

PROGRAM ABSTRACT - Form A

Proposed Degree Title: B.S. in Electrical Engineering
B.A., B.S., M.A., M.S., etc. Discipline

COLLEGE CSM Proposed Implementation Date Fall 2024

About the A-Form.

Background: New baccalaureate and graduate-level degrees must be approved by the Chancellor's Office. Every January, CSU campuses send updated University Academic Master Plans (or UAMPs) to the Chancellor's Office, which are then approved by the Board of Trustees at their March meeting. When the Board of Trustees approves a campus request to add a new program to the UAMP, it authorizes the campus to submit a formal proposal to the Chancellor's Office for establishing such a degree program.

Purpose: The A-Form is used to propose the addition of a new baccalaureate or graduate degree to the UAMP.

Process: After review by the appropriate college curriculum or planning committee in the spring semester, A-Forms are sent to Academic Programs at the beginning of the summer. The forms are distributed to key University officers (including all members of Provost's Council and the President's Cabinet) over the summer for information dissemination, review and feedback. The feedback received as a result of this distribution is provided to proposers as it is received during the summer (to inform development of the program proposal) and to the Budget and Long-range Planning Committee (BLP) at the beginning of the fall semester.

Outcomes: BLP reviews the A-Forms and the feedback collected by Academic Programs, and makes recommendations as to whether programs should be added to the next UAMP. Placement of a program on the UAMP is the campus-level authorization to proposers to submit a complete new program proposal (via a P-Form). Comments from BLP are sent back to the proposal originator to inform the final design and plan for the proposed program. The A-Form, summer reviewer feedback, and BLP comments are additionally used to prepare a summary statement for the Chancellor's Office, which is required for any addition to the UAMP.

Directions.

- Fill in the degree title, college and implementation date above.
- Attach a program abstract addressing items 1-5 to this form.
- Identify the program proposer and obtain the department chair or program director signature below.
- Submit the abstract and the Form A to the college curriculum or planning committee. (Check with the college for submission deadlines.)

1. Description: Briefly describe the essential features of the curriculum that will be developed.

- If the new degree is currently offered as an option in an existing degree program, give a rationale for the conversion.
- If the new degree program is not commonly offered as a bachelor's or master's degree, provide a compelling academic rationale explaining how the proposed subject area constitutes a coherent, integrated degree major that has potential value to students.

2. Mission: How will this program benefit the college, university, region and/or state? How is it aligned with the College and University Mission and Vision?

3. Demand: What evidence is there of adequate student demand for this program?

[Note that Board of Trustees classifies Anthropology, Art, Biology, Chemistry, Economics, English, Foreign Languages, Geography, Geology, History, Mathematics, Music, Philosophy, Physics, Political Science, Psychology, Sociology, Speech/Communication and Theatre Arts/Drama as "Broad Foundation Programs" for which societal need and student demand are not "the preeminent criteria" for offering baccalaureate programs.]

Preliminary evidence of adequate student demand for the proposed program should include

- (i) A list of other CSU campuses currently offering the proposed degree major program (see the CSU Mentor website at <http://www2.assist.org/browseAreas.do>),
- (ii) A list of neighboring institutions, public or private, currently offering the proposed degree major program,
- (iii) Information indicating substantial regional demand for individuals who have earned this degree (contact the Career Center for assistance), and
- (iv) Information indicating adequate student interest in the proposed program (e.g., numbers of minors, existing programs at feeder community colleges, or results of student surveys).

Graduate degree program proposals must also include the number of declared undergraduate majors and the degree production over the preceding three years for the corresponding baccalaureate program.

4. Resources: Give preliminary estimates of the following resources needed to implement the program:


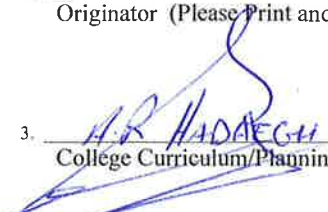
- Additional faculty positions;
- Additional resources required for program administration (e.g., release time for a Chair or Director);
- Additional staff support;
- Additional space requirements; and
- Additional specialized equipment and materials other than those expected to be provided by the Library and Instructional and Information Technology Services (IITS).

Note that in the course of reviewing the A-Form over the summer, the Library and IITS will estimate additional library, information technology and academic computing resources needed for implementation. Indicate whether there are any unusual aspects of the curriculum design that need to be taken into account in the preparation of the Library and IITS estimates.

If there are recognized accrediting bodies in the program area, what are the accreditation criteria and how necessary is accreditation?

5. Relation to Existing Programs: Describe the potential effect on existing programs (e.g., enrollment changes, opportunities for collaboration, resources).

REVIEW PROCESS

1. <u>Edward Price</u>  Originator (Please Print and Sign) _____ Date _____	2. <u>Edward Price</u> Program/Department Director/Chair* _____ - if applicable _____ Date _____
3. <u>A.R. HADAECHI</u>  College Curriculum/Planning Committee* _____ Date <u>Nov 4, 2014</u>	4. _____ College Dean (or Designee)* _____ Date _____
5. _____ Date received in Academic Programs	

* Signature indicates support that the proposed program move forward for consideration for placement on the UAMP.

1. Description

Electrical engineers “research, design, develop, test, or supervise the manufacturing and installation of electrical equipment, components, or systems for commercial, industrial, military, or scientific use¹.” An Electrical Engineering (EE) program would prepare students for careers as electrical engineers. Course work would include topics such as introductory physics, introductory chemistry, mathematics, programming, digital logic, electromagnetism, analog circuits, digital circuits, signals and systems processing, microcontrollers, sensors, devices physics, power engineering, telecommunications, control systems, RF engineering, instrumentation, microelectronics, and engineering design. Many courses would have substantial laboratory components.

Currently, the Physics Department offers an Option in Applied Electronics as part of the Applied Physics BS degree. This Option, which has some similarity to EE, would be the basis for developing the new EE program. Compared to the Option in Applied Electronics, an EE degree would include greater study of electronics and electromagnetism, and less study of other areas of physics (mechanics, thermodynamics, quantum mechanics). Job descriptions calling for electrical engineers are more common than those calling for physicists or applied physicists. Thus, for those students interested in electronics and electrical applications, a BS in EE would be more marketable. Those students with an interest in broader fields and applications will still be able to take the Applied Physics BS.

It is expected that a curriculum team consisting of faculty from Physics, along with representatives from industry, faculty from CSM departments, and faculty consultants from thriving EE programs would assist in the development of the curriculum, and that existing courses would be modified or utilized as much as feasible. It is also expected that the curriculum would meet the requirements of ABET.²

2. Mission

“As a public university, CSUSM grounds its mission in the public trust, alignment with regional needs, and sustained enrichment of the intellectual, civic, economic, and cultural life of our region and state.”

The mission alignment of an EE program is clear. CSUSM is in a quickly growing region of San Diego county, close to several centers of industrial and technical innovation. Local companies have hired recent Applied Physics graduates because of their skills in applied electronics and applied physics. An EE program will provide students with the option of developing more specialized technical skills that are needed by local employers.

3. Demand

- i. The following CSU campuses offer EE: CPP, CPSLO, CSUB, CSUFRES, CSUFULL, CSULA, CSULB, CSUN, CSUS, SDSU, SFSU, and SJSU.
- ii. Neighboring institutions offering EE include UC San Diego, SDSU, and University of San Diego.
- iii. Regional need: North San Diego County and southwest Riverside County is one of the fastest growing areas in California, and the region has a high concentration of technology-based firms.

¹ U.S. Bureau of Labor Statistics <http://www.bls.gov/oes/current/oes172071.htm>

² ABET criteria for EE programs are at <http://www.abet.org/eac-criteria-2014-2015/>

Projections for regional and state growth show a strong need for workers with degrees in all STEM disciplines³, and echo national reports such as *Engage to Excel*⁴, which calls for one million additional STEM degrees in the US in the next decade. Currently, California is the state with the highest employment level in EE in the nation, based on employment per thousand jobs.⁵ Yet despite this demand, “California... performed far below the national average in recent bachelor degrees awarded in science or engineering².” As a result, “the state must find ways to cultivate more bachelor degree holders in science and engineering despite its current budget challenges².”

- iv. Student interest: The closest degree to EE currently offered at CSUSM is an Option in Applied Electronics within the Applied Physics degree. There are ~120 Applied Physics majors at this time.⁶ Approximately 25% of Applied Physics majors declare the Option in Applied Electronics. Given the career opportunities with an EE degree, it is reasonable to expect even more students would seek this degree.

4. Resources

An EE program would require new tenure track faculty, including some senior hires; office space, research space, and start up funds for new faculty; additional course releases for the Department Chair; technical, instructional, and academic support staff; instructional and research laboratory space; instructional lab equipment; and additional software, computing resources, IT support, and library collections⁷. It is expected that an externally funded, comprehensive feasibility study would be performed to identify the resources required to initiate and sustain the program, and that the program would not launch until the resource needs of current CSM programs⁸ were addressed and sufficient resources were available to sustain the EE program and obtain ABET accreditation.⁹ In particular, it is expected that grants and donations will be obtained to fund the launch and first five years of the program. After that time, it is expected that the program will be supported by student enrollment, although it is expected that the program will continue to seek external resources.

5. Relation to existing programs

Currently, the Physics Department offers an Option in Applied Electronics as part of the Applied Physics BS degree. This is similar to an EE program, though less specialized; relevant courses include PHYS 280 Introduction to Electronics, PHYS 301 Digital Electronics, PHYS 402 Computer Interfacing and Control, PHYS 403 Signals and Systems Processing, and PHYS 422 Applied Solid State Physics. It is expected that the electronics courses (currently listed as PHYS) would be renamed or cross-listed as ENGN, and that an EE degree will impact enrollment in the Applied Electronics Option. Mathematics, Computer Science, and Chemistry offer other relevant courses, and might be asked to develop additional courses. These departments, as well as GE courses, would receive an increased service load from an EE program.

³ *California's Position in Technology and Science 2010*. Kevin Klowden and Candice Flor Hynek with Benjamin Yeo. Milken Institute. April 2011.

⁴ Presidents Council of Advisors on Science and Technology. (2012). *Engage to excel: Producing one million additional college graduates with degrees in science, technology, engineering, and mathematics*.

⁵ U.S. Bureau of Labor Statistics <http://www.bls.gov/oes/current/oes172071.htm>

⁶ Radar Report, October 2014.

⁷ E.g., licenses for software like solidworks, matlab; computing workstations; IEEE and other engineering-focused journals.

⁸ The current CSM Strategic Plan identifies targets for new tenure track hires, additional research space, increased instructional lab budgets, and more technical and academic support staff.

⁹ ABET criteria for EE programs are at <http://www.abet.org/eac-criteria-2014-2015/>

Ricardo Fierro

From: Katherine Kantardjieff
Sent: Friday, November 07, 2014 12:40 PM
To: Ricardo Fierro
Subject: Approval of A-form for Electrical Engineering and CSM Dean's signature

Rick,

After reviewing the A-form for Electrical Engineering and the budget worksheet, I send this email as confirmation of my reading of the documents and my approval that they move forward to Academic Programs, campus stakeholders, and BLP.

Please accept this email as my signature. When I return to campus next week, I will provide my wet signature on the actual signature page of the A-form.

Sincerely,

Katherine Kantardjieff

Dean, College of Science and Mathematics California State University San Marcos Sent from my Verizon Wireless 4G LTE Tablet