PROPOSAL TO OFFER A NEW ACADEMIC PROGRAM/ MAJOR IN FALL 2002
(LONG FORM)

Proposed Name of Degree: Bachelor of Science in Computer Sciences

Options/ Emphases in the Degree: _____

Faculty Proposing New Program: Ivona Grzegorczyk, PhD

Review and Approval:

1. Curriculum Committee Approval:

Curriculum Chair: _____ Date: 12/11/01

2. Academic Senate Approval:

Chair, Academic Senate: _____ Date: 12/10/01

3. Administration Approval:

President (or designee): _____ Date: 12/17/01

PROCEDURE FOR SUBMITTING PROPOSALS FOR NEW PROGRAMS

A campus, in accordance with its approved academic master plan, submits detailed proposals for new degree major programs to the Office of Academic Program Planning for review and approval in the academic year preceding projected implementation. Approval of any degree major program is subject to campus assurances that financial support, qualified faculty, physical facilities and library holdings sufficient to establish and maintain the program will be available within current budgetary support levels. The proposal must follow the format below, and four copies should be sent to Academic Program Planning, Office of the Chancellor.

1. Definition of the Proposed Degree Major Program

a. Name of the campus submitting the request, the full and exact designation (degree terminology) for the proposed degree major program, and academic year of intended implementation.

California State University Channel Islands
Bachelor of Science in Computer Science
Fall 2002

b. Name of the department, departments, division or other unit of the campus that would offer the proposed degree major program. Identify the unit that will have primary responsibility.

Academic Affairs

c. Name, title, and rank of the individual(s) primarily responsible for drafting the proposed degree major program.

Ivona Grzegorczyk, PhD
Associate Professor of Mathematics

d. Objectives of the proposed degree major program.

1. Provide students with the opportunity to earn a state-supported Bachelor degree in Computer Science from the California State University.
2. Prepare students for employment in a variety of highly sophisticated and complex high-tech and bio-tech industries.
3. Prepare students for further study in graduate or professional schools.
4. Offer all CSUCI students the opportunity to broaden their knowledge and learn in this subject area.

Total number of units required for the major. List of all courses, by catalog number, title, and units of credit, to be specifically required for a major under the proposed degree program. Identify those new courses that are (1) needed to initiate the program and (2) needed during the first two years after implementation. Include proposed catalog descriptions of all new courses.

125 Semester units required for the major.

Since CSUCI will only begin admitting students in Fall 2002, all courses are new and will be needed to initiate the program. These courses will be offered during the first two years (and subsequent years) after program implementation. See the following pages for Courses and Catalog Descriptions.

LOWER DIVISION REQUIREMENTS (43-46 Units)

MATH 150 Calculus 1 (4, G.E B3)
MATH 151 Calculus 2 (4)
COMP 150 Object Oriented Programming (4)
COMP 151 Data Structures and Program Design (4)
MATH/PHIL 230 Logic (3) (G.E. A3 or C3)
COMP 162 Comp. Architecture and Assembly Language(3)
MATH 240 Linear Algebra (3)
COMP 232 Programming Languages (3, G.E. C3?)
COMP 262 Computer Organization and Architecture (3)
Sciences 12 units

UPPER DIVISION REQUIREMENTS (46 Units)

MATH 300 Discrete Mathematics (3)
MGT 346 Scientific and Professional Ethics (3)
MATH 344 Analysis of Algorithms (3)
COMP 444 Automata, Languages and Computation (3)
COMP 362 Operating Systems and System Architecture (3)
MATH 342 Probability and Statistics (3)
COMP 350 Software Engineering (3)
COMP 420 Databases (3)
COMP 447 Societal Issues in Computing (3, G.E. D)
MATH 451 Numerical Analysis (3)
COMP 464 Computer Graphics I (3)
COMP 499 Senior Colloquium (1)

Choose 3 Computer Science Electives (9 units) **from the following list:**

COMP/ MATH 431 Bioinformatics (4- INT)
COMP 466 Computer Graphics II
COMP 469 AI/Neural Nets
MATH 440 Operation Research (3-INT)
ENGL 484 Technical writing
COMP 449 Human Comp. Interaction (3-INT)
COMP 424 Security (3)
COMP 429 Computer Networks (3)
COMP 462 Advanced Object Oriented Programming (3)
COMP 422 Design of Compilers (3)
COMP 490 Topics in Computer Science (3)
COMP 494 Independent Study (3)
COMP 497 Directed Study (3)
COMP 492 Internship (3)
COMP 499 Senior Colloquium (1)

TOTAL COMPUTER SCIENCE CREDITS REQUIRED BY ACCREDITATION: **89 units (including 24 G.E. credits)**

The choice of electives should reflect student specialization and require approval by the student's advisor. Students are cautioned against assuming that courses taken before such approval will be acceptable.

REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN COMPUTER SCIENCE DEGREE:

Lower Division Required Major Courses	43
Upper Division Required Major Courses.....	37
Upper Division Elective Major Courses	9
Elective Courses	6
General Education Included in Major Requirements	(24)
General Education & Title V.....	30
Total	125

COURSE DESCRIPTIONS FOR CATALOG

COMP 100. Computers: Their Impact and Use (3)

An introduction to the uses, concepts, techniques, and terminology of computing. Places the possibilities and problems of computer use in historical, economic, and social contexts. Shows how computers can assist in a wide range of personal, commercial, and organizational activities. Typical computer applications, including word processing, spreadsheets, and databases. Not open to Computer Science majors.

COMP 101. Computer Literacy (3)

An introduction to computer applications, including web applications, word processing, spreadsheets, databases and programming. Includes service learning component. Not open to Computer Science majors.

COMP 103. Computer Programming Introduction (3)

An introduction to the design, development and expression of algorithms. Algorithms and their stepwise refinement. Expression of algorithms in a formal language. This course is intended to be a first course in programming language (for example VISUAL BASIC or C/C++). Not open to students who have completed Comp. 150.

COMP 150. Object Oriented Programming (3+1)

Introduction to algorithms, their representation, design, structuring, analysis and optimization. The course introduces the concept of object paradigm and teaches how to design and implement algorithms as structured programs in a high level language. Course includes programming lab. Students with no programming experience should take COMP 103 first.

COMP 151. Data Structures and Program Design (3+1)

Prerequisite: Comp. 150. Introduction to data structures and the algorithms that use them. Review of composite data types such as arrays, records, strings, and sets. The role of the abstract data type in program design. Definition, implementation, and application of data structures such as stacks, queues, linked lists, trees, and graphs. Recursion. Use of time complexity expressions in evaluating algorithms. Comparative study of sorting and searching algorithms. Course includes programming lab.

COMP 162. Computer Architecture and Assembly Language (3)

Prerequisite: COMP 150. An introduction to computer architecture, assembly language programming, system software and computer applications. Number systems and data representation. Internal organization of a computer. Primitive instructions and operations. Assembly language. Language translation principles. Overview of operation systems.

COMP 232. Programming Languages (3)

Prerequisites: COMP 162 and 151. Discussion of issues in the design, implementation, and use of high-level programming languages. Historical background. How languages reflect different design philosophies and user requirements. Technical issues in the design of major imperative (procedural) programming languages. Other approaches to programming: functional programming, logic programming, and object-oriented programming.

COMP 262. Computer Organization and Architecture (3)

Prerequisites: COMP 151 and 162. Extension of basic addressing concepts to more advanced addressability such as base register and self-relative addressing. Comparative computer architecture focusing on such organizations as multiple register processors and stack machines. Basics of virtual memory input-output. Introduction to the concept of microprogrammable systems. Low-level language translation process associated with assemblers. System functions such as relocatable loading and memory management. Application of data structure and hashing techniques to the above. Other related topics.

COMP 350. Software Engineering (3)

Prerequisites: COMP 232, 262. Concepts and techniques for systems engineering, requirements analysis, design, implementation and testing of large scale computer systems. Principles of software engineering for production of reliable, maintainable and portable software products. Emphasis on functional analysis and structured design techniques. Topics include unit, integration and systems testing, configuration management, and software quality assurance practices. Participation in group activities involving analysis, design and implementation of a software intensive system. Introduction to Computer Aided Software Engineering (CASE)

COMP 362. Operating Systems (3)

Prerequisites: COMP 262.Examination of the principal types of systems including batch, multi-programming, and time-sharing. Networked systems are also discussed. The salient problems associated with implementing systems are considered including interrupt or event driven systems, multi-tasking, storage and data base management, and input-output. Emphasis will be placed on some of the simple algorithms used to solve common problems encountered such as deadlocks, queue service, and multiple accesses to data. Projects will be implemented to reinforce the lectures.

COMP 420. Database Theory and Design (3)

Prerequisite: COMP 350. Database structure including: structure definition, data models, semantics of relations, and operation on data models. Database schemas: element definition, use and manipulation of the schema. Elements of implementation. Algebra of relations on a database. Hierarchical data bases. Discussion of information retrieval, reliability, protection and integrity of databases.

COMP 422. Design of Compilers (3)

Prerequisites: COMP 310 and MATH 362. Organization of compiler including lexical and syntax analysis, symbol tables, object code generation, code optimization techniques, and overall design. Compilation techniques and run-time structures.

COMP 424. Computer System Security (3)

Prerequisite: COMP 350. Security techniques in operating systems, data bases, and computer networks. Analysis of formal security models. Introduction to cryptography, public key security schemas.

COMP 429. Computer Networks (3)

Prerequisites: COMP 310, COMP 362 and MATH 344 Basic software design and analysis considerations in networking computers into coherent, cooperating systems capable of processing computational tasks in a distributed manner. Network topology, routing procedures, message multiplexing and process scheduling techniques.

COMP 431. Bioinformatics (4)

Prerequisite: COMP 150, MATH 151, Statistics. Basic computational models used in molecular biology and chemistry will be introduced. Topics include algorithms for string alignments, dynamic programming, structural superposition algorithms, computing with differential information, 3D motifs, Hidden Markov Models, phylogenetic trees, statistical/ information techniques for pattern recognition, genetic algorithms.

COMP 444. Automata, Languages, and Computation (3)

Prerequisites: MATH. 300. Study of the relation of languages (i.e. sets of strings) and machines for processing these languages, with emphasis on classes of languages and corresponding classes of machines. Phrase structure languages and grammar. Types of grammars and classes of languages. Regular languages and finite state automata. Context-free languages and pushdown automata. Unrestricted languages and Turing Machines. Computability models of Turing, Church, Markov, and McCarthy. Applications to programming languages, compiler design, and program design and testing.

COMP 447. Societal Issues in Computing (3)

Prerequisites: COMP 350 and COMP 362 and senior standing. A survey course on the role of the digital computer in modern society. The dangers of the misuse of computers (as in the invasion of privacy), as well as the proper and intelligent use of the machines, are discussed.

COMP 449. Human-computer Interaction (3)

Prerequisite: COMP 350. The information exchange between humans and computer systems will be examined. Aspects of input/output devices, software engineering, and human factors will be discussed with

respect to human-computer interactions. Topics include: text and graphic display; user modeling; program design, debugging, complexity and comprehension; and current research studies and methodologies.

COMP 462. Advanced Object-Oriented Programming (3)

Prerequisite: COMP 350. Principles of object-oriented design and programming based on languages such as JAVA, C++ and Smalltalk will be presented. Understanding of the role of objects, methods, message passing, encapsulation, and inheritance for effective programming will be stressed. Language structure versus particular engineering objectives will be analyzed. Design Patterns techniques will be a unifying theme.

COMP 464. Computer Graphic Systems and Design I (3)

Prerequisite: COMP 350 and MATH 240. Fundamental concepts of computer graphics. Graphics devices; graphics languages; interactive systems. Applications to art, science, engineering and business. Trade-offs between hardware devices and software support.

COMP 466. Computer Graphic Systems and Design II (3)

Prerequisite: COMP 464. Advanced concepts of computer graphics. Topics include computer graphics software and hardware, mathematical basis of geometric modeling, data base management in manufacturing environments, imagining and visualization.

COMP 469. Artificial Intelligence/ Neural nets (3)

Prerequisites: COMP 310, 362, and 350. An exploration of the use of computers to perform computations normally associated with intelligence, pattern formation and recognition using various backpro iterations. Stacks, decision trees and other modern mining tools and computational models for knowledge representation will be covered. Other topics may include natural language and imagining.

COMP 490. Topics in Computer Science (3)

Prerequisites: Junior standing.
Current issues in computer science.

COMP 492. Internship (3)

Prerequisites: Junior standing and Program approval of written proposal of internship studies.
Supervised work and study in industrial setting involving development of degree related skills. All students are required to present their projects at the Senior Seminar. Credit/no credit.

COMP 494. Independent Research (3)

Prerequisites: Senior standing and Program approval of written proposal of independent research studies.
Supervised project involving theoretical research in the field of computer science or its applications. All students are required to present their projects at the Senior Seminar. Credit/no credit.

COMP 497. Directed Study (3)

Prerequisites: Senior standing and Program approval of written proposal of directed studies.
Supervised project involving library research. All students are required to present their projects at the Senior Seminar.

COMP 499. Senior Colloquium (1)

Prerequisites: Senior standing.
Oral presentation of current advancements in the field, reports on students' projects, and invited lectures. Repeatable.

f. List of elective courses, by catalog number, title, and units of credit that can be used to satisfy requirements for the major. Identify those new courses that are (1) needed to initiate the program and (2) needed during the first two years after implementation. Include proposed catalog descriptions of all new courses.

Since CSUCI will only begin admitting students in Fall 2002, all courses are new and will be needed to initiate the program. Computer Science majors are required to complete 9 units of electives from the following list.

COMP 466 Graphics II (2+1)
COMP 431 Bioinformatics (3)
COMP 469 AI/Neural nets (3)
MATH 440 Op. Research (3)
ENGL 484 Technical writing (3)
COMP 449 Human Computer Interaction (3)
COMP 424 Security (3)
COMP 429 Networks (3)
COMP 462 Advanced O-O programming (3)
COMP 422 Design of Compilers (3)
COMP 490 Topics in Computer Science (3)
COMP 492 Internship (3)
COMP 494 Research (3)
COMP 497 Directed Study (3)
COMP 499 Senior Colloquium (3)

COURSE DESCRIPTIONS FOR CATALOG

See above descriptions

g. If any formal options, concentrations, or special emphases are planned under the proposed major, explain fully.

none

h. **Course prerequisites and other criteria for admission of students to the proposed degree major program, and for their continuation in it.**
Except as noted below, all courses are open to matriculated students of the University. Also, students must have declared themselves as Business Majors and remain in good academic standing throughout their enrollment at CSUCI.

-Students seeking admission to the Computer Science Program must be officially accepted into CSUCI and declare themselves Computer Science majors.
- Students must remain good academic standing.

LIST OF COURSES WITH PREREQUISITES:

COMP 150. Object Oriented Programming (3+1) Prerequisite : Some programming experience recommended.
COMP 151. Data Structures and Program Design (3+1) Prerequisite: Comp. 150.
COMP 162. Computer Architecture and Assembly Language (3) Prerequisite: Comp. 150.
COMP 232. Programming Languages (3) Prerequisites: Comp. 162 and 151.
COMP 262. Computer Organization and Architecture (3) Prerequisites: Comp. 151 and 162.
COMP 444. Automata, Languages, and Computation (3) Prerequisites: Math. 300.
COMP 350. Introduction to Software Engineering (3) Prerequisites: Comp. 232, 262.
COMP 362. Operating Systems (3) Prerequisites: Comp. 262.
COMP 420. Database Theory and Design (3) Prerequisite: Comp. 350.
COMP 422. Design of Compilers (3) Prerequisites: Comp. 344 and Math 362.
COMP 424. Computer System Security (3) Prerequisite: Comp. 350.
COMP 429. Computer Networks (3) Prerequisites: Comp. 344, Comp. 362 and Math 344
COMP 431. Bioinformatics (3) Prerequisite: Comp. 150, Math 151, Statistics.
COMP 432. Advanced Object-Oriented Programming (3) Prerequisite: Comp. 350.
COMP 449. Human-computer Interaction (3) Prerequisite: Comp 350.
COMP 447. Societal Issues in Computing (3) Prerequisites: Comp. 350 and Comp 362 and senior standing.
COMP 464. Computer Graphic Systems and Design I (3) Prerequisite: Comp. 350 and Math 240.
COMP 466. Computer Graphic Systems and Design II (3) Prerequisite: Comp. 464.
COMP 469. Artificial Intelligence/ Neural nets (3) Prerequisites: Comp. 344, 362, and 350.
COMP 490. Topics in Computer Science(3) Prerequisites: Junior standing.
COMP 492. Internship (3) Prerequisites: Junior standing and Program approval of written proposal of internship studies.
COMP 494. Independent Research (3) Prerequisites: Senior standing and Program approval of written proposal of independent research studies.
COMP 497. Directed Study (3) Prerequisites: Senior standing and Program approval of written proposal of directed studies.
COMP 499. Senior Colloquium (1) Prerequisites: Senior standing.

i. **Explanation of special characteristics of the proposed degree major program, e.g., in terminology, units of credit required, types of course work, etc.**

-The program contains up-to-date technical, theoretical and intellectual achievements in the field of Computer Science.
-It stresses modern computer applications in highly developing fields such as bioinformatics, computational chemistry and computer graphics.
-It implements the distinguishing characteristics of all CSUCI programs: an interdisciplinary and service learning approach to higher education.

j. For undergraduate programs, provisions for articulation of the proposed major with community college programs.

See the attached description of proposed articulation with local community colleges. The articulation agreements will be addressed during 2002.

k. **Provision for meeting accreditation requirements, where applicable, and anticipated date of accreditation request.**

The program is designed in accordance with the major accrediting body ABET:

Accreditation Board for Engineering and Technology, Inc.
111 Market Pl., Suite 1050
Baltimore, MD 21202
(410) 347-7700
(410) 625-2238 (Fax)

2. **Need for the Proposed Degree Major Program**

a. **List of other California State University campuses currently offering or projecting the proposed degree major program; list of neighboring institutions, public and private, currently offering the proposed degree major program.**

Most other CSU campuses offer a Bachelor of Science in Computer Science. In addition, three nearby private institutions (California Lutheran, Pepperdine, Westmont) offer some variations of the degree.

b. **Differences between the proposed program and programs listed in Section 2a above.**

-The CSUCI Program will provide an opportunity to earn a state-supported Computer Science degree to students in the local service area – and offer all students access to a highly desired high-tech positions in a unique program that stresses an interdisciplinary learning approach.

- The program is designed to reflect rapidly changing needs of the computer based industries and the sophisticated computer applications (for example in bioinformatics, data mining, computer graphics, internet development, security issues).

- The program provides service and internship learning with the local bio-tech and high –tech companies.

f. **Professional uses of the proposed degree major program.**

The Bachelor of Science in Computer Science will prepare students for a variety of high-tech and bio-tech industrial positions. The Degree would also prepare students for graduate school in computer related fields.

g. **The expected number of majors in the year of initiation and three years and five years thereafter. The expected number of graduates in the year of initiation and three years and five years thereafter.**

	Number of Majors*	Number of Graduates*
Initiation Year	60	2
Third year	100	80
Fifth year	200	180

•from CSU Channel Islands Enrollments Models

3. **Existing Support Resources for the Proposed Degree Major Program**

a. **Faculty members, with rank, appointment status, highest degree earned, date and field of highest degree, and professional experience (including publications if the proposal is for a graduate degree), who would teach in the program.**

Ivona Grzegorczyk
Associate Professor of Mathematics
PhD in Mathematics, 1990
Mathematics Professor since 1992

Three additional full-time professors in the Computer Science area are planned for Fall 2002

Other CSUCI full-time science (3) and mathematics (1) faculty will offer interdisciplinary and computation intensive application courses.

Ching-Hua Wang
Professor of Biology
PhD in Biology, 1986
CSU Biology Professor since 1990

Louise H. Lutze-Mann
Associate Professor of Biology
PhD in Biology, 1983
Biology Professor since 1994

Philip Hampton
Associate Professor of Chemistry
PhD in Chemisrty, 1989
Chemistry Professor since 1991

This program will require classroom space, designated computer laboratory space, library materials, library electronic databases and the use of Information Technology (IT) resources. The program assumes the development of campus resources for students, faculty and staff: parking, offices, food service, health services and key academic support resources (admission, advising, records, etc.).

4. **Additional Support Resources Required**

b. **Any special characteristics of the additional faculty or staff support positions needed to implement the proposed program.**

During 2002, CSUCI anticipates hiring three tenure track faculty members to assist in offering CS program. Additional mathematics and sciences faculty also will be hired.

c. **The amount of additional lecture and/or laboratory space required to initiate and sustain the program over the next five years. Indicate any additional special facilities that will be required. If the space is under construction, what is the projected occupancy date? If the space is planned, indicate campus-wide priority of the facility, capital outlay program priority, and projected date of occupancy.**

The program will use the existing classroom space and new computer labs that are being developed.

d. **Additional library resources needed. Indicate the commitment of the campus to purchase or borrow through interlibrary loan these additional resources.**

No additional library resources needed above the existing CSUCI Library acquisition program. The faculty is working with the Library staff to assure an appropriate level and subject distribution of library resources.

Additional equipment or specialized materials that will be (1) needed to implement the program and (2) needed during the first two years after initiation. Indicate the source of funds and priority to secure these resource needs.

No new needs beyond those planned during the development of the campus facilities.

5. **Abstract of the Proposal and Proposed Catalog Description**

COMPUTER SCIENCE

The Computer Science degree at Channel Islands offers latest, cutting edge education for various industrial and applied fields. The program will prepare students for careers in high-tech, computer and Internet driven industries, where interdisciplinary, dynamic and innovative professionals trained in latest technologies are increasingly sought. Students will be given a strong background in computer hardware and software, as well as a substantial amount of "hands-on" experience. The program will stress interdisciplinary applications in other sciences and business.

DEGREES OFFERED:

Bachelor of Science in Computer Science
Minor in Computer Science

CONTACT INFORMATION

Ivona Grzegorczyk, Associate Professor of Mathematics
Phone: (805) 437-8868 Fax: (805) 437-8864
Web Page: http://www.csuci.edu
Email: ivona.grze@csuci.edu

PROPOSED COURSE OF STUDY:

FRESHMAN YEAR (30 Units)

ENGL 100 Composition and Rhetoric (3, G.E. A1)
MATH 150 Calculus 1 (4, G.E B3)
COMP 150 Object Oriented Programming (4)
G.E. Section A, C, D, or E (3)

MATH 151 Calculus 2 (4)
MATH/PHIL 230 Logic (3, G.E. A3 or C3)
COMP 151 Data Structures and Program Design (3)
COMP 162 Comp. Architecture and Assembly Language(3)
G.E. Section A, C, D, or E (3)

SOPHOMORE YEAR (28-31 Units)

MATH 240 Linear Algebra (3)
COMP 232 Programming Languages (3)
COMP 262 Computer Organization and Architecture (3)
MATH 300 Discrete Mathematics (3)
MGT 346 Scientific and Professional Ethics (3, G.E. D)
Select one 2 semester science sequence and an additional science course (one lab section required) in Physics, Biology, or Chemistry (13-16, G.E. B1 and B2]

JUNIOR YEAR (18 Units + G.E)

MATH 342 Analysis of Algorithms (3)
COMP 344 Automata, Languages and Computation (3)
COMP 362 Operating Systems and System Architecture (3)
COMP 380 Program Design Techniques (3)
MATH 342 Probability and Statistics (3, G.E. A3)
COMP 350 Software Engineering (3)

SENIOR YEAR (20-21 Units+ G.E.)

COMP 440 Databases (3)
COMP 450 Societal Issues in Computing (3, G.E. D)
MATH 451 Numerical Analysis (3)
COMP 464 Computer Graphics I (3)
COMP 499 Senior Colloquim(1)
Choose 3 or more Computer Science Electives (9) from the following list:

COMP 430 Design of Compilers (3)
COMP 431 Bioinformatics (3)
COMP 466 Computer Graphics II (3)
COMP 469 AI/Neural Nets(3)
MATH 440 Operation Research (3)
ENGL 434 Technical Writing (3)
COMP 485 Human Comp. Interaction (3)
COMP 424 Security (3)
COMP 429 Networks (3)
COMP 432 Advanced Object Oriented Programming (3)
COMP 492 Internship (3)
COMP 494 Independent Research(3)
COMP 497 Directed Study (3)
COMP 499 Senior Colloquium (1)

The choice of electives should reflect student specialization and require approval by the student's advisor. Students are cautioned against assuming that courses taken before such approval will be acceptable.

General Education Included in Major Requirements

MATH 150 Calculus 1 (4, G.E. B3)
MATH/PHIL 230 Logic (3, G.E. A3)
MGT 346 Scientific and Professional Ethics (3, G.E. D)
COMP 344 Automata, Languages and Computation (3, C3)
COMP 450 Societal Issues in Computing (3, G.E. D)
Sciences - (8, G.E. B1, B2)
TOTAL 24

REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN COMPUTER SCIENCE DEGREE:

Lower Division Required Major Courses	43
Upper Division Required Major Courses	37
Upper Division Elective Major Courses	9
Elective Courses	6
General Education Included in Major Requirements	(24)
General Education & Title V	30
Total	125

LOWER DIVISION REQUIRED MAJOR COURSES (43-46 units):

MATH 150 Calculus 1 (4)
MATH 151 Calculus 2 (4)
PHIL 230 Logic (3) (G.E. A3 or C3)
COMP 150 Object Oriented Programming (4)
COMP 151 Data Structures and Program Design (4)
COMP 162 Comp. Architecture and Assembly Language(3)
MATH 240 Linear Algebra (3)
COMP 232 Programming Languages (3)
COMP 262 Computer Organization and Architecture (3)
Select one 2 semester science sequence and an additional science course (one lab section required) in Physics, Biology, or Chemistry (12-15, G.E. B1 and B2]

UPPER DIVISION REQUIRED MAJOR COURSES (37 units):

MATH 300 Discrete Mathematics (3)
MGT 346 Scientific and Professional Ethics (3)
MATH 342 Analysis of Algorithms (3)
COMP 310 Automata, Languages and Computation (3)
COMP 362 Operating Systems and System Architecture (3)
COMP 380 Program Design Techniques (3)
MATH 342 Probability and Statistics (3)
COMP 350 Software Engineering (3)
COMP 440 Databases (3)
COMP 450 Societal Issues in Computing (3, G.E. D)
MATH 451 Numerical Analysis (3)
COMP 464 Computer Graphics I (3)
COMP 499 Senior Colloquium(1)

ELECTIVES in MAJOR (9-10 units) from the following list:

COMP 430 Design of Compilers (3)
COMP 431 Bioinformatics (4)
COMP 466 Computer Graphics II (3)
COMP 469 AI/Neural Nets(3)
MATH 440 Operation Research (3)
ENGL 484 Technical Writing (3)
COMP 449 Human Comp. Interaction (3)
COMP 424 Security (3)
COMP 429 Networks (3)
COMP 462 Advanced Object Oriented Programming (3)
COMP 490 Internship (3)
COMP 492 Internship (3)
COMP 494 Independent Research(3)
COMP 497 Directed Study (3)
COMP 499 Senior Colloquium (1)

ELECTIVES (6 units)

TOTAL UNITS IN THE MAJOR: 88 units

MINOR IN COMPUTER SCIENCE (25]

MATH 150 Calculus 1 (4)
MATH 151 Calculus 2 (4)
COMP 150 Object Oriented Programming (4)
COMP 151 Data Structures and Program Design (4)
MATH 300 Discrete Math (3)

Select two upper upper-division courses from the CS program approved by the advisor (6).

TOTAL UNITS IN THE MINOR: 24 units

COURSE LIST:

See

COURSE DESCRIPTIONS FOR CATALOG

COMP 100. Computers: Their Impact and Use (3)

An introduction to the uses, concepts, techniques, and terminology of computing. Places the possibilities and problems of computer use in historical, economic, and social contexts. Shows how computers can assist in a wide range of personal, commercial, and organizational activities. Typical computer applications, including word processing, spreadsheets, and databases. Not open to Computer Science majors.

COMP 101. Computer Literacy (3)

An introduction to computer applications, including web applications, word processing, spreadsheets, databases and programming. Includes service learning component. Not open to Computer Science majors.

COMP 103. Computer Programming Introduction (3)

An introduction to the design, development and expression of algorithms. Algorithms and their stepwise refinement. Expression of algorithms in a formal language. This course is intended to be a first course in a two-course sequence, the second being a programming language laboratory. Not open to students who have completed Comp. 150.

COMP 103VB Computer Programming in VISUAL BASIC (3)
COMP 103C Computer Programming in C/C++ (3)

COMP 150. Object Oriented Programming (3+1)

Prerequisite : Some programming experience recommended.
Introduction to algorithms, their representation, design, structuring, analysis and optimization. The course introduces the concept of object paradigm and teaches how to design and implement algorithms as structured programs in a high level language. Course includes programming lab.

COMP 151. Data Structures and Program Design (3+1)

Prerequisite: Comp. 150. Introduction to data structures and the algorithms that use them. Review

of composite data types such as arrays, records, strings, and sets. The role of the abstract data type in program design. Definition, implementation, and application of data structures such as stacks, queues, linked lists, trees, and graphs. Recursion. Use of time complexity expressions in evaluating algorithms. Comparative study of sorting and searching algorithms. Course includes programming lab.

COMP 162. Computer Architecture and Assembly Language (3)

Prerequisite: Comp. 150. An introduction to computer architecture, assembly language programming, system software and computer applications. Number systems and data representation. Internal organization of a computer. Primitive instructions and operations. Assembly language. Language translation principles. Overview of operation systems.

COMP 232. Programming Languages (3)

Prerequisites: Comp. 162 and 151. Discussion of issues in the design, implementation, and use of high-level programming languages. Historical background. How languages reflect different design philosophies and user requirements. Technical issues in the design of major imperative (procedural) programming languages. Other approaches to programming: functional programming, logic programming, and object-oriented programming.

COMP 262. Computer Organization and Architecture (3)

Prerequisites: Comp. 151 and 162. Extension of basic addressing concepts to more advanced addressability such as base register and self-relative addressing. Comparative computer architecture focusing on such organizations as multiple register processors and stack machines. Basics of virtual memory input-output. Introduction to the concept of microprogrammable systems. Low-level language translation process associated with assemblers. System functions such as relocatable loading and memory management. Application of data structure and hashing techniques to the above. Other related topics.

UPPER DIVISION

COMP 310. Automata, Languages, and Computation (3)

Prerequisites: Math. 300, Phil. 230. Study of the relation of languages (i.e. sets of strings) and machines for processing these languages, with emphasis on classes of languages and corresponding classes of machines. Phrase structure languages and grammar. Types of grammars and classes of languages. Regular languages and finite state automata. Context-free languages and pushdown automata. Unrestricted languages and Turing Machines. Computability models of Turing, Church, Markov, and McCarthy. Applications to programming languages, compiler design, and program design and testing.

COMP 362. Operating Systems (3)

Prerequisites: Comp. 262.Examination of the principal types of systems including batch, multi-programming, and time-sharing. Networked systems are also discussed. The salient problems associated with implementing systems are considered including interrupt or event driven systems, multi-tasking, storage and data base management, and input-output. Emphasis will be placed on some of the simple algorithms used to solve common problems encountered such as deadlocks, queue service, and multiple accesses to data. Projects will be implemented to reinforce the lectures.

COMP 350. Introduction to Software Engineering (3)

Prerequisites: Comp. 232, 262. Concepts and techniques for systems engineering, requirements analysis, design, implementation and testing of large scale computer systems. Principles of software engineering for production of reliable, maintainable and portable software products. Emphasis on functional analysis and structured design techniques.

Topics include unit, integration and systems testing, configuration management, and software quality assurance practices. Participation in group activities involving analysis, design and implementation of a software intensive system. Introduction to Computer Aided Software Engineering (CASE)

COMP 424. Computer System Security (3)

Prerequisite: Comp. 350. Security techniques in operating systems, data bases, and computer networks. Analysis of formal security models. Introduction to cryptography, public key security schemas.

COMP 429. Computer Networks (3)

Prerequisites: Comp. 310, Comp. 362 and Math 344 Basic software design and analysis considerations in networking computers into coherent, cooperating systems capable of processing computational tasks in a distributed manner. Network topology, routing procedures, message multiplexing and process scheduling techniques.

COMP 430. Design of Compilers (3)

Prerequisites: Comp. 310 and Math 362. Organization of compiler including lexical and syntax analysis, symbol tables, object code generation, code optimization techniques, and overall design. Compilation techniques and run-time structures.

COMP 431. Bioinformatics (3)

Prerequisite: Comp. 150, Math 151, Statistics. Basic computational models used in molecular biology and chemistry will be introduced. Topics include algorithms for string alignments, dynamic programming, structural superposition algorithms, computing with differential information, 3D motifs, Hidden Markov Models, phylogenetic trees, statistical/ information techniques for pattern recognition, genetic algorithms.

COMP 432. Advanced Object-Oriented Programming (3)

Prerequisite: Comp. 350. Principles of object-oriented design and programming based on languages such as JAVA, C++ and Smalltalk will be presented. Understanding of the role of objects, methods, message passing, encapsulation, and inheritance for effective programming will be stressed. Language structure versus particular engineering objectives will be analyzed. Design Patterns techniques will be a unifying theme.

COMP 440. Database Theory and Design (3)

Prerequisite: Comp. 350. Database structure including: structure definition, data models, semantics of relations, and operation on data models. Database schemas: element definition, use and manipulation of the schema. Elements of implementation. Algebra of relations on a database. Hierarchical data bases. Discussion of information retrieval, reliability, protection and integrity of databases.

COMP 449. Human-computer Interaction (3)

Prerequisite: Comp 350. The information exchange between humans and computer systems will be examined. Aspects of input/output devices, software engineering, and human factors will be discussed with respect to human-computer interactions. Topics include: text and graphic display; user modeling; program design, debugging, complexity and comprehension; and current research studies and methodologies.

COMP 450. Societal Issues in Computing (3)

Prerequisites: Comp. 350 and Comp 362 and senior standing. A survey course on the role of the digital computer in modern society. The dangers of the misuse of computers (as in the invasion of privacy), as well as the proper and intelligent use of the machines, are discussed.

COMP 464. Computer Graphic Systems and Design I (3)

Prerequisite: Comp. 350 and Math 240. Fundamental concepts of computer graphics. Graphics devices; graphics languages; interactive systems. Applications

to art, science, engineering and business. Trade-offs between hardware devices and software support.

COMP 466. Computer Graphic Systems and Design II (3)

Prerequisite: Comp. 464. Advanced concepts of computer graphics. Topics include computer graphics software and hardware, mathematical basis of geometric modeling, data base management in manufacturing environments, imagining and visualization.

COMP 469. Artificial Intelligence/ Neural nets (3)

Prerequisites: Comp. 310, 362, and 350. An exploration of the use of computers to perform computations normally associated with intelligence, pattern formation and recognition using various backpro iterations. Stacks, decision trees and other modern mining tools and computational models for knowledge representation will be covered. Other topics may include natural language and imagining.

COMP 492. Internship (3)

Prerequisites: Junior standing and Program approval of written proposal of internship studies.
Supervised work and study in industrial setting involving development of degree related skills. All students are required to present their projects at the Senior Seminar. Graded credit/no credit.

COMP 494. Independent Research (3)

Prerequisites: Senior standing and Program approval of written proposal of independent research studies.
Supervised project involving theoretical research in the field of computer science or its applications. All students are required to present their projects at the Senior Seminar. Graded credit/no credit.

COMP 497. Directed Study (3)

Prerequisites: Senior standing and Program approval of written proposal of directed studies.
Supervised project involving library research. All students are required to present their projects at the Senior Seminar. Graded credit/no credit.

COMP 499. Senior Colloquium (1)

Prerequisites: Senior standing.
Oral presentation of current advancements in the field, reports on students' projects, and invited lectures.
Graded credit/no credit. Repeatable.