students should be able to change concentrations with little disruption since the first year sequence is similar between the two existing concentrations and this proposed concentration. We expect several students will participate each year.

6. Existing Support Resources

6a. Faculty who would teach in the program.

Existing CEE/CS faculty and faculty for the Global Intelligence and National Security program would teach the courses for this proposed concentration.

6b. Space, facilities, and resources that would be used in support of the program.

Existing facilities will be used in support of this concentration. This includes the Cybersecurity and Networking Research Laboratory (Sci III 314), the Mathematics Cryptography Research Laboratory (Sci III 206), National Security Resource Center (BDC 240), the Computer Security Laboratory (Sci III 337), existing classroom facilities, and existing computer laboratories.

7. Additional Support Resources Required

7a. Additional faculty or staff support positions needed.

None.

7b. Additional space and/or special facilities needed.

None.

7c. Additional library resources needed.

None.

7d. Additional academic technology, equipment, or specialized materials needed.

None.