NEAC Recommendations
April 5, 2006

Name	Committee	Representing	Term
Stall, Patricia	Instructionally Related Activities Fee Comm.	At large	06-08

Discussion: Intents, Purposes, and Justifications of this Proposal

The proposed policy and procedures serve the following intents and purposes: to offer the campus community a clear understanding of the nature of various certificate programs at CSUSM; to define and distinguish between credit and non-credit certificate programs at CSUSM; to establish rules and regulations setting the minimum requirements of credit certificate programs; to codify procedures for the proposal, review, and approval of credit certificates programs; and to clarify the relationship between college-based, General Fund-based programs and the Office of Extended Studies, with regard to the manner in which all types of certificate programs are developed and offered at CSUSM.

Purpose:

- A campus policy on certificate programs is needed in order to encourage and guide the development of further credit (and non-credit) certificate programs. Such programs should bolster student enrollment in college-based programs, offer new modes of access to a variety of student audiences pursuing continuing educational opportunities, and better serve the needs of students who desire programs in non-traditional, specialized fields of academic, professional, and vocational study and training.

History:

- A variety of non-credit certificates were already offered through Extended Studies prior to the establishment of this policy (in 1999), and this had created some confusion regarding the distinction between credit and non-credit certificates. The purpose of this policy was (and is) to sort out the basic definitions, intents, and purposes of these different kinds of certificates, and to establish minimum levels of academic rigor and accomplishment associated with the completion of these different classes of certificates.
- The Certificate Policy passed by the Academic Senate at the May 12, 1999 meeting was approved as an interim policy for the academic years 1999-2000, 2000-01, 2001-02, and 2002-03. At the time that the policy was proposed and approved, there was uncertainty as to whether the existence of certificate programs would help or hinder more traditional degree programs. The Academic Senate was requested to study the effect of certificate programs on baccalaureate and master's degree programs in 2001-02, and to make a recommendation that either the policy be continued indefinitely, continued for a fixed length of time, or discontinued. APP examined the need for certificate programs in 2001-02 and recommended that the policy be renewed (with the minor changes that, for clarity, earlier references to "residential" programs were replaced with "college-based" programs, and a reference to "Extended Studies Winter and Summer Sessions" was changed to "Summer Session) for an additional three years: academic years 2003-04, 2004-05, and 2005-06. The Academic Senate unanimously approved this continuation on May 15, 2002.
- In Spring 2002, the first two proposed CSUSM Certificates had only recently been presented to APP for consideration :
    - Certificate of Advanced Study in Middle Level Education (College of Education), and
    - Certificate of Advanced Study in Biliteracy Education: Spanish (College of Education).

  These have been approved, along with two new CSUSM certificates:
    - Elementary Subject Matter Preparation Certificate (College of Arts and Sciences; a "Certificate of Specialized Study")
    - Certificate of Advanced Study in Critical Studies of Schooling, Culture and Language (College of Education)

  A Certificate of Specialized Study in Communicative Sciences and Disorders is currently under review by UCC and BLP.
- Two Certificates of Competence have been created in Extended Studies during the life of this policy:
    - Foundations of Business: Healthcare Administration (designed, but not offered)
    - Biotechnology Laboratory Technician (a 17-unit certificate, currently being offered)

Recommendation:

- APC recommends that the policy be renewed without a sunset date. Should deficiencies in the policy and procedures for certificate be uncovered at some future date, the APC can be asked to re-examine the policy and procedures.

- The remainder of this document is as in May 2002 with the following pair of changes:
    - The header "**Certificate Programs at CSUSM: Policy and Procedures**" has been shortened to "**Certificate Programs at CSUSM: Policy**" in order to separate the policy from the procedures.
    - The procedures now assign the Academic Senate level review of new certificate proposals to "the University Curriculum Committee and, for resource implications, the Budget Long-range Planning Committee" instead of to the Academic Planning and Policy Committee.

Overview of the Policy

The centerpiece of the policy is the distinction between credit certificates and non-credit certificates. The former are certificates earned by completing courses that carry credit toward an undergraduate or graduate degree, and the latter are certificates offered through Extended Studies earned by completing courses that (for the most part) do not carry degree credit. Credit certificates will be developed by college-based programs, subject to Academic Senate review and approval. Non-credit certificates will be developed by the Office of Extended Studies, in consultation with college-based programs, as outlined in the Extended Studies Policy (see http://lynx.csusm.edu/policies/policy_online.asp?ID=65).

APC recommends retaining four different categories of certificate programs: Two kinds of non-credit certificates, reflecting current practice in Extended Studies, and two kinds of credit certificates, one supplementing undergraduate programs of study, and one supplementing graduate programs. Further details are provided in the policy document itself.

Certificate programs are not intended to supplant or compete with traditional Majors, Minors, or graduate programs of study; rather, their purpose is to serve a variety of student audiences whose educational objectives would be better met through the pursuit of more focused and specialized programs of study. This policy establishes criteria and guidelines for the development, review, and approval of certificate programs, to ensure that these programs will serve their intended function.

Certificate Programs at CSUSM: Policy

This document describes the kinds of certificate programs offered at CSUSM, establishes minimum requirements of various kinds of certificates, sets forth regulations governing certificate programs, and outlines procedures for proposal and review of certificate programs.

Under this policy, CSUSM will be able to offer a variety of Certificate programs, enabling students at various stages of their academic careers to pursue specialized and focused areas of study not covered by traditional degree programs. Certificate programs are designed for a variety of purposes: to offer integrated programs of study in the context of continuing education, to offer programs of study that increase and certify the student's competency in a specialized technical or professional skill or area of study, to offer paraprofessional training, in a particular career field, or to offer a focused program of study in an academic area not addressed through traditional majors, minors, or graduate degree programs.

The time to completion, requirements, and prerequisites of Certificate programs vary with the kind of Certificate pursued by the student. Certificates may be awarded for short- or longer-term courses of study, depending upon the breadth and depth of teaming and competency to be gained through completion of the certificate. Classes taken as part of a certificate program may or may not carry academic credit toward undergraduate or graduate degrees. Certificates may be awarded to students upon completion of the Certificate program, or in some cases, at the student's completion of other undergraduate degree requirements.

Credit certificate programs consist entirely of classes that carry credit toward an undergraduate or graduate degree. Credit certificates are developed by college-based programs, subject to Academic Senate review and approval. Two kinds of credit certificates are distinguished, one offered at the undergraduate level (The CSUSM Certificate of Specialized Study, defined below) and one at the graduate level (The CSUSM Certificate of Advanced Study).

Non-credit certificate programs are offered through Extended Studies and consist of classes and activities that (for the most part) do not carry degree credit. Non-credit certificates are developed by the Office of Extended Studies, in consultation with college-based programs. Non-credit certificate programs

may combine credit and noncredit classes and activities, subject to consultation between college-based programs and the Office of Extended Studies. Two kinds of non-credit certificates are distinguished, reflecting distinct purposes of such programs and different expectations of student teaming outcomes to be demonstrated upon completion of the programs.

Certificate Programs: Definitions and Minimum Requirements[1]

Extended Studies Certificates are non-credit certificates offered through Extended Studies and developed in consultation between the Office of Extended Studies and related college-based programs. The curricula are designed for individuals who participate in an organized and integrated program of study but who are not (for the most part) matriculated students of the University.

1. *The Extended Studies Certificate of Completion* is awarded for successfully completing a planned educational experience (workshop, conference, short course, seminar, or series of courses and seminars) designed for specific academic and/or professional training objectives. Individual classes and activities composing Certificates of Completion carry no University degree credit.

2. *The Extended Studies Certificate of Technical, Vocational or Professional Competence* is awarded a.) for successfully completing a planned educational experience (workshop, conference, short course, seminar, or series of courses and seminars) designed for specific academic and/or professional training objectives; and b.) for successfully demonstrating the acquisition of desired skills and/or mastery of a body of knowledge, upon completion of the program of study. Classes and activities composing Certificates of Competence may or may not carry University degree credit. Where degree credit classes are included in a program of study, students who are not matriculated students of the University can enroll in classes through Open University.

CSUSM Certificates are credit certificates developed and offered by college-based programs, subject to review and approval by the Academic Senate. These programs are open only to matriculated students of the University.

1. *The CSUSM Certificate of Specialized Study* is awarded to baccalaureate and post-baccalaureate students a.) for successfully completing a structured program of educational experiences, at least 12 semester units, determined in advance by a program, department, or college, geared toward mastery of a focused academic field of study or a specialized professional or vocational area of competency; and b.) for successfully demonstrating, the acquisition of desired skills and/or mastery of a body of knowledge, upon completion of the program of study. Curriculum for Certificates of Specialized Study include mainly Upper Division (300-499) classes and may include Graduate (500-599) classes. These classes carry academic credit toward completion of the baccalaureate degree and, where applicable to a specific Master's program, the Master's degree.

Certificates of Specialized Study supplement and do not replace traditional Major and Minor programs, addressing areas of study more specialized, or more professionally or vocationally oriented than the focus of Majors or Minors. They are intended to serve regularly enrolled baccalaureate students who wish to gain an additional academic credential, upon completion of the certificate program. They are also geared toward post-baccalaureate students seeking the same credential, for who a traditional graduate or second baccalaureate degree is not suitable. Post-baccalaureate students should consult individual program descriptions for admissions requirements and procedures.

2. *The CSUSM Certificate of Advanced Study* is awarded to post-baccalaureate students and graduate degree candidates a.) for successfully completing a structured program of educational experiences, at least 12 semester units, determined in advance by a graduate program, department, or college, geared toward advanced mastery of a focused academic field of study or a specialized

[1] These descriptions are to be adapted and updated for inclusion in the CSUSM General Catalog and in Extended Studies Bulletins, as warranted by advancing levels of implementation of various certificate programs.

professional area of competency; and b.) for successfully demonstrating the acquisition of desired skills and/or mastery of a body of knowledge, upon completion of the program of study. Curriculum for a Certificate of Advanced Study is composed primarily of Graduate (500-699) classes. Where applicable, these classes carry academic credit toward completion of a specific Master's degree.

Certificates of Advanced Study supplement and do not replace traditional graduate degree programs, addressing areas of study more specialized or more professionally or vocationally oriented than the focus of traditional Master's degrees. They are intended to serve regularly enrolled, graduate candidate students who wish to gain an academic credential in addition to the Master's degree. They are also geared toward post-baccalaureate students seeking the same credential, for whom a traditional graduate or second baccalaureate degree is not suitable. These programs may also serve post-graduate students. Post-baccalaureate and postgraduate students should consult individual program descriptions for admissions requirements and procedures.

Guidelines for Proposal and Review of Credit Certificates

- Credit certificate programs should not supplant or replace traditional majors, minors, or Master's degree programs. Rather, certificate programs should supplement traditional degree programs, attracting students whose needs are better served by more focused and specialized programs of study. Proposals for credit certificate programs should identify precisely the technical/professional/vocationaI skill(s) or the academic specialty whose study is facilitated by the development of the program. Proposals should explain the distinction between the certificate and any related majors, minors, and Master's degree programs. Proposals should also explain why the academic objectives served by the certificate are not sufficiently served through existing, academic programs (majors, minors, and Master's).
- Oversight for credit certificate programs is provided by the Academic Senate. Proposals for credit certificate programs will follow the one-year cycle of review established for new minors, options, concentrations, etc. Existing program proposal forms will be adapted to the purpose of guiding authors of proposals through the process.
- Courses associated with credit certificate programs can be offered in General Fund-based and Extended Education settings, as courses in the fall and spring semesters, in the Summer Session, or in other possible settings, subject to arrangements agreed upon by programs offering the certificate and the Office of Extended Studies.
- This policy stipulates that credit certificates are to be composed of a minimum of 12 semester units of study, a figure that is consistent with minimum standards established at other CSU campuses. However, authors and reviewers of certificate program proposals should be aware that, beyond this minimum specification, credit certificate programs at other CSU campuses typically comprise an average 18 to 30 semester units of study. The determination of the number of units of study to be required in any particular certificate program is therefore a relative issue; authors and reviewers of proposals should relate this issue to the final learning outcomes to be advanced by the program. Depending upon the skills or knowledge to be gained through completion of the certificate program, some programs will be relatively concentrated and others more extensive, in terms of the required number of units of study.

- Criteria for Certificates of Specialized Study:
    - Certificates of Specialized Study must include a minimum of 12 units of study, with a minimum of 9 units of upper division coursework.
    - Lower division course requirements and prerequisites may be waived based on transfer of credit from a previous institution, or demonstrated competence in the field, as specified in the program proposal.
    - At least 75% of coursework required for the certificate must be completed at CSU San Marcos.

      At least nine units of upper division coursework required for the certificate must not be applied toward the student's major or minor.

- GE courses taken to fulfill certificate requirements may not be applied to GE requirements of the baccalaureate degree.
- All courses required for a certificate must be passed with a grade of C (2.0) or better; higher standards may be imposed within a particular certificate program.

- Criteria for Certificates of Advanced Study:
  - Certificates of Advanced Study must include a minimum of 12 units of study, with a minimum of nine units at the Graduate level (500-699).
  - No more than three units of advanced undergraduate coursework (400-499) may be applied to the certificate.
  - At least 75% of required coursework must be completed at CSU San Marcos.
  - Up to 12 units of coursework may be applied to progress toward a Master's degree, upon approval of the relevant graduate program.
  - All courses required for a certificate must be passed with a grade of B (3.0) or better.

Procedure for Submitting Proposals for New Certificates

Each new Certificate is subject to review and approval by the relevant college curriculum committee and the University Curriculum Committee and, for resource implications, the Budget Long-range Planning Committee of the Academic Senate. Requests for approval of a Certificate should be submitted according to the timeline of the appropriate college curriculum committee and should follow the format below:

1. Full and exact title of the Certificate program and level of the program (Certificate of Specialized vs. Advanced Study). Name and position of the person(s) submitting the proposed Certificate. Intended implementation date of the program.

2. List of the existing programs in the discipline(s) under which the new Certificate is to be offered.

3. List of the existing program(s) that may be affected by the proposed Certificate.

4. Purpose of the proposed Certificate, including specific academic objectives served, professional applications, potential student market, and a statement explaining the need for the Certificate in comparison to existing related Majors, Minors, and Graduate programs.

5. List of the courses, by catalog number, title, and units of credit, as well as total units to be required under the proposed Certificate.

6. Definition of the minimum level of competence to be demonstrated to earn the proposed Certificate, and a description of the means of assessing that competence (examination, practicum, field experience, etc.).

7. Description of assessment strategies for waiver of lower division requirements (where applicable).

8. New courses to be developed. Include proposed catalog descriptions in the Certificate proposal. "C-forms" for these courses should accompany the proposed Certificate package for curricular review.

9. List of all present faculty members, with rank, appointment status, highest degree earned, date and field of highest degree, and professional experience, who would teach in the proposed aggregate of courses.

10. Instructional resources (faculty, space, equipment, library volumes, etc.) needed to implement and sustain the Certificate program.

APPLIED PHYSICS

Degree program offered: Bachelor of Science in Applied Physics

Physics is a study of the fundamental macroscopic and microscopic properties of nature, from the building blocks of matter to the origin, extent, and future of the universe itself. Physicists seek to measure, understand, model, and control the processes in the physical world around us. To this end, physicists use a variety of descriptive and quantitative techniques to represent their knowledge. Furthermore, this work is conducted in a community where collaboration, teaching, and communication of results are essential. Applied physics makes a connection between fundamental research in physics and its application to real-world problem-solving. Research in applied physics has led to the use of electricity and magnetism for lighting and propulsion, given birth to the semiconductor industry, which has provided us with the conveniences of modern electronics, and played an important part in the development of biomedical technology. While engineers have perfected many of these inventions, applied physicists have been responsible for their discovery.

The degree in applied physics prepares students to succeed in a wide range of entry-level positions in the high technology and biotechnology industry, by giving them a broad and rigorous grounding in the principles of physics, while at the same time emphasizing the application of physics to real-world problems. Applied physics baccalaureate-level graduates will have unique critical thinking and problem-solving abilities that will be valuable to employers in a wide range of technical fields.

The Applied Physics Degree requires the completion of 120 semester units in one of two options, Applied Physics or Applied Electronics, each of which allows students to focus on a particular area of interest. Both options will provide opportunities for student research in collaboration with faculty members in the Physics Department. These undergraduate research opportunities will provide valuable training that will make graduates more competitive in the job market later.

Preparation

Freshman applicants must complete a comprehensive program of college preparatory study totaling between 24 and 28 units, depending on the option chosen. Transfer students entering at the junior and senior level will be expected to have completed the equivalent required physics and supporting courses elsewhere. All courses taken for the major, including supporting courses, must be completed with a grade of C (2.0) or better.

Degree Requirements

Either option for the Bachelor of Science in Applied Physics requires the completion of 120 semester units. As a part of each option, students are required to complete 51 units of General Education courses. Six (6) to nine (9) units of lower-division GE, including the laboratory requirement in Area B (Math and Science), are automatically satisfied by combinations of CHEM 150, CS 111, MATH 160, and PHYS 201. The exact number of units satisfied in this way will depend on the option chosen. A minimum of 18 units in physics must be completed at Cal State San Marcos.

Applied Physics Option

This option is intended for those students who wish to pursue a career in industry where the application of the principles of physics might be important in modeling, or in research and development.

	Units
General Education*	51
Preparation for the major*	24-25
Option requirements	40
Students must take a sufficient number of elective units to bring the total number of units to a minimum of	120

* Six (6) lower-division General Education units in Area B (Math and Science) are automatically satisfied by courses taken in Preparation for the Major.

Preparation for the Applied Physics Option

Non-physics supporting courses (24-25 units)

	Units
CHEM 150†	5
CS 111†	4
MATH 160†	5
MATH 162†	4
MATH 160†	5
MATH 162†	4
MATH 346	3
Choose one of the following courses:	
MATH 260†	4
MATH 362	3
MATH 370	3
MATH 374	3

Lower-division Physics courses (15 units)

PHYS 201†	4
PHYS 202	4
PHYS 203	4
PHYS 280	3

† These courses satisfy the Mathematics (B4), Physical Science (B1), and Laboratory (B3) requirements of General Education.

Upper-division Physics courses (25 units)

PHYS 320	3
PHYS 321	3
PHYS 323	3
PHYS 324	3
PHYS 421	3
PHYS 422	3
PHYS 423	3
PHYS 380 or PHYS 480	2
PHYS 499	2

Electives for the major	10-11

Select elective courses from the following list:
CHEM 402
PHYS 301
PHYS 380*
PHYS 402
PHYS 403
PHYS 480*

* PHYS 380 or PHYS 480 may be chosen as an elective, if it has not already been taken as part of the upper-division core.

Students may also take up to six (6) units of elective courses in another major in the natural or mathematical sciences, chosen in consultation with and approved by the physics academic advisor prior to taking the course.

Applied Electronics Option

This option is intended for those students who wish to pursue a career in which an understanding of the design of electronic devices, possibly interfaced to computers and/or research equipment, is required.

	Units
General Education*	51
Preparation for the major*	27-28
Option requirements	39
Students must take a sufficient number of elective units to bring the total number of units to a minimum of	120

* Six (6) lower-division General Education units in Area B (Math and Science) are automatically satisfied by courses taken in Preparation for the Major.

Preparation for the Applied Electronics Option

Non-physics supporting courses (27-28 units)

	Units
CS 111†	4
CS 211	4
CS 231	4
MATH 160†	5
MATH 162†	4
MATH 346	3

Choose one of the following courses:

MATH 260†	4
MATH 362	3
MATH 370	3
MATH 374	3

Lower-division Physics courses (15 units)

PHYS 201†	4
PHYS 202	4
PHYS 203	4
PHYS 280	3

† These courses satisfy the Mathematics (B4), Physical Science (B1), and Laboratory (B3) requirements of General Education.

Upper-division Physics courses (24 units)

PHYS 301	4
PHYS 320	3
PHYS 321	3
PHYS 323	3
PHYS 402	4
PHYS 403	3
PHYS 380 or PHYS 480	2
PHYS 499	2

Electives for the major 8-9

Select elective courses from the following list:

CS 331
PHYS 324
PHYS 380*
PHYS 421
PHYS 422
PHYS 423
PHYS 480*

* PHYS 380 or PHYS 480 may be chosen as an elective, if it has not already been taken as part of the upper-division core.

Students may also take up to six (6) units of elective courses in another major in the natural or mathematical sciences, chosen in consultation with and approved by the physics academic advisor prior to taking the course.

Catalog descriptions of all courses associated with the program:

CHEMISTRY (CHEM)

CHEM 150 General Chemistry (5)

Introduction to many of the basic qualitative models and principles in chemistry. The areas covered include: basic nuclear and atomic structure, the periodic table, covalent and ionic bonding, states of matter, intermolecular forces, energy changes, chemical equilibria, acid-base chemistry, stoichiochemistry, properties of gases, and chemical properties of the common elements. The laboratory experiments and projects are designed to complement lecture material and provide real-life applications of chemistry in society. *Counts towards the fulfillment of the Lower-division General Education Requirement in Physical Sciences and Its Life Forms. Three hours of lecture, one hour of discussion, and three hours of laboratory per week. Recommended: High School Chemistry. Prerequisite: Completion of Entry the Level Mathematics (ELM) requirement.*

CHEM 402 Physical Chemistry – Quantum (3)

Designed to introduce the student majoring in science to the basic principles of Quantum Mechanics and Spectroscopy as applied to chemical problems. The areas covered include: quantum mechanics of model

systems, electronic structure of atoms and molecules, and atomic and molecular spectroscopy. *Prerequisites: CHEM 250, MATH 162, and PHYS 201.*

COMPUTER SCIENCE (CS)

CS 111 Computer Science I (4). Emphasizes programming methodology and problem-solving. A block-structured, high level language such as C will be used for the specification and implementation of algorithms. Includes princles and applications of software engineering, numerical computing, artificial intelligence, database and user interface. *Three hours of lecture and three hours of laboratory. Prerequisites: MATH 115, 132, or equivalent.*

CS 211 Computer Science II (4).
A continuation of program design and development. Introduction to data structures, stacks, queues, linear lists, trees, and sets. Includes pointers, recursion, and implementation and analysis of sorting and searching algorithms, problem state space, relational database, numerical approximation methods. *Three hours of lecture and three hours of laboratory. Prerequisite: CS 111 or equivalent.*

CS 231 Assembly Language and Digital Circuits (4)
The structure of computers, number and character representation, word and instruction formats, and flowcharting. Machine and assembly language programming, address modification, indexing, indirect addressing, subroutines, and mnemonic interpreting systems. Includes digital logic and circuits of commonly used computer components. *Three hours of lecture and three hours of laboratory. Prerequisite: CS 111 or equivalent.*

CS 331 Computer Architecture (3)
A study of the functional organization and sequential operation of digital computers. The major concepts of a computer will be discussed. Introduction to machine instruction architecture and design. The study of the internal operations during program execution. Several computer architectures will be studied. *Corequisite or Prerequisite: MATH 370. Prerequisite: PHYS 301 or equivalent.*

MATHEMATICS (MATH)

MATH 160 Calculus with Applications I (5)
Differential and integral calculus of functions of one variable: analytic geometry, limits, continuity, derivatives, analysis of curves, integrals, applications, algebraic, trigonometric, logarithmic, and exponential functions, historical perspectives. Includes a laboratory experience using either computers or graphing calculators. *Prerequisites: A strong background in high school mathematics (Algebra I and II, Geometry and Trigonometry) or MATH 125 with a minimum grade of C (2.0).*

MATH 162 Calculus with Applications II (4)
A continuation of differential and integral calculus: inverse trigonometric and hyperbolic functions, integration methods, intermediate forms, coordinate systems, planes and lines in space, sequences and series, applications, historical perspectives. Includes a laboratory experience using either computers or graphing calculators. *Prerequisite: MATH 160 (or equivalent) with a grade of C (2.0) or better.*

MATH 260 Calculus with Applications III (4)
Differential and integral calculus of functions of several variables: three-dimensional analytic geometry, vector calculus, partial derivatives, multiple integrals, line integrals, applications, historical perspectives. Includes a computer laboratory experience. *Prerequisite: MATH 162 (or equivalent) with a grade of C (2.0) or better.*

MATH 362 Differential Equations (3)

Analysis and application of ordinary differential equations: linear and nonlinear equations, existence and uniqueness theorems, analytic methods, qualitative analysis of solutions, numerical methods. Combines theoretical ideas along with hands-on experience using appropriate computer software. *Prerequisite: MATH 160.*

MATH 370 Discrete Mathematics (3)
The terminology, concepts, and techniques of some areas of discrete mathematics applicable to computer science. Logic and proof techniques, recursion, set theory and counting, relations and functions, groups and codes, graphs. *Prerequisite: MATH 160.*

MATH 374 Linear Algebra (3)
Systems of linear equations, vector spaces, independence, bases, dimension, orthogonality, least squares, determinants, eigenvalues and eigenvectors, positive definiteness, computation, linear programming. Continues theoretical ideas with hands-on experience using appropriate software packages. *Prerequisite: MATH 160.*

MATH 346 Mathematical Methods for Physics (3)
Survey of mathematical methods applicable to physics. Includes series, complex analysis, ordinary and partial differential equations, and special functions and transforms. *Prerequisite: MATH 162. Recommended: MATH 260*. (NOTE: This is a new course in the Department of Mathematics.)

PHYSICS (PHYS)

PHYS 201 Physics of Mechanics and Sound (4)
A broad coverage of the principles of mechanics and wave motion. The areas covered include: Observation and measurement, kinematics, dynamics, work and energy, impulse and momentum, equilibrium of rigid bodies, rotational motion, oscillations, and waves in mechanical media. Required for students whose field of study is physics, chemistry, or computer science. *Counts toward the fulfillment of the lower-division General Education requirement in Physical Universe and Its Life Forms. Three hours of lecture and three hours of laboratory. Recommended: High school physics. Prerequisites: Completion of MATH 160 with a minimum grade of C. requirement.*

PHYS 202 Physics of Electromagnetism and Optics (4)
A broad coverage of classical electromagnetism and optics. The areas covered include: Electric charge, electric fields, electric potential, capacitors and dielectrics, DC circuits, magnetic fields, magnetic properties of matter, AC circuits, Maxwell's equations, electromagnetic waves, the nature and propagation of light, geometrical optics, and wave optics. *Three hours of lecture and three hours of laboratory. Prerequisites: Completion of PHYS 201 and Math 162 with a minimum grade of C in each.*

PHYS 203 Modern Physics (4)
An overview of the fundamental ideas of modern physics and coverage of the principles of fluids and thermodynamics. The areas covered include fluids, temperature, heat, the kinetic theory of gases, entropy, and the law of thermodynamics, along with the theory of special relativity, wave particle duality, an introduction to quantum mechanics, and atomic physics, the electronic properties of solids, nuclear physics, and a descriptive introduction to the standard model and cosmology. *Three hours of lecture and three hours of laboratory. Prerequisites: Completion of PHYS 202 with a minimum grade of C.*

PHYS 205 Physics for the Biological Sciences I (4)
A broad coverage of the principles of mechanics, properties of matter and wave motion. The topics covered include: Observation and measurement, kinematics, dynamics, energy, momentum, equilibrium, fluids and solids, thermodynamics, oscillations, and waves. *Required for students whose field of study is biology. Three hours of lecture and three hours of laboratory. Recommended: High school physics or an*

introductory college level physics course. Prerequisites: Completion of MATH 160 with a minimum grade of C.

PHYS 206 Physics for the Biological Sciences II (4)
A broad coverage of electromagnetism, optics, and nuclear physics. The areas covered include: Electrostatics, electric fields, magnetism, magnetic fields, electric circuits, geometrical optics, optical instruments, nuclear physics, radiation, and spectroscopy. *Required for students whose field of study is biology. Three hours of lecture and three hours of laboratory. Prerequisites: Completion of PHYS 201 or PHYS 205 with a minimum grade of C.*

PHYS 280 Introduction to Electronics (3)
Introduction to the design and measurement techniques of modern electronics. Includes AC circuit theory, passive filters, semiconductor diodes, transistors, operational amplifiers, including active filters, and a general introduction to digital circuits. The activities provide students with an opportunity for hands-on experience with a wide range of electronic circuits. *Two hours of lecture and two hours of activity. Prerequisites: PHYS 202. Recommended completion or concurrent: PHYS 203.*

PHYS 301 Digital Electronics (4)
Introduction to digital computer hardware design including: gates, flip-flops, registers, and memory to perform logical and arithmetic operations on numeric and other data represented in binary form. The laboratory uses digital logic integrated circuitry for experiments with combinational and sequential networks, and simple digital systems. *Three hours of lecture and three hours of laboratory. Prerequisites: PHYS 202 and CS 231 or equivalent with a minimum grade of C.*

PHYS 320 Classical Mechanics (3)
Classical mechanics and associated mathematical and numerical techniques: Principles of Newtonian mechanics, an introduction to Hamiltonian and Lagrangian Dynamics. Applications to central force problems and small vibrations, and other selected topics in mechanics, including applications in engineering and biological systems. *Prerequisites: PHYS 203.*

PHYS 321 Classical Electromagnetism (3)
An introduction to the applications of Maxwell's equations and the propagation of EM waves in relation to matter. Topics to be covered include: dielectrics, conductors, plasmas, and waveguides, and selected topics in EM wave radiation, propagation, absorption, transmission, and diffraction. *Three hours of lecture. Prerequisites: PHYS 202, PHYS 203, MATH 162 all with a grade of C or better. Recommended: MATH 346.*

PHYS 323 Quantum Physics (3)
A survey of quanta based physical theories, their experimental foundations and applications: quantum physics of atoms, molecules, nuclei and electrons; introduction to condensed matter physics. *Prerequisite: PHYS 203. Recommended: MATH 346.*

PHYS 324 Statistical Mechanics & Thermodynamics (3)
Covers the laws of thermodynamics with applications to ideal and non-ideal systems. Includes elementary kinetic theory of gases, entropy, classical and quantum statistical mechanics. Other topics covered may include magnetism and low-temperature physics. *Prerequisites: PHYS 203.*

PHYS 380 Applied Laboratory Techniques (2)
Experimental work including an introduction to the equipment and techniques used in mechanics, electromagnetism, optics, electronics, quantum physics, nuclear physics, biophysics, medical physics, and/or geophysics. An emphasis will be placed on experimental design and data analysis. *Six hours of laboratory. Prerequisite: PHYS 203.*

PHYS 402 Computer Interfacing and Control (4)
Introduction to the design and use of sensors of various types with digital computer interfaces for data capture and experimental control. Various types of digital communication are studied including synchronous and asynchronous interfaces. The laboratory provides hands on experience in computer interfacing through integrated circuits, sensors, and microcontrollers. *Three hours of lecture and three hours of laboratory. Prerequisites: PHYS 301. May not be taken for credit by students who have received credit for PHYS 302.*

PHYS 403 Signals and Systems (3)
Introduction to signals and digital signal processing including: fundamentals of signals, signal processing, filter synthesis, discrete-time systems, discrete Fourier transforms and FFT, Z-transforms, sampling, quantization, and image processing. *Prerequisites: PHYS 202.*

PHYS 421 Applied Electromagnetic Waves and Optics (3)
A study of the application of electromagnetic principles to electromagnetic waves and optics. Includes radiation and propagation of electromagnetic waves, ray optics, physical optics, optical devices, laser optics, holography, and optics of vision. *Prerequisites: PHYS 321, MATH 162, MATH 346.*

PHYS 422 Applied Solid State Physics (3)
(currently PHYS 322, Solid State Physics).Selected topics in solid-state physics. Includes crystal structure, thermal, electrical, and magnetic properties of solids, elementary band theory, semiconductors, and solid-state devices. *Prerequisites: PHYS 203, and an upper-division non-GE mathematics course.*

PHYS 423 Quantum Mechanics (3)
A study of the concepts and theories of nonrelatiavistic quantum mechanics. Includes the Schroedinger equation, operators, angular momentum, the hydrogen atom, and applications to simple quantum mechanical systems. *Prerequisites: PHYS 323, MATH 346. Recommended: MATH 362.*

PHYS 480 Advanced Applied Physics Laboratory (2)
Experimental work including in-depth experimentation in mechanics, electromagnetism, optics, electronics, quantum physics, computational physics, biophysics, medical physics, and/or geophysics. An emphasis will be placed on experimental design and data analysis. *Six hours of laboratory. Prerequisite: PHYS 203, PHYS 280.*

PHYS 499 Senior Laboratory Thesis (2)
Experimental or laboratory physics research project. The student must consult with a physics faculty member to decide on the research problem and then work collaboratively under the guidance of the faculty member in the laboratory. The student will produce a 10-20 page paper summarizing the research and the results obtained. An appropriate bibliography must be included. *Prerequisite: Consent of the instructor.*

CALIFORNIA STATE UNIVERSITY SAN MARCOS

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PROGRAM PROPOSAL - Form P

COLLEGE: Arts and Sciences

Discipline: Physics

X New Major | ___ New Minor | ___ New Credential | ___ New Option | ___ New Certificate | ___ New Track, Emphasis or Concentration | ___ Change to Program | ___ Delete Program | ___ Discontinue Program

All new degree major programs and certain new options are submitted for Chancellor's Office approval by the Vice President for Academic Affairs. Program changes, discontinuations, and deletions are sent as information items.

TITLE OF DEGREE PROGRAM: Bachelor of Science in Applied Physics

Enter a brief summary of the purpose of this proposal.

A Bachelor Science Degree in Applied Physics is being proposed to meet the need for highly qualified individuals who have a unique combination of technical knowledge, critical thinking abilities, and problem-solving skills that are valuable to employers in a wide range of technical fields. The Applied Physics degree will have two options, an Applied Physics Option and an Applied Electronics Option. This new degree program will provide unique opportunities for students at Cal State San Marcos and help the campus better serve the needs of our region. The proposed degree in Applied Physics will also attract new students to Cal State San Marcos and strengthen the enrollments in courses in several disciplines in the College of Arts and Sciences.

Does this proposal impact other disciplines? X Yes ___ No

If yes, obtain signature(s). Any objections should be stated in writing and attached to this form.

Discipline	Signature	Date	Support	Oppose
Biology	Denise Garcia	2-7-06	✓	
Chemistry	J A Trimble	2/7/06	✓	
Computer Science	[signature]	2/7/06	✓	
Mathematics	[signature]	2/7/06	✓	

If additional space is needed to complete this form, use supplementary sheets.

REVIEW PROCESS

	Date		Date
Graham Oberem — Originator (Please Print)	2/8/06	Marion J. Reid — Library and Information Services	2-16-06
Graham Oberem [signature] — Program/Center/Department - Director/Chair	2/8/06	Computing & Telecommunications	
[signature] Garcia — College Curriculum Committee	2/8/06	Campus Physical Planning (if applicable)	

APPROVAL PROCESS

	Date		Date
1. [signature] — College Dean (or Designee)	2/9/06	4. Vice President for Academic Affairs (or Designee)	
2a. [signature] — ~~Academic Planning and Policy Committee~~ UCC	4/3/06	5. President (or Designee)	
2b. Budget and Long Range Planning (if applicable)		6. Date to Chancellor's Office	
3. Academic Senate			

BUDGET & LONG RANGE PLANNING COMMITTEE REPORT TO SENATE

Members: Bonnie Bade & Kathleen Watson (co-chairs), Kit Herlihy, Robin Marion, Patty Seleski, Non-voting members: David Barsky**,** Tom Bennett**,** Vicki Golich, Wayne Veres

Review of Proposed B.S. in Applied Physics

The Budget and Long Range Planning Committee (BLP) has reviewed and discussed the P-form for Applied Physics program. We have reviewed the immediate and long range prospects for this proposed degree program, and considered the resource implications of initiating the degree. BLP submits the following analysis of the impact of this program to the Academic Senate to guide Senators in their consideration of this proposal.

Program Overview

BLP commends the Applied Physics proposal originators for the unique design of the program that offers two options: Applied Physics and Applied Electronics. These two options differ in the non-physics courses taken in preparation for the major and in the advanced-level courses taken in physics. The lower division core physics courses are common to both options and the advanced physics courses in each option may be taken as electives for the other options. The coursework is innovative in the way it focuses on development of applied problem-solving skills without foregoing rigor. As indicated in the findings of research in physics education, students will be actively engaged in hands-on learning that promotes critical thinking, conceptual understanding, and development of problem solving skills. Another unique attribute is the active pursuit of strong professional relationships with potential employers in local industry in North County San Diego. Feedback from the community will provide input to the evolution of the Applied Physics Degree and keep the campus abreast of changing needs of the job market in our region.

Program Demand

The American Institute of Physics conducts extensive national and regional statistical research on graduation rates and employment in physics through formal surveys among physics departments, physics faculty, physics graduates, and employers. According to their recent report, annual number of physics graduates increased nationally by 25% from 1999 to 2003. The latest regional data available lists the names of 51 companies in California that employed baccalaureate-level physics graduates in the period 2001-2003, many with a presence in San Diego and Southern Riverside Counties. Dr. David Barsky estimates the following rollout for majors in this program: 2007 – 9, 2008 – 16, 2009 – 20, 2010 – 26.

Resource Implications

Laboratory equipment: The equipment needed to implement this program is largely supported by the COAS annual laboratory budget for the Physics Lab equipment. Part of this budget is for new and replacement equipment. There is a list of equipment for planned acquisition in the next three to four years to be supported by a portion of the equipment budget, and the rest of the money will be set aside for repair and replacement. Physics has been successful at applying for lottery grants to supplement the equipment budget. The Academic Blueprint Committee has provided $14,000 for the purchase of two high grade optical tables for the optics lab. They have been ordered and will be installed before the end of this semester. This acquisition leverages use of existing equipment in the Department and opens the door to several advanced optical experiments.

Computers: Eighteen of thirty-six laptop computers used for Physics are on a refresh system. BLP recommends the originators work with IITS to move the other eighteen to refresh over time. IITS further invites Physics to continue a dialogue to bring innovative Academic Technology solutions to the new Applied Physics program.

Space: A work-order has been placed with Facilities to divide SCI 2, Room 247, a Physics computer lab, in two. This will enable the same number of computers to be used for lower division labs while creating space for more advanced projects.

Library: Money is allocated on the Academic Blueprint for Physics acquisitions, with $5,000 allocated for the first year, and $4,000 per year ongoing.

Course offerings:
Eight new courses will be required for the new major:
MATH 346 – Mathematical Methods for Physics (new in the Department of Math)
PHYS 280 – Introduction to Electronics
PHYS 320 – Classical Mechanics
PHYS 324 – Statistical Mechanics & Thermodynamics
PHYS 380 – Applied Laboratory Techniques
PHYS 421 – Applied Electromagnetism & Optics
PHYS 423 – Quantum Mechanics
PHYS 480 – Advanced Applied Physics Laboratory

Four additional courses will be modified for the new program. The course overlap outlined in the program overview will make it possible for the Department of Physics to offer both options with the current three tenure-track faculty as soon as the degree is implemented.

In closing, BLP would like to express our appreciation to the originators of the proposal for their collegiality and their quick responses to our many questions throughout the review process.

BUDGET & LONG RANGE PLANNING COMMITTEE REPORT TO SENATE

Members: Bonnie Bade & Kathleen Watson (co-chairs), Kit Herlihy, Robin Marion, Patty Seleski,

Non-voting members: David Barsky**,** Tom Bennett**,** Vicki Golich, Wayne Veres

Review of Proposed Minor in Linguistics

The Budget and Long Range Planning Committee (BLP) has investigated and discussed the P-Form for a minor in Linguistics. BLP has reviewed the immediate and long range prospects for this proposed degree program and has considered the resource implications of initiating the degree. BLP submits the following analysis of the impact of this program to the Academic Senate to guide Senators in their consideration of this proposal.

Program Demand: The demand for a Linguistics Minor appears to be significant. The originators of the Minor in Linguistics have performed a survey of students in Linguistics and World Languages courses that has indicated that of 176 students surveyed, 125 said that they would consider a Linguistics Minor if it were available. While this is not a random sampling of students, it is a sampling of students who might be participants in the Minor as most students do not know what linguistics is until they take either LING 100-English Grammar and Syntax or LING 300-Introduction to Linguistics. Liberal Studies students surveyed said they would select Linguistics as their Depth of Study area, a module composed of a subset of the courses required for the minor.

AY 05-06 has five students declaring Linguistics as a special major, while eight students have taken an independent study Morphology course. These students came to Linguistics professors individually to ask for an independent study opportunity to pursue their interest in one of the language structure fields. This indicates to the BLP committee an interest in Linguistics that goes beyond fulfilling general education requirements.

Resource Implications: Resource implications for a new Linguistics Minor are minimal. There are four faculty members available to teach the new courses: Dr. Ahlers and Dr. Gómez de García in LBST; and Dr. Michael Hughes and Dr. Alicia Muñoz-Sanchez of WLHL. Both the Dean of the Library and the Dean of IITS have indicated that existing library collections and instructional technologies suffice to offer the minor in Linguistics. No additional space is required to offer the program.

Course Offerings: The four new courses associated with the minor also serve to support the upcoming Masters in Communication Sciences and Disorders proposed by the College of Education, as well as the current language and culture track and a potential linguistics track offered by World Languages and Hispanic Literatures.

In closing, BLP would like to express our appreciation to the originators of the proposal for their collegiality and their quick responses to our many questions throughout the review process.