

**Elevating Electrical and Computer Engineering Options
to a Full
Electrical and Computer Engineering (ECE) Degree Program**

1. Program Type (Please specify any from the list below that apply—delete the others)

Option Elevation

2. Program Identification

a. Campus

California State University Fresno

c. Full and exact degree designation and title (e.g., Master of Science in Genetic Counseling, Bachelor of Arts in History).

Master of Science in Electrical and Computer Engineering

b. Term and academic year of intended implementation (e.g., fall 2020).

Fall 2020

c. Total number of units required for graduation. This will include all requirements (and campus-specific graduation requirements), not just major requirements.

30 units

e. Name of the department(s), division, or other unit of the campus that would offer the proposed degree major program. Please identify the unit that will have primary responsibility.

Department of Electrical and Computer Engineering

f. Name, title, and rank of the individual(s) primarily responsible for drafting the proposed option or concentration elevation to a full degree major program.

Dr. Nagy Bengiamin, Professor, Coordinator of the Graduate Program

g. Please specify whether this proposed program is subject to WASC Substantive Change review. The campus may submit a copy of the WASC Sub-Change proposal in lieu of this CSU proposal format. If campuses choose to submit the WASC Substantive Change Proposal, they will also be required to submit a program assessment plan using the format found in the CSU program proposal template.

It is not subject to WASC Substantive Change review.

h. Optional: Proposed Classification of Instructional Programs and CSU Degree Program Code

To be determined upon the program's approval.

i. Please provide teach-out policy language to accommodate those students who will complete the original program with the option or concentration.

The current options being elevated contain no curriculum changes as a result of this proposal. All current courses will continue to be offered under the new degree. Students can complete their current requirements after this elevation has occurred.

j. Provide evidence the current option will be discontinued once all existing students exit the program.

Once the elevated program is approved, the department will stop accepting new students in the options program. All incoming students will be admitted into the elevated program only. The department will then submit the necessary forms to discontinue the options.

3. Program Overview and Rationale

a. Provide a rationale for option or concentration elevation to a full degree program. Include a brief description of the program, its purpose and strengths, fit with institutional mission, and a justification for elevating the option or concentration to a full degree program at this time.

The current program is a full-fledged MS in Engineering (MSE) program with three options: Electrical Engineering (EE-option), Computer Engineering (CE-option) and Mechanical Engineering (ME-option). The program originally began in the 1970's as a self-supporting extension program with EE and ME options. In 2001, the program was approved to be available to students on the Fresno State campus. In 2011, the CE-option was approved as part of the MSE program. Since then, the program has grown and the options have become well established. Knowing that the options are diverse and in well-established engineering fields, the EE and CE options have created more depth and they matured to the level of justifying the need for elevation to stand-alone full-fledged program. While establishing a common core between ME and EE/CE has always been a challenge, the overlap between EE and CE continued to grow. In 2018, the external review panel of the MSE program recommended elevating the EE and CE options to full degree program. The overlap between EE and CE technologies and their presence in the same department (ECE department) motivated the faculty to combine the two options (EE and CE) into one broad program that motivates more joint research activities and encourages creativity. The new titles of the elevated program (MS/ECE) will be more reflective of the common relevant technical areas for engineering practices in the region and the nation. This is

expected to help in recruiting highly qualified students and bringing more recognition to the elevated program in its specialized subjects.

- b. *Provide the proposed catalog copy description, including program overview, degree requirements (including course catalog numbers, titles, and units), and admission requirements. For master's degrees, please also include catalog copy describing the culminating experience requirement(s).*

The revised catalogue copy is provided in Appendix I.

- c. *Provide written documentation of the campus approval process with written evidence of a significantly greater campus and administrative commitment to sustain the stand-alone program than was required to establish it as a specialization area.*

Approval documents are provided in Appendix II.

4. **Curriculum** – *(These requirements conform to the revised 2013 WASC Handbook of Accreditation)*

- a. *Provide a side-by-side comparison showing the course requirements of the existing degree major and concentration on one side and the proposed new major on the other.*

Current EE and CE options	Proposed MS-ECE
<p>A. Main Core (1 unit) ENGR 200</p> <p>B. Option Core (9 units) EE Option: ENGR201, ECE224; Choose one from ECE230, ECE241, ENGR206 CE Option: ECE278; choose two from ECE240, ECE243, ECE274</p> <p>C. Electives (14 units) For either option, choose from remaining ECE upper-division (100-level) and graduate courses. Minimum of 6 units from corresponding program electives. Maximum of 8 100-level units.</p> <p>D. Culminating Experience (6 units) For either option, choose</p> <ol style="list-style-type: none"> 6 units of electives plus comprehensive exam, minimum of 3 units from corresponding program electives, or ECE298 Project (3 units) plus 3 units of program electives, or ECE299 Thesis (6 units) 	<p>A. Fundamental courses (12 units)</p> <ol style="list-style-type: none"> ENGR200, ECE201 Choose 3 courses from ECE224, ECE231, ECE241, ECE245, ECE253, ECE240, ECE242, ECE274, ECE278 <p>B. Electives (12-18 units)</p> <ul style="list-style-type: none"> Up to 6 units may be taken from ECE 100-level course; which are not required for a BS degree in the ECE department. Up to 6 units of 200-level courses in program related subjects (Business, Engineering, Mathematics, Physics, Computer Science) may be taken; with the ECE Graduate Coordinator's approval. 200-level ECE courses: (Course prerequisites must have been completed before enrolling in the course). <p>C. Culminating Experience (0-6 units) Choose from,</p> <ol style="list-style-type: none"> Comprehensive Exam (0 units) ECE298 Project (3 units) ECE299 Thesis (6 units)
Total = 30 units	Total = 30 units

b. These program proposal elements are required:

- *Comprehensive assessment plan addressing all assessment elements;*
- *Matrix showing where student learning outcomes are introduced (I), developed (D), and mastered (M)*

The Student Outcomes Assessment Plan (SOAP) for the proposed degree program is provided in Appendix III.

5. Evidence of Potential Student Demand

Please provide enrollment numbers in the current option for the past three to five years to provide evidence of sustained and possible future interest in the program.

Enrollment Data

	2015-2016	2016-2017	2017-2018	2018-2019
EE-option	33	46	39	20
CE-option	16	26	22	12

The peak of 2016-2017 was hard to explain, other than the visa system for international students, since the ECE program has high international students enrollment. That peak resulted in a high graduation rate during the two following years; which resulted in a decline in the overall enrollment figures. In 2018-2019 for example, the number of graduates exceeded 40. In addition, there was a decline in granted student visas last year.

Also, the majority of ECE students choose to do the project or the thesis route. Only very few choose to take a comprehensive exam. In the past few years, the department was pushing for the comprehensive exam route to be able to manage the high enrollment since the manageable capacity of the ECE graduate program is estimated to be about 25 to 30 project/thesis students.

6. Self-Support Programs

N/A

Submit completed proposal packages to:

degrees@calstate.edu

Academic Programs and Faculty Development

CSU Office of the Chancellor

401 Golden Shore

Long Beach, CA 90802-4210

Contact Us

Dr. Alison M. Wrynn, Ph.D

Interim Assistant Vice Chancellor, Academic Programs and Faculty Development, and Interim
State University Dean, Academic Programs

Phone (562) 951-4672

Fax (562) 951-4982

awrynn@calstate.edu

Academic Programs and Faculty Development is on the Web <http://www.calstate.edu/APP/>

Contact Extended Education

Dr. Sheila Thomas

Assistant Vice Chancellor and

Dean, Extended Education

Phone (562) 951-4795

Fax (562) 951-4982

sthomas@calstate.edu

Appendix I
Revised Catalog Copy

Department of Electrical and Computer Engineering

Reza Raeisi, Chair
East Engineering Building, Room 254A
559.278.6038
www.fresnostate.edu/engineering/elec-computer/

Degrees and Programs Offered

BS in Electrical Engineering, B.S.
BS in Computer Engineering, B.S.
MN in Electrical Engineering, Minor
MN in Computer Engineering, Minor
MS in Electrical and Computer Engineering, MS-ECE –Electrical Engineering Option, M.S.
MS in Engineering – Computer Engineering Option, M.S.

Courses Offered

Bachelor of Science (BS) Program

Electrical Engineering: The BS in Electrical Engineering Program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

Electrical engineers design and develop electronic circuits, equipment and systems in the areas of electromagnetics (antennas; radar, radio, and television systems), communications (telephone systems, satellite communications; laser and optical fiber communications; aircraft and missile guidance systems), computers and digital systems (computers, microprocessors, and microcomputers; artificial intelligence), physical electronics and optics (transistors; integrated circuits; optical display devices; lasers; optical fibers), power systems and energy conversion (electric power generation; analysis and synthesis of power transmission and distribution protection systems design; on-line power control protection systems design), and control systems (computer control, robotics, automated manufacturing, intelligent sensors). Hands-on experiences are emphasized and gained through laboratory work and design projects.

Computer Engineering: The BS in Computer Engineering Program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET). Computer engineering is a discipline which allows the student to obtain expertise in the design, programming, and applications of computers. It prepares the graduate for professional practice or graduate studies.

The BS program combines the following:

- a. A strong emphasis on electrical engineering (primarily electronic circuits and systems)
- b. A broad basis in mathematics, physical science, and general engineering

- c. Fundamentals of computer science including programming methodology, software engineering, and operating systems
- d. Introductory and advanced concepts in the design of computers and computer systems

A rich set of technical area courses is available to allow students to broaden their knowledge within any of several computer engineering areas.

Mission and Program Educational Objectives

The mission of the Department of Electrical and Computer Engineering is to fulfill the needs of the region and state by providing an undergraduate and graduate technical education in electrical engineering and computer engineering to a diverse group of students. Additionally, the department strives to continually update its rigorous programs of study in order to qualify its graduates for positions in industry located in the region and beyond while providing sufficient programmatic breadth and depth to assure a successful practice in the profession. Furthermore, students are grounded in the rigorous scientific and theoretical foundations of the discipline, in order not only to enable graduates to enter and be successful in any advanced level educational program of their choosing, but also to be able to build upon this strong foundation and extend it to new depths.

The Electrical Engineering Program and the Computer Engineering Program award degrees to students who within three to five years of graduation, through work experience and/or graduate education in the engineering field, will be expected to

1. have grown technically to the level sufficient to be productive in their respective industry workplaces.
2. be capable of addressing technical problems of increasing complexity.
3. communicate and function effectively in an interdisciplinary team environment at a level commensurate with their career development.
4. demonstrate an ability for independent learning and continued professional as well as ethical development.

~~The mission of the department complements and is enhanced by a graduate program leading to the M.S. in Engineering. For more information, see Master of Science in Engineering Program.~~

The faculty members possess depth and breadth in their specialty areas and are active in bringing these experiences and skills to the classroom. The identifiable strengths of the academic program are the laboratory and hands-on experience for students, the proper attention given to the scientific and mathematical foundation of electrical engineering and computer engineering, and the rigor of upper-division courses coupled with design and culminating senior projects. The technical and liberal arts components of the curriculum provide the students with the opportunity for gaining self-development, technical competence, and awareness of economic and ethical responsibilities. The technical curriculum includes (1) basic engineering science, (2) core electrical and computer engineering subjects, and (3) a junior-/senior-level choice for more depth in communications and analog systems, power systems and controls, or digital systems and computers.

The department requires mandatory advising to help students make sound academic decisions.

Organizations

Student chapters of the Institute of Electrical and Electronic Engineers (IEEE) and Eta Kappa Nu (the national honor society for electrical engineers) are active in the department. The Lyles College of Engineering, in addition, has chapters of Tau Beta Pi, the Society of Women Engineers, the Society of Hispanic Engineers, and the National Society of Black Engineers.

Co-op Program

The department participates in the Valley Industry Partnership Program which allows students to integrate planned industrial experiences into their academic programs. Students interested in this program should contact the chair of the Department of Electrical and Computer Engineering and the college's co-op coordinator.

Mandatory Advising

Students must complete mandatory advising with a faculty member at least once during each academic year. Students who fail to do so by the established deadline (usually around the end of April) will be prevented from participating in the STAR registration process prior to the start of classes.

Bachelor of Science Degree Requirements

Electrical Engineering Major

(See note 1)

1. Major requirements (65 units) and additional requirements (27-28 units)

Major requirements (65 units)

ECE 1, 71, 72, 85, 85L, 90, 90L, 102, 103, 118, 118L, 121, 124, 125, 126, 128, 128L, 134, 138, 138L, 155, 186A (51 units)

Select one from CE 29, ME 29, or ME 136 (3 units)

Technical Area Courses (11 units)

Select from the following

ECE 106, 107, 114, 115, 132, 135, 136, 140, 146, 148, 151, 152, 153, 162, 166, 168, 171, 176, 172, 173, 174, 178

Select at least two from the following: ECE 119L, 121L, 134L, 136L, 155L

Additional requirements (27-28)

MATH 76, 77, 81

PHYS 4A; PHYS 4B, 4BL; PHYS 4C; choose one from MATH 121, 123, 128, 152, 171, 181, 182

2. General Education requirements (49 units)*

Select one course from each of the G.E. areas: Area A1, A2, D1, D2. (See G.E. listings.)

The following courses are required to satisfy both G.E. and additional requirements: MATH 75 [B4], CHEM 3A [B1], PHIL 1 or 10 [C2], ECE 186B [IB], ECON 40 or 50 [D3], BIOL 10 [B2]

3. Other requirements (6 units)

Upper-division writing and Multicultural and International (MI)

4. Sufficient elective units to meet required total units (if needed) (See Degree Requirements.)

5. Total (124 units)

Note: Engineering majors are exempt from G.E. Area A3, third course Area C, Area E, and Area ID.

Advising Notes

1. Courses in mathematics, the physical sciences, or engineering taken CR/NC are not counted toward fulfillment of degree requirements in electrical engineering.
2. Electrical engineering majors might consider a math minor (see faculty advisor for details).
3. All electrical engineering students must consult with their academic advisor at least once each year.
4. The Upper-Division Writing Skills requirements can be met by passing the university examination or completing an upper-division writing course with a letter grade of C or better no sooner than the term in which 60 units of coursework are completed. The writing course units are not counted toward the required 130 program units.
5. ENGR 101 may be taken instead of MATH 81.
6. The prerequisites for ECE 186A are ECE 85, 85L, 90, 90L, 102, 118, 124, 128, 128L; one lab from ECE 119L, 118L, 121L, 134L, 138L, 155L; and two courses from ECE 121, 134, 138, 155.
7. Students must enroll in and complete ECE 1 during the first two semesters of attendance at Fresno State.
8. The following prerequisite courses must be completed with a letter grade of C or better: ECE 71, 72, 85, 85L, 90, 90L.

Prerequisites

Students violating any course prerequisites may be required to take an additional course (if they earned a C) or repeat a course (if they earned a D or less.) Repeated violations of prerequisites may trigger disciplinary action.

Computer Engineering Major

1. Major requirements (68 units) and additional requirements (21 units)

Major requirements (68 units)

ECE 1, 71 or CSCI 40, ECE 81 or CSCI 41, ECE 72, 85, 85L, 90, 90L, 103, 106, 118, 118L, 124, 125, 128, 128L, 146, 174, 176, 178, 186A (52 units)

Technical Area (16 units)

Select at least 16 units from the following: ECE 107, 114, 115, 119L, 126, 132, 134, 134L, 135, 138, 138L, 140, 148, 155, 172, 173; CSCI 144, 150, 156

Additional requirements (21 units)

MATH 76, 77, 81; PHYS 4A; PHYS 4B, PHYS 4BL; PHYS 4C (see advising notes)

2. General Education requirements (49 units)*

Select one course from each of the G.E. areas: Area A1, A2, D1, D2. (See G. E. listings.)

The following courses are required to satisfy both G.E. and major requirements: MATH 75 [B4], CHEM 3A [B1], PHIL 1 or 10 [C2], ECE 186B [IB], ECON 40 or 50 [D3], BIOL 10 [B2]

3. Other requirements (6 units)

Upper-division writing and Multicultural and International (MI)

PLSI 120 or BA 104 are required to satisfy MI requirements.

4. Sufficient elective units to meet required total units (if needed) (See Degree Requirements.)

5. Total (124 units)

Note: Engineering majors are exempt from G.E. Area A3, Area E, Area IC, and Area ID. Only one course is required for G.E. Area C2.

Advising Notes

1. Courses in mathematics, the physical sciences, or engineering taken CR/NC are not counted toward fulfillment of degree requirements in computer engineering.
2. Computer engineering majors might consider a math minor. (See faculty advisor for details.)
3. All computer engineering students must consult with their academic advisor at least once each year.
4. The Upper-Division Writing Skills requirements can be met by passing the university examination or completing an upper-division writing course with a letter grade of C or better no sooner than the term in which 60 units of coursework are completed. The writing course units are not counted toward the required 130 program units.
5. ENGR 101 may be taken instead of MATH 81.
6. The prerequisites for ECE 186A are ECE 85, 85L, 90, 106, 118, 118L, 124, 128, 128L, 176; CSCI 41; and one course from ECE 146 or 174.

7. Students must enroll in and complete ECE 1 during the first two semesters of attendance at Fresno State.
8. The following prerequisite courses must be completed with a letter grade of C or better: ECE 72, 71, 85, 85L, 90, 90L.

Prerequisites: Students missing any course prerequisites may be required to take an additional course (if they earned a C) or repeat a course (if they earned a D or less.)

Master of Science in Electrical and Computer Engineering (MS-ECE)

The Master of Science in ECE Engineering program has the following goals: (1) to develop the students' advanced analytical skills by developing an in-depth understanding of major theoretical and practical engineering concepts; (2) to develop students' written and oral communication skills applied to technical areas; (3) to achieve an appropriate level of competence by the students in solving practical electrical or ~~mechanical~~ computer engineering problems; (4) to develop students' critical and creative thinking skills in mastering new topics required to understand and solve complex engineering problems; and (5) to allow the students to demonstrate a sufficient depth of knowledge in a substantive area of electrical or ~~mechanical~~ computer engineering to pursue advanced academic or industrial work.

Program Objectives

The program has the following objectives: (1) to complete a minimum of 30 units of graduate coursework, ~~including appropriate core courses~~, (2) to successfully demonstrate knowledge base in culminating experience, and (3) to enhance the students' career goals by increasing their theoretical, research, and problem-solving skills in applied engineering.

The program consists of the following:

A. Main Core (1 unit)

ENGR 200

B. Option Core (9 units)

~~EE Option: ENGR 201, ECE 224; choose one from ECE 230, ECE 241, ENGR 206~~

~~CompE Option: ECE 278; choose two from ECE 240, 243, 274~~

~~ME Option (choose 3 courses): ENGR 201, 202, 205, 206~~

C. Electives (14 units)

~~CompE and EE Options: Choose from remaining upper-division and graduate courses. Minimum of 6 units from corresponding program electives. Maximum of 9 upper-division units. See advising notes.~~

ME Option: Choose from remaining upper-division and program courses. Maximum of 9 upper-division units. See courses in Mechanical Engineering.

D. Culminating Experience (6 units)

For either option, choose

1. 6 units of electives plus comprehensive exam, minimum of 3 units from corresponding program electives, or
2. ECE 298 or ME 298 Project (3 units) plus 3 units of program electives, or
3. ECE 299 or ME 299 Thesis (6 units)

Total (30 units)

Advising Notes

1. CompE Program electives: ECE 224, 240, 242, 243, 255, 274, 291T, 290 (3 units max)
2. EE Program electives: ENGR 206, ECE 230, 231, 232, 241, 245, 247, 249, 251, 253, 255, 257, 259, 274, 291T, 290 (3 units max)
3. Approved graduate courses may be taken with the permission of the department of the program of study.

Up to nine semester hours of satisfactory graduate credit may be transferred into the program from other institutions if not used in completing another graduate degree program. Undergraduate courses may be transferred if the courses were not used in completing another degree program. The total undergraduate upper-division semester hours applied to this degree program cannot exceed nine hours.

The Graduate Record Examination (GRE) Aptitude Test is required of all students prior to advancement to candidacy status.

The program requires extensive use of a computer; therefore, students are expected to have their own computer or access to one 24 hours a day.

Admission to the University

Requirements for admission to California State University, Fresno are in accordance with Title 5, Chapter 1, Subchapter 3 of the California Code of Regulations.

Admission to the Program

Students who apply to the program are placed in one of the following categories:

1. **Graduate Standing, Classified.** Students with (a) an undergraduate degree in electrical or computer an appropriate engineering discipline from a recognized an ABET-accredited program, (b) a good academic record and an undergraduate grade point average of 3.0, (c) a minimum GRE quantitative score of 150-550 are eligible

GRE quantitative score of 150-550 are eligible for classified (degree status) graduate standing, and (d) a letter of recommendation from an academic or an industrial source.

2. **Graduate Standing, Conditionally Classified.** Electrical and computer engineering students with 2.5 GPA from non-ABET accredited engineering programs or students with a degree in physical science or mathematics or a different engineering discipline, and who have not met the requirements of category 1, will be given conditionally classified graduate standing. These students may be required to take prerequisite courses and/or achieve a certain future GPA as determined by the graduate program at the time of admission. Upon satisfactorily meeting any all specified requirements, students will then be advanced to classified standing.

Degree Candidacy

The following requirements must be met prior to advancement to candidacy:

1. Classified graduate standing.
2. Completion at California State University, Fresno of at least 109 units of the proposed degree program with a 3.0 average GPA on all completed courses listed on the application for advancement to candidacy. work appearing on the program.
3. A minimum grade point average of 3.0 in all required graduate coursework from the date of commencing the first course of the proposed master's degree program.
4. 3. Departmental recommendation for advancement to candidacy.
5. 4. Satisfactory completion of the Graduate Writing Skills Requirement (ENGR 200).

Non-degree students

Students with a bachelor's degree may take graduate courses (concurrent with regular students) for credit or audit. Prior approval is required.

Master of Science Degree requirement

1. Fundamental Courses (12 units)
 - a. ENGR 200 (1)
 - b. ENGR 201 (2)
 - c. Choose from the following (9)
ECE224, ECE231, ECE241, ECE245, ECE253
ECE240 ECE 242, ECE274, ECE278
2. Choose from the following (12-18 units)
 - a. Up to six units may be taken from ECE 100-level courses; which are not required for a BS degree in the ECE department.
 - b. Up to six units of 200-level courses in program related subjects (Business, Engineering, Mathematics, Physics, and Computer Science) may be taken with the graduate coordinator's approval.

c. 200-level ECE courses (Course prerequisites must have been completed before enrolling in the course).

3. Culminating Experience (0-6 units)

Choose one of the following routs:

Thesis – ECE 299 (6)

Projects – ECE 298 (3)

Comprehensive Exam (0)

Total 30 units

Advising note:

Must be classified and advanced to candidacy before enrolling in ECE 290, ECE 299, or ECE 298.

ENGR 200. Seminar in Engineering

Orientation to the graduate program, exposure to various areas within Electrical Engineering and Mechanical Engineering, introduction to research methods, discussion of project and thesis topics.

Units: 1

~~ECE~~ENGR 201. Systems Modeling and Realization

Prerequisites: Graduate Standing. Advanced software and hardware engineering tools and their applications; instrumentation and experimental measurements; transducers; analog and digital signal conditioning; instrumentation amplifiers; signal reconstruction; actuators; dynamic systems modeling; realization of models; spectrum analysis; real-time computations; data analysis. (12 lecture, 32 lab hours)

Units: 32

ENGR 202. Applied Engineering Analysis

Study of analytical tools used in the analysis and modeling of engineering systems in addition to the use of simulation software such as MATLAB. Emphasis is placed on solving problems tied to direct applications within the engineering disciplines.

Units: 3

ENGR 205. Computing in Engineering Analysis

(ENGR 205 same as CE 205). Prerequisite: graduate status in engineering. Solution of engineering problems using digital computation. Modeling of engineering systems for numerical analysis at the graduate level. Solution of engineering problems using digital computation. Modeling of engineering systems for numerical analysis.

Units: 3

ENGR 206. Stochastic Theory in Engineering Analysis for Electrical Engineers

Prerequisites: ECE 125 or ME 125 or equivalent. Estimation theory and applications, reliability theory, statistical yield models, random processes, autocorrelation, power spectral densities, noise characterization, random processes, matched filters, multivariable regression, analysis of variance, and design of experiments. Applications to communications and communication systems, control systems, and dynamic mechanical systems.

Units: 3

ENGR 210. Linear Control Systems

A first-year graduate course covering the analysis, synthesis, and performance of linear control systems. Partial fraction expansion, Routh's criterion, the impulse function. Basic servo characteristics and types, block diagrams, transfer functions. A detailed treatment of the root locus method for analysis and synthesis. Frequency response, logarithmic and polar plots, Nyquist's criterion, stability characteristics, phase margin and gain margin.

Units: 3

Appendix II
University Approval Documents

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GRADUATE PROGRAM

(master's degree, doctoral degree, certificate of advanced study, Credential
requiring graduate-level course work)

CATALOG STATEMENT REVISION REQUEST

Return original to:

Division of Research and Graduate
Studies; Thomas Administration
Building, Room 130; Mail Stop TA 51

Graduate Program: MS in ECE
Department: Electrical and Computer Engineering
Contact Person: Nagy Bengiamin
Phone: 8-8339
E-mail: bengiami@csufresno.edu
Effective Term/Year: Fall 2020

PURPOSE OF FORM: To propose revision of a graduate program catalog statement (program description and/or requirements) as it appears in the University Catalog. The proposed program changes if approved will be binding on students who are advanced to candidacy under the new catalog statement. **NOTE:** Revisions in graduate courses and proposals for new graduate courses are submitted on separate forms available through the Division of Research and Graduate Studies, phone 8-2448.

INSTRUCTIONS: Use attachments to this sheet to indicate the changes that you propose. Make changes as space allows directly on a 8.5" x 11" xerographic copy of the entire page(s) of your graduate program statement (description/requirements) as it appears in the most recent University Catalog, including page numbers. Use "mock-up" style: cross out wording to be deleted; type new language in margins. If there is no sufficient space in the margins to type lengthy additions, designate inserts (a, b, c, etc.). Attach fully typed language for each insert on additional sheets. Address question on these instructions to the Dean, phone 8-2448.

Routine proposals for graduate program changes are reviewed by the Graduate Curriculum Subcommittee. Extensive, substantive changes are reviewed by the University Graduate Committee.

Those planning to propose a new or extensively revised graduate program (master's, doctoral, or certificate of advanced study), including a proposal for a revised or an additional option under an existing graduate degree, should schedule a meeting with the Research and Graduate Dean. **JUSTIFICATION:** Explain why the proposed changes in the graduate program are needed. Attach additional pages as necessary. Special justification and approval are required for proposals to increase master's degree program units above 30 units in academic fields, and 60 units in professional fields. Such justification must include comparative information concerning similar programs at representative universities, and outline adherence to accreditation standards if applicable. Document the impact of the proposed change and/or any increased program units on program students and department resources.

CONSULTING SIGNATURES (if required)

In an effort to avoid misunderstandings, signatures must be obtained from those **departments potentially affected** by proposed changes(s).

I have read the catalog statement revision request and support the proposed change(s).

Yes ☒ No ☐

If no, please explain your concern (s):

Department Chair (of department being consulted)

Mechanical Engineering
Department

Department

Gemunu Hapawana
Department Chair (typed name)

Department Chair (typed name)

[Signature]
Department Chair Signature

Department Chair Signature

Oct. 09, 2019
Date

Date

REQUIRED SCHOOL SIGNATURES (verifies proposal has been approved)

Graduate Program Coordinator

Nagy Bengiamin

Typed Name

N. N. Nagy
Signature

10/4/19
Date

Department Chair

Reza Raeisi

Typed Name

[Signature]
Signature

10/4/19
Date

School Curriculum (or Credential) Committee Chair (if applicable)

Nagy Bengiamin
Typed Name

N. N. Nagy
Signature

10/10/19
Date

School Dean

Ram Nunna
Typed Name

[Signature]
Signature

30 Oct 2019
Date

-For committee use only-

**UNIVERSITY GRADUATE COMMITTEE/GRADUATE CURRICULUM
SUBCOMMITTEE REVIEW RECOMMENDATION**

☒ **Request Approved**

☐ **Request Denied**

☐ **Request Deferred**

12/4/19
Date of Action

Explanation:

Recommendation approved by:

Dean, Research and Graduate Studies/or designee

James Marshall
Typed Name


Signature

12/4/19
Date

Department of Electrical and Computer Engineering

Reza Raeisi, Chair

East Engineering Building, Room 254A

559.278.6038

www.fresnostate.edu/engineering/elec-computer/

Degrees and Programs Offered

BS in Electrical Engineering, B.S.

BS in Computer Engineering, B.S.

MN in Electrical Engineering, Minor

MN in Computer Engineering, Minor

MS in Electrical and Computer Engineering, MS-ECE –~~Electrical Engineering Option~~, M.S.

~~MS in Engineering – Computer Engineering Option, M.S.~~

Courses Offered

Bachelor of Science (BS) Program

Electrical Engineering: The BS in Electrical Engineering Program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

Electrical engineers design and develop electronic circuits, equipment and systems in the areas of electromagnetics (antennas; radar, radio, and television systems), communications (telephone systems, satellite communications; laser and optical fiber communications; aircraft and missile guidance systems), computers and digital systems (computers, microprocessors, and microcomputers; artificial intelligence), physical electronics and optics (transistors; integrated circuits; optical display devices; lasers; optical fibers), power systems and energy conversion (electric power generation; analysis and synthesis of power transmission and distribution protection systems design; on-line power control protection systems design), and control systems (computer control, robotics, automated manufacturing, intelligent sensors). Hands-on experiences are emphasized and gained through laboratory work and design projects.

Computer Engineering: The BS in Computer Engineering Program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET). Computer engineering is a discipline which allows the student to obtain expertise in the design, programming, and applications of computers. It prepares the graduate for professional practice or graduate studies.

The BS program combines the following:

- a. A strong emphasis on electrical engineering (primarily electronic circuits and systems)
- b. A broad basis in mathematics, physical science, and general engineering
- c. Fundamentals of computer science including programming methodology, software

engineering, and operating systems

d. Introductory and advanced concepts in the design of computers and computer systems

A rich set of technical area courses is available to allow students to broaden their knowledge within any of several computer engineering areas.

Mission and Program Educational Objectives

The mission of the Department of Electrical and Computer Engineering is to fulfill the needs of the region and state by providing an undergraduate and graduate technical education in electrical engineering and computer engineering to a diverse group of students. Additionally, the department strives to continually update its rigorous programs of study in order to qualify its graduates for positions in industry located in the region and beyond while providing sufficient programmatic breadth and depth to assure a successful practice in the profession. Furthermore, students are grounded in the rigorous scientific and theoretical foundations of the discipline, in order not only to enable graduates to enter and be successful in any advanced level educational program of their choosing, but also to be able to build upon this strong foundation and extend it to new depths.

The Electrical Engineering Program and the Computer Engineering Program award degrees to students who within three to five years of graduation, through work experience and/or graduate education in the engineering field, will be expected to

5. have grown technically to the level sufficient to be productive in their respective industry workplaces.
6. be capable of addressing technical problems of increasing complexity.
7. communicate and function effectively in an interdisciplinary team environment at a level commensurate with their career development.
8. demonstrate an ability for independent learning and continued professional as well as ethical development.

The mission of the department complements and is enhanced by a graduate program leading to the M.S. in Engineering. For more information, see Master of Science in Engineering Program.

The faculty members possess depth and breadth in their specialty areas and are active in bringing these experiences and skills to the classroom. The identifiable strengths of the academic program are the laboratory and hands-on experience for students, the proper attention given to the scientific and mathematical foundation of electrical engineering and computer engineering, and the rigor of upper-division courses coupled with design and culminating senior projects. The technical and liberal arts components of the curriculum provide the students with the opportunity for gaining self-development, technical competence, and awareness of economic and ethical responsibilities. The technical curriculum includes (1) basic engineering science, (2) core electrical and computer engineering subjects, and (3) a junior-/senior-level choice for more depth in communications and analog systems, power systems and controls, or digital systems and computers.

The department requires mandatory advising to help students make sound academic decisions.

Organizations

Student chapters of the Institute of Electrical and Electronic Engineers (IEEE) and Eta Kappa Nu (the national honor society for electrical engineers) are active in the department. The Lyles College of Engineering, in addition, has chapters of Tau Beta Pi, the Society of Women Engineers, the Society of Hispanic Engineers, and the National Society of Black Engineers.

Co-op Program

The department participates in the Valley Industry Partnership Program which allows students to integrate planned industrial experiences into their academic programs. Students interested in this program should contact the chair of the Department of Electrical and Computer Engineering and the college's co-op coordinator.

Mandatory Advising

Students must complete mandatory advising with a faculty member at least once during each academic year. Students who fail to do so by the established deadline (usually around the end of April) will be prevented from participating in the STAR registration process prior to the start of classes.

Bachelor of Science Degree Requirements

Electrical Engineering Major

(See note 1)

1. Major requirements (65 units) and additional requirements (27-28 units)

Major requirements (65 units)

ECE 1, 71, 72, 85, 85L, 90, 90L, 102, 103, 118, 118L, 121, 124, 125, 126, 128, 128L, 134, 138, 138L, 155, 186A (51 units)

Select one from CE 29, ME 29, or ME 136 (3 units)

Technical Area Courses (11 units)

Select from the following

ECE 106, 107, 114, 115, 132, 135, 136, 140, 146, 148, 151, 152, 153, 162, 166, 168, 171, 176, 172, 173, 174, 178

Select at least two from the following: ECE 119L, 121L, 134L, 136L, 155L

Additional requirements (27-28)

MATH 76, 77, 81

PHYS 4A; PHYS 4B, 4BL; PHYS 4C; choose one from MATH 121, 123, 128, 152, 171, 181, 182

2. General Education requirements (49 units)*

Select one course from each of the G.E. areas: Area A1, A2, D1, D2. (See G.E. listings.)

The following courses are required to satisfy both G.E. and additional requirements: MATH 75 [B4], CHEM 3A [B1], PHIL 1 or 10 [C2], ECE 186B [IB], ECON 40 or 50 [D3], BIOL 10 [B2]

3. Other requirements (6 units)

Upper-division writing and Multicultural and International (MI)

4. Sufficient elective units to meet required total units (if needed) (See Degree Requirements.)

5. Total (124 units)

Note: Engineering majors are exempt from G.E. Area A3, third course Area C, Area E, and Area ID.

Advising Notes

9. Courses in mathematics, the physical sciences, or engineering taken CR/NC are not counted toward fulfillment of degree requirements in electrical engineering.
10. Electrical engineering majors might consider a math minor (see faculty advisor for details).
11. All electrical engineering students must consult with their academic advisor at least once each year.
12. The Upper-Division Writing Skills requirements can be met by passing the university examination or completing an upper-division writing course with a letter grade of C or better no sooner than the term in which 60 units of coursework are completed. The writing course units are not counted toward the required 130 program units.
13. ENGR 101 may be taken instead of MATH 81.
14. The prerequisites for ECE 186A are ECE 85, 85L, 90, 90L, 102, 118, 124, 128, 128L; one lab from ECE 119L, 118L, 121L, 134L, 138L, 155L; and two courses from ECE 121, 134, 138, 155.
15. Students must enroll in and complete ECE 1 during the first two semesters of attendance at Fresno State.
16. The following prerequisite courses must be completed with a letter grade of C or better: ECE 71, 72, 85, 85L, 90, 90L.

Prerequisites

Students violating any course prerequisites may be required to take an additional course (if they earned a C) or repeat a course (if they earned a D or less.) Repeated violations of prerequisites may trigger disciplinary action.

Computer Engineering Major

1. Major requirements (68 units) and additional requirements (21 units)

Major requirements (68 units)

ECE 1, 71 or CSCI 40, ECE 81 or CSCI 41, ECE 72, 85, 85L, 90, 90L, 103, 106, 118, 118L, 124, 125, 128, 128L, 146, 174, 176, 178, 186A (52 units)

Technical Area (16 units)

Select at least 16 units from the following: ECE 107, 114, 115, 119L, 126, 132, 134, 134L, 135, 138, 138L, 140, 148, 155, 172, 173; CSCI 144, 150, 156

Additional requirements (21 units)

MATH 76, 77, 81; PHYS 4A; PHYS 4B, PHYS 4BL; PHYS 4C (see advising notes)

2. General Education requirements (49 units)*

Select one course from each of the G.E. areas: Area A1, A2, D1, D2. (See G. E. listings.)

The following courses are required to satisfy both G.E. and major requirements: MATH 75 [B4], CHEM 3A [B1], PHIL 1 or 10 [C2], ECE 186B [IB], ECON 40 or 50 [D3], BIOL 10 [B2]

3. Other requirements (6 units)

Upper-division writing and Multicultural and International (MI)

PLSI 120 or BA 104 are required to satisfy MI requirements.

4. Sufficient elective units to meet required total units (if needed) (See Degree Requirements.)

5. Total (124 units)

Note: Engineering majors are exempt from G.E. Area A3, Area E, Area IC, and Area ID. Only one course is required for G.E. Area C2.

Advising Notes

9. Courses in mathematics, the physical sciences, or engineering taken CR/NC are not counted toward fulfillment of degree requirements in computer engineering.
10. Computer engineering majors might consider a math minor. (See faculty advisor for details.)
11. All computer engineering students must consult with their academic advisor at least once each year.
12. The Upper-Division Writing Skills requirements can be met by passing the university examination or completing an upper-division writing course with a letter grade of C or better no sooner than the term in which 60 units of coursework are completed. The writing course units are not counted toward the required 130 program units.
13. ENGR 101 may be taken instead of MATH 81.

14. The prerequisites for ECE 186A are ECE 85, 85L, 90, 106, 118, 118L, 124, 128, 128L, 176; CSCI 41; and one course from ECE 146 or 174.
15. Students must enroll in and complete ECE 1 during the first two semesters of attendance at Fresno State.
16. The following prerequisite courses must be completed with a letter grade of C or better: ECE 72, 71, 85, 85L, 90, 90L.

Prerequisites: Students missing any course prerequisites may be required to take an additional course (if they earned a C) or repeat a course (if they earned a D or less.)

Master of Science in Electrical and Computer Engineering (MS-ECE)

The Master of Science in ECE Engineering program has the following goals: (1) to develop the students' advanced analytical skills by developing an in-depth understanding of major theoretical and practical engineering concepts; (2) to develop students' written and oral communication skills applied to technical areas; (3) to achieve an appropriate level of competence by the students in solving practical electrical or ~~mechanical~~computer engineering problems; (4) to develop students' critical and creative thinking skills in mastering new topics required to understand and solve complex engineering problems; and (5) to allow the students to demonstrate a sufficient depth of knowledge in a substantive area of electrical or ~~mechanical~~computer engineering to pursue advanced academic or industrial work.

Program Objectives

The program has the following objectives: (1) to complete a minimum of 30 units of graduate coursework, ~~including appropriate core courses~~; (2) to successfully demonstrate knowledge base in culminating experience, and (3) to enhance the students' career goals by increasing their theoretical, research, and problem-solving skills in applied engineering.

The program consists of the following:

A. Main Core (1 unit)

ENGR 200

B. Option Core (9 units)

~~EE Option: ENGR 201, ECE 224; choose one from ECE 230, ECE 241, ENGR 206~~

~~CompE Option: ECE 278; choose two from ECE 240, 243, 274~~

~~ME Option (choose 3 courses): ENGR 201, 202, 205, 206~~

C. Electives (14 units)

~~CompE and EE Options: Choose from remaining upper-division and graduate courses. Minimum of 6 units from corresponding program electives. Maximum of 9 upper-division units. See advising notes.~~

ME Option: Choose from remaining upper-division and program courses. Maximum of 9 upper-division units. See courses in Mechanical Engineering.

D. Culminating Experience (6 units)

For either option, choose

4. 6 units of electives plus comprehensive exam, minimum of 3 units from corresponding program electives, or
5. ECE 298 or ME 298 Project (3 units) plus 3 units of program electives, or
6. ECE 299 or ME 299 Thesis (6 units)

Total (30 units)

Advising Notes

4. CompE Program electives: ECE 224, 240, 242, 243, 255, 274, 291T, 290 (3 units max)
5. EE Program electives: ENGR 206, ECE 230, 231, 232, 241, 245, 247, 249, 251, 253, 255, 257, 259, 274, 291T, 290 (3 units max)
6. Approved graduate courses may be taken with the permission of the department of the program of study.

Up to nine semester hours of satisfactory graduate credit may be transferred into the program from other institutions if not used in completing another graduate degree program.

Undergraduate courses may be transferred if the courses were not used in completing another degree program. The total undergraduate upper-division semester hours applied to this degree program cannot exceed nine hours.

The Graduate Record Examination (GRE) Aptitude Test is required of all students prior to advancement to candidacy status.

The program requires extensive use of a computer; therefore, students are expected to have their own computer or access to one 24 hours a day.

Admission to the University

Requirements for admission to California State University, Fresno are in accordance with Title 5, Chapter 1, Subchapter 3 of the California Code of Regulations.

Admission to the Program

Students who apply to the program are placed in one of the following categories:

1. **Graduate Standing, Classified.** Students with (a) an undergraduate degree in electrical or computer engineering from a recognized institution of post-secondary education an ABET-accredited program, (b) a good academic record and an undergraduate grade point average of 3.0, (c) a minimum GRE quantitative score of

~~150 550 are eligible for classified (degree status) graduate standing, and (d) a letter of recommendation from an academic or an industrial source.~~

2. **Graduate Standing, Conditionally Classified.** ~~Electrical and computer engineering~~ Students with 2.5 GPA from non-ABET accredited engineering programs, or students with a degree in physical science or mathematics or a different engineering discipline, and who have not met the requirements of category 1, will be given conditionally classified graduate standing. These students may be required to take prerequisite courses and/or achieve a certain future GPA as determined by the graduate program at the time of admission. Upon satisfactorily meeting any all specified requirements, students will then be advanced to classified standing.

Degree Candidacy

The following requirements must be met prior to advancement to candidacy:

1. Classified graduate standing.
2. ~~Completion at California State University, Fresno of at least 109 units of the proposed degree program with a 3.0 average GPA on all completed courses listed on the application for advancement to candidacy work appearing on the program.~~
3. ~~A minimum grade point average of 3.0 in all required graduate coursework from the date of commencing the first course of the proposed master's degree program.~~ Departmental recommendation for advancement to candidacy.
4. Satisfactory completion of the Graduate Writing Skills Requirement (ENGR 200).

Non-degree students

Students with a bachelor's degree may take graduate courses (concurrent with regular students) for credit or audit. Prior approval is required.

Master of Science Degree requirement

4. Fundamental Courses (12 units)
 - b. ENGR 200 (1)
 - c. ENGR 201 (2)
 - d. Select from the following (9)
ECE224, ECE231, ECE241, ECE245, ECE253
ECE240 ECE 242, ECE274, ECE278
5. Choose from the following (12-18 units)
 - d. Up to six units may be taken from ECE 100-level courses; which are not required for a BS degree in the ECE department.
 - e. Up to six units of 200-level courses in program related subjects (Business, Engineering, Mathematics, Physics, and Computer Science) may be taken with the graduate coordinator's approval.

f. 200-level ECE courses (Course prerequisites must have been completed before enrolling in the course).

6. Culminating Experience (0-6 units)

Choose one of the following routs:

Thesis – ECE 299 (6)

Projects – ECE 298 (3)

Comprehensive Exam (0)

Total 30 units

Advising note:

Must be classified and advanced to candidacy before enrolling in ECE 290, ECE 299, or ECE 298.

ENGR 200. Seminar in Engineering

Orientation to the graduate program, exposure to various areas within Electrical Engineering and Mechanical Engineering, introduction to research methods, discussion of project and thesis topics.

Units: 1

ECEENGR 201. Systems Modeling and Realization

Prerequisites: Graduate Standing. Advanced software and hardware engineering tools and their applications; instrumentation and experimental measurements; transducers; analog and digital signal conditioning; instrumentation amplifiers; signal reconstruction; actuators; dynamic systems modeling; realization of models; spectrum analysis; real-time computations; data analysis. (12 lecture, 32 lab hours)

Units: 32

ENGR 202. Applied Engineering Analysis

Study of analytical tools used in the analysis and modeling of engineering systems in addition to the use of simulation software such as MATLAB. Emphasis is placed on solving problems tied to direct applications within the engineering disciplines.

Units: 3

ENGR 205. Computing in Engineering Analysis

(ENGR 205 same as CE 205). Prerequisite: graduate status in engineering. Solution of engineering problems using digital computation. Modeling of engineering systems for numerical analysis at the graduate level. Solution of engineering problems using digital computation. Modeling of engineering systems for numerical analysis.

Units: 3

ENGR 206. Stochastic Theory in Engineering Analysis for Electrical Engineers

Prerequisites: ECE 125 or ME 125 or equivalent. Estimation theory and applications, reliability theory, statistical yield models, random processes, autocorrelation, power spectral densities, noise characterization, random processes, matched filters, multivariable regression, analysis of variance, and design of experiments. Applications to communications and communication systems, control systems, and dynamic mechanical systems.

Units: 3

ENGR 210. Linear Control Systems

A first-year graduate course covering the analysis, synthesis, and performance of linear control systems. Partial fraction expansion, Routh's criterion, the impulse function. Basic servo characteristics and types, block diagrams, transfer functions. A detailed treatment for the root locus method for analysis and synthesis. Frequency response, logarithmic and polar plots, Nyquist's criterion, stability characteristics, phase margin and gain margin.

Units: 3

Justification:

In anticipation of the approval of the elevation of the EE-option and CE-option in the MS in Engineering to a "MS in Electrical and Computer Engineering", we are requesting these catalogue copy changes to reflect the requirements of the degree (as a Master's degree itself and not an option of the Master's in Engineering). The MS-ECE detailed program description will be under the ECE department in the catalogue, rather than being in the general Lyles College of Engineering section (where the elevating options are presently listed).

One course change is required. That is to reduce the units of ENGR 201 to 2-units instead of 3-units and call it ECE 201. This change will be more reflective of the course's technical content as a required course in the MS-ECE program.

This catalog change is necessary to reflect the elevation of the EE-option and CE-option to a full-fledged MS-ECE program offered by the ECE department.

GRADUATE COURSE CHANGE OR DELETION REQUEST

Return original to:

Division of Research and Graduate Studies
Thomas Administration Building, Room 130
Mail Stop TA 51

Graduate Program: MS in Engineering
Department: Electrical and Computer Engineering
Contact Person: Nagy Bengiamin
Phone: 8-8339
E-mail: bengiami@csufresno.edu
Effective Term/Year: Fall 2020

1. PURPOSE OF FORM: To propose revision or deletion of an existing graduate course. *If you wish to propose a new course, or a conversion of a topics course, or make substantial changes to an existing course, use the "New Graduate Course Request" form. If you wish to change Mode of Instruction to Online, use the "Proposal to Change Mode of Instruction to Online for Multi-Mode and Web-Based Courses" form.*

2. PURPOSE OF YOUR REQUEST:

a. Course Revision. (check all that apply)

<input checked="" type="checkbox"/> Subject/Catalog Number	<input type="checkbox"/> Description	<input type="checkbox"/> Course Classification Number (C/S)
<input type="checkbox"/> Title	<input checked="" type="checkbox"/> Units	<input type="checkbox"/> Mode of Delivery
<input type="checkbox"/> Prerequisite	<input type="checkbox"/> Grading Basis	

(Complete items 3, 4, and 5 below)

b. Course Deletion. Check here: ☐ (Complete items 3 and 5 below)

3. COURSE INFORMATION PRIOR TO REVISION:

Prefix/ Catalog Long Course
Subject ENGR Number 201 Title Systems Modeling and Realization Units 3

Attach a copy of the entire page on which this course appears in the current University Catalog. Highlight the course with a yellow marker.

4. REVISED COURSE INFORMATION:

Prefix/ Catalog Long Course
Subject ECE Number 201 Title Systems Modeling and Realization Units 2

Systems Modeling Letter
Short Title (16 spaces only) Grading Basis (Letter, CR/NC, SP, Mixed)

Mode of Delivery (check one): ☒ Lecture ☐ Seminar ☐ Supervision
☐ Multi-mode/Web-based (use "Proposal to Change Mode of Instruction to Online for Multi-Mode and Web-Based Courses" form)

Course Classification (C/S#) 02

Using a xerographic catalog copy of this course, cross out wording to be deleted. Type new language in the margins. If there is not sufficient space to type lengthy additions, designate inserts (a, b, c, etc.). Attach fully typed language for each insert on an additional sheet. **Do not exceed 40 words in the course description.**

5. **JUSTIFICATION:** Explain on an attached sheet why the proposed change is needed. If the change is a part of a series of proposed changes in related courses, please elaborate. In addition, if the proposed change entails a change in units or a significant modification in terms of method of delivery, special facilities, library resources, technical assistance, or other costs, please furnish details.

6. **CONSULTING SIGNATURES (if required)**

Signatures must be obtained from those departments potentially affected by the proposed change(s).

I have read the proposal and support the proposed change(s).

Yes ☒ No ☐

If no, please explain your concern (s):

Department Chair (of department being consulted)

Department

Department

Department Chair (typed name)

Department Chair (typed name)

Department Chair Signature

Department Chair Signature

Date

Date

7. **REQUIRED SCHOOL SIGNATURES** (verifies proposal has been approved)

Graduate Program Coordinator

Nagy Bengiamin

Typed Name

Signature

Date

Department Chair

Reza Raeisi

Typed Name

Signature

Date

School Curriculum (or Credential) Committee Chair (if applicable)

Nagy Bengiamin

Typed Name

Signature

Date

School Dean

Ram Nanna

Typed Name

Signature

Date

- For committee use only -

UNIVERSITY GRADUATE COMMITTEE/GRADUATE CURRICULUM
SUBCOMMITTEE REVIEW RECOMMENDATION:

☒ Request Approved

☐ Request Denied

☐ Request Deferred

12/4/19
Date of Action

Explanation:

w/ minor revisions

Recommendation approved by:

Dean, Research and Graduate Studies/or designee

James Marshall
Typed Name

[Signature]
Signature

12/5/19
Date

ENGR 201. Systems Modeling and Realization

Prerequisites: Graduate Standing. Advanced software and hardware engineering tools and their applications; instrumentation and experimental measurements; transducers; analog and digital signal conditioning; instrumentation amplifiers; signal reconstruction; actuators; dynamic systems modeling; realization of models; spectrum analysis; ~~real-time computations~~; data analysis. (~~12~~ lecture, ~~32~~ lab hours)

Units: ~~32~~

Justification:

In anticipation of the approval to elevate the EE-option and CE-option of the MS in engineering program to a full-fledged MS in ECE program, ENGR 201 will be a required course in the elevated program. The curriculum of the elevated program is designed for 2 units only with ENGR 201 being one of the required courses.

CALIFORNIA STATE UNIVERSITY, FRESNO
Department of Electrical and Computer Engineering

I. COURSE TITLE: Systems Modeling and Realization

Course No: ECE 201

Unit Value: 2

Prerequisite: Graduate Standing

Semester: XXXX

Instructor: Dr. Nagy Bengiamin

Office: EE276

Email: bengiami@csufresno.edu

Office Hours: Posted on Canvas

Telephone: 278-8339

II. CATALOG DESCRIPTION: Advanced software and hardware engineering tools and their applications; instrumentation and experimental measurements; transducers; analog and digital signal conditioning; instrumentation amplifiers; signal reconstruction; actuators; dynamic systems modeling; realization of models; spectrum analysis; real-time computations; data analysis. (1 lecture, 3 lab hours)

III. PURPOSE OF THE COURSE: This course is designed to introduce students to typical recent engineering tools used in design and analysis such that they can solve challenging technical problems effectively. The intention is to prepare graduate students for advanced computational analysis and conducting experimental work needed to complete an effective graduate program as well as practice after graduation. The gained knowledge and hands-on experience in this course would enhance students' grasp of theoretical concepts and help them appreciate their value in practice. At the completion of this course students would feel comfortable working in the lab with advanced engineering tools and be able to use these tools for research and investigation. The gained self-confidence should contribute positively to students' work throughout their program of study and enhance their ability to lead a challenging career.

IV. MODE OF DELIVERY:

- The course will have a Canvas page. You are responsible to check the posted course announcements and the homework assignments on regular basis.
- Some of the lectures (less than 20% of the total number) may be delivered online via Canvas. These lectures will be announced in class or on Canvas well before the anticipated class time.

V. COURSE GOALS:

- Provide students with a deeper understanding of main concepts in signal analysis, mathematical modeling, instrumentation and testing.
- Enhance students' analytical and critical thinking skills by applying theoretical and practical engineering concepts to investigate and conduct research in open-ended problems.
- Introduce students to advanced engineering tools (software and hardware) and their use in solving technical problems.
- Enhance students' hands-on experiences through the application of theoretical concepts using hardware and software tools.
- Help students reach a sufficient level of comfort with popular engineering tools such that they can use them effectively in problem solving and explore them further in the future.
- Improve students' written communication skills via lab reports and class presentations.

VI. STUDENT LEARNING OUTCOMES:

At the completion of this course, students will be able to:

1. Apply theoretical signal analysis and mathematical modeling concepts in a laboratory environment.

2. Use recent software (Matlab and Labview) to model dynamic systems, acquire experimental data, implement real-time systems, and evaluate mathematical model results versus actual data.
3. Integrate engineering specific software with other general purpose software tools.
4. Identify and utilize a variety of instruments, actuators and sensors used in general engineering applications.
5. Integrate hardware and software to establish test procedures for system characterization.
6. Write effective laboratory reports.

VII. TEXTBOOK AND REQUIRED MATERIAL:

- "Sensors and Actuators – Engineering System Instrumentation," - Second Edition; by Clarence W. De Silva, CRC Press, ISBN 978-1-4665-0681-7, 2016. (An **eBook** version is available)
- Handouts as posted on Canvas.

VIII. COURSE CONTENT

Tentative Time Schedule:

(Subject to change according to the progress/needs of the group in the course and/or due to extraneous circumstances.)

Date	Topic	Reading Assignment
xxxx	Introduction; Syllabus; Review of basic concepts	Chapter 1
xxxx	Intro. to instruments and Matlab including Simulink and Simscape	Handout
xxxx	Introduction to Labview	Handout (lab activity)
xxxx	Component Interconnection and Signal Conditioning	Chapter 2
xxxx	Wheatstone-Bridge	Handout (lab activity)
xxxx	Performance specifications and analysis	Chapter 3
xxxx	Black-Box Characterization	Handout (lab activity)
xxxx	Analog Sensors and Transducers	Chapter 5
xxxx	Linear Variable Differential Transformer (LVDT)	Handout (lab activity)
xxxx	Strain Gages	Handout (lab activity)
xxxx	Temperature Sensors	Handout (lab activity)
xxxx	Thermocouples	Handout (lab activity)
xxxx	Spectral Analysis	Handout
xxxx	Vibration Experiment	Handout (lab activity)
xxxx	Digital Transducers	Chapter 6
xxxx	Discrete Actuators	Chapter 8
xxxx	Final Activity	Handout

IX. LAB REPORTS

- Each group should submit one typed formal lab report for each experiment.
- Each group member must write an identifiable section(s) of the report. Write your name at the beginning of each section you write.
- The whole group is responsible for the uniformity and completeness of the report; i.e. all group members must review the report and agree on the necessary changes.

- All reports are due at beginning of the lab session following the completion of the reported experiment. Late reports will lose 20% of the grade for every late day.

The organization and format of the typed formal report are to be determined by the group. The following should be included for a minimum content:

1. Cover page that includes the course title, experiment title, list of group members, date. (Attached)
2. Objective (s) of the experiment: This should be a concise statement (about 50 words) that gives a clear idea about the purpose of the experiment and what is intended to be achieved. Highlight the scientific/engineering concepts to be investigated.
3. Background: This section may include a brief presentation of the relevant theoretical and basic scientific/engineering concepts that support the experimental work to be conducted. If needed, a list of references may be given at the end of the report and referenced in this section by number.
4. Experiment Setup and Methodology: This section should include a list of the major pieces of equipment used in addition to the following:
 - How the experiment is conducted and the purpose of each step.
 - Equipment integration including block and wiring diagrams. A photo of the physical setup may also be included.
 - Computer and microcontrollers software code with sufficient explanation of the computational logic used.
5. Results Received: This section should include the raw data received, copies of software code, personal observations, and any other support material. Data should be tabulated and presented in a logical manner.
6. Data Analysis and Evaluation: This section should include data manipulation and analysis to support the engineering/scientific concepts investigated by the experiments. Comment on the level of accuracy and sufficiency of data received.
7. Conclusion: Write a clear statement on the final accomplishments of the experiment and the level of success in achieving the stated objectives and demonstrating the targeted scientific/engineering concepts. You may also make suggestions for future work and improvising on the employed methodology.

X. EVALUATION PROCEDURES

A. Percent Distribution Point Value

1. Quizzes (25%)

You should be prepared to take a 15-minute quiz at the beginning of class on Monday. If given, the scope will be limited to the previous week's lecture and lab work.

2. Performance during lab sessions (20%)

You will be assessed on your attentiveness, contribution to the group work, received results, response to questions, and compliance with lab policy and safety rules.

3. Assignments and Lab reports (55%)

You will be assessed on the format of the report and the received results. Identifiable individuals' contributions are required.

4. No final exam in this course since there will be weekly quizzes and evaluated laboratory activities.

B. Grading Scale

89-100% (A); 79-88% (B); 69-78% (C); 59-68% (D); 0-58 (F)

XI. POLICIES:

A. Course Policies

- You should consult Canvas on regular basis for announcements, assignments and due dates.
- You must attend all lab sessions and contribute to the work at hand.
- The above topics and procedures for this course are subject to change in the event of extenuating circumstances. These changes will be announced in class and you are responsible to find out about these from your classmates if you happened to have been absent the day the announcement was made.
- Students with disabilities are reminded to identify themselves to the university and the instructor so reasonable accommodation for learning and evaluation can be made.
- You are referred to the university's policy regarding student conduct. University policies are stated in the university Catalog, Schedule of Courses, and other university publications.
- Safety is important and caution must be exercised at all times. You are responsible for your safety and for the equipment you are using. Use commonsense in handling equipment and avoid any abuse in use. The following precautions are of the utmost importance:
 - Don't work in the lab by yourself at any time.
 - Use the phone in the room to call 911 in case of emergencies
 - Avoid unnecessary internet surfing
 - Don't apply power to the system if you are unsure of any part of the system
 - Keep your bench organized and clean at all times
 - Don't bring food or drinks to the lab at any time

B. University Policies

Students with Disabilities: Upon identifying themselves to the instructor and the university, students with disabilities will receive reasonable accommodation for learning and evaluation. For more information, contact Services to Students with Disabilities in University Center Room 5 (278-2811).

Honor Code: "Members of the CSU Fresno academic community adhere to principles of academic integrity and mutual respect while engaged in university work and related activities." You should:

1. Understand or seek clarification about expectations for academic integrity in this course (including no cheating, plagiarism and inappropriate collaboration).
2. Neither give nor receive unauthorized aid on examinations or other course work that is used by the instructor as the basis of grading.
3. Take responsibility to monitor academic dishonesty in any form and to report it to the instructor or other appropriate official for action.

Students should sign a statement at the beginning of all submitted reports saying:

"I have done my own work and have neither given nor received unauthorized assistance on this work."

Cheating and Plagiarism: "Cheating is the actual or attempted practice of fraudulent or deceptive acts for the purpose of improving one's grade or obtaining course credit; such acts also include assisting

another student to do so. Typically, such acts occur in relation to examinations. However, it is the intent of this definition that the term 'cheating' not be limited to examination situations only, but that it include any and all actions by a student that are intended to gain an unearned academic advantage by fraudulent or deceptive means. Plagiarism is a specific form of cheating which consists of the misuse of the published and/or unpublished works of others by misrepresenting the material (i.e., their intellectual property) so used as one's own work." Penalties for cheating and plagiarism range from a 0 or F on a particular assignment, through an F for the course, to expulsion from the university. For more information on the University's policy regarding cheating and plagiarism, refer to the Schedule of Courses (Legal Notices on Cheating and Plagiarism) or the University Catalog (Policies and Regulations).

Plagiarism Detection: The campus subscribes to the Turnitin plagiarism prevention service (<http://turnitin.com/>), and you may need to submit written assignments to Turnitin via Blackboard (<http://blackboard.csufresno.edu/>). Your work will be used by Turnitin for plagiarism detection and for no other purpose. You may indicate in writing to the instructor that you refuses to participate in the Turnitin process, in which case the instructor can use other electronic means to verify the originality of the work. Turnitin Originality Reports will generally be available for your viewing.

Computers: "At California State University, Fresno, computers and communications links to remote resources are recognized as being integral to the education and research experience. Every student is required to have his/her own computer or have other personal access to a workstation (including a modem and a printer) with all the recommended software. The minimum and recommended standards for the workstations and software, which may vary by academic major, are updated periodically and are available from Information Technology Services (<http://www.csufresno.edu/ITS/>) or the University Bookstore. In the curriculum and class assignments, students are presumed to have 24-hour access to a computer workstation and the necessary communication links to the University's information resources."

Disruptive Classroom Behavior: "The classroom is a special environment in which students and faculty come together to promote learning and growth. It is essential to this learning environment that respect for the rights of others seeking to learn, respect for the professionalism of the instructor, and the general goals of academic freedom are maintained. ... Differences of viewpoint or concerns should be expressed in terms which are supportive of the learning process, creating an environment in which students and faculty may learn to reason with clarity and compassion, to share of themselves without losing their identities, and to develop and understanding of the community in which they live . . . Student conduct which disrupts the learning process shall not be tolerated and may lead to disciplinary action and/or removal from class."

Copyright policy: Copyright laws and fair use policies protect the rights of those who have produced the material. The copy in this course has been provided for private study, scholarship, or research. Other uses may require permission from the copyright holder. The user of this work is responsible for adhering to copyright law of the U.S. (Title 17, U.S. Code). To help you familiarize yourself with copyright and fair use policies, the University encourages you to visit:

<http://www.csufresno.edu/library/libraryinformation/campus/copyright/copyrtpolicyfull.pdf>.

For copyright Questions and Answers:

<http://www.csufresno.edu/library/libraryinformation/campus/copyright/faqcopyright.pdf>.

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materials on any single computer for non-commercial, personal, or educational purposes only, provided that you (1) do not modify it, (2) use it only for the duration of this course, and (3) include both this notice and any copyright notice originally included with the material. Beyond this use, no material from the course web site may be copied, reproduced, re-published, uploaded, posted, transmitted, or distributed in any way without the permission of the original copyright holder. The instructor assumes no responsibility for individuals who improperly use copyrighted material placed on the web site.

Subject to Change: The syllabus and schedule are subject to change in the event of extenuating circumstances.

ENGR 201 Systems Modeling and Realization
Electrical and Computer Engineering Department

Experiment Title: _____

Prepared by: Team member 1 (lead person) _____

Team member 2 _____

Team member 3 _____

Date _____

“I have done my own work and have neither given nor received unauthorized assistance on this work.”

Signatures: Team Member 1 _____ Team Member 2 _____ Team Member 3 _____

To be completed by the instructor

Final Grade:

Team member 1: Lab performance _____ Report _____

Team member 2: Lab performance _____ Report _____

Team member 3: Lab performance _____ Report _____

Appendix III
Student Outcomes Assessment Plan (SOAP)

Master of Science in Electrical and Computer Engineering (MS-ECE) Student Outcomes Assessment Plan (SOAP)

Mission Statement

The MS-ECE Program provides advanced engineering education in Electrical and Computer Engineering to resident students as well as practicing engineers working in the high-tech industries surrounding the Fresno metropolitan area. Graduates of this program should be able to advance their career and work on complex engineering problems dictated by continuing advances in technology. Additionally, the program seeks to prepare graduates for advanced research and engineering applications to fulfill the technical needs of local industry in the region and beyond.

Program Objectives

The MS-ECE program builds upon a previously acquired foundation in basic science, mathematics, and electrical/computer engineering to advance skills in research and applied engineering science. The objective of the program is to enhance the graduates' ability to advance their chosen careers in industry, academia, and public institutions. Career advancement can be in the form of successfully completing higher education or practicing engineering where assumed responsibilities are well beyond those expected of entry level engineering positions. Advancing careers in practice can be via

- 1) a deeper understanding of engineering theoretical and applied concepts,
- 2) engaging in advanced technological endeavors including research, and
- 3) contributing effectively to the mission of the organization.

These program objectives are consistent with the essential components of the mission and vision of California State University Fresno:

- Support and develop high quality graduate programs appropriate to the needs of the region
- Engage in high quality research, with particular emphasis on applications that support the region.
- Build upon existing academic programs and create new academic programs to help transform and develop the region.

The ECE faculty members offer courses and conduct scholarly work in the broader areas of electrical and computer engineering including communication, control systems, computer networking, embedded systems, VLSI/digital systems, robotics, power systems, wireless sensory systems, cyber security, artificial intelligence, and high frequency electronics. These areas overlap and they provide opportunities for integration and cross-area projects. This facilitates providing students with broad backgrounds and programs of study that prepare them best for practice as well as more advanced studies.

Student Learning Outcomes (SLOs)

The graduate of the program should be able to

- 1) apply advanced mathematics and engineering science concepts to practical problems.
- 2) demonstrate knowledge in advanced electrical/computer engineering subjects and utilize advanced engineering tools to solve engineering problems.

- 3) utilize modern engineering tools, conduct experiments and analyze collected data (hands-on).
- 4) communicate effectively orally and in writing.
- 5) conduct literature searches and formulate ideas via critical thinking practices.

Table 1 demonstrates how the curriculum supports the stated SLOs.

Table 1 - Curriculum Map

SLO	ENGR 200	ECE 201	Required courses	Elective courses	Culminating Experience
1		I	D	D	M
2		I	D	D	M
3		I	D	D	M
4	I	I	D		M
5	I		D		M

I- introduced D- developed M-mastered

Table 2 summarizes the assessment tools utilized to collect data. Direct and indirect assessment tools are also identified.

Table 2 - Assessment Tools

SLO	Student coursework (direct)	Embedded questions (direct)	Culminating experience (direct)	Exit Survey (indirect)	Alumni Survey (indirect)
1	X	X	X		X
2	X	X	X	X	X
3	X		X	X	X
4			X	X	X
5			X		X

Standard

On a scale of 1 (poor) to 5 (excellent), the faculty members consider a rating of 3.75 or higher to be satisfactory. A rating below 2.75 for any of the outcomes requires immediate attention, and a rating between 2.75 and 3.75 requires further observation as a “carry over item” in the next evaluation cycle. Attached are the rubrics for assessing student learning outcomes.

Time Schedule and Closing the Loop

Table 3 presents the time schedule for administering the assessment tools. It should be noticed that this schedule facilitates collecting a minimal amount of data on all SLOs every year.

Table 3 - Time Schedule

Student Coursework (direct)	Embedded questions (direct)	Evaluation of culminating experience (direct)	Exit Survey (indirect)	Alumni Survey (indirect)
One required course every year	One 200-level elective course every year	Every year	Every year	Every four year

Collected data is to be compiled and analyzed by the faculty every year for continuous monitoring. Rating below 3.75 may require immediate attention and further data gathering before the end of the four-year cycle. A comprehensive review of the program takes place every four years to examine patterns in data and to determine action items for program improvement.

Rubric
Application of MATH, SCIENCE, and ENGR Principles
MS-ECE Student Learning Outcome 1

Course#: _____

Evaluate each item on a scale of 1 to 5 (5 is the highest).

Item	Proficiency					
	5	4	3	2	1	N/A
Proper selection of math/science/en gr principles	<i>Selection of math/science/en gr principles was well justified and explained</i>		<i>Selection of math/science/en gr was partially justified</i>		<i>Selection of math/science/en gr was not justified</i>	
Application of math/science/en gr to problems	<i>Advanced math/science/en gr principles were applied with depth to solve key problems in depth</i>				<i>Math/science/en gr principles were referred but not applied to solve key problems</i>	
The effectiveness of applying math/science/en gr principles to problems	<i>Application of Math/science/en gr principles was essential to solve key problems</i>				<i>Application of Math/science/en gr principles was not related to solve key problems</i>	

Average Score: _____

Evaluator: _____

Date: _____

Rubric
Knowledge in ECE Subjects and Engineering Tool Skills
MS-ECE Student Learning Outcome 2

Course#: _____

Evaluate each item on a scale of 1 to 5 (5 is the highest).

Item		Proficiency					
		5	4	3	2	1	N/A
In-depth Knowledge on EE Subjects	<i>Problem formulation</i>	<i>Conduct research to Identify and formulate a problem using mathematical tools and engineering models</i>					
	<i>Problem solving</i>	<i>Solve problem mathematically or using engineering tools</i>					
	<i>Analyzing results</i>	<i>Analyzing results quantitatively</i>					
Engineering Tool Skill	<i>Modeling Tools</i>	<i>Fluent</i>				<i>Learning</i>	
	<i>Design Tools</i>	<i>Fluent</i>				<i>Learning</i>	
	<i>Analysis Tools</i>	<i>Fluent</i>				<i>Learning</i>	
	<i>Manufacturing Tools</i>	<i>Fluent</i>				<i>Learning</i>	

Average Score: _____

Evaluator: _____

Date: _____

Rubric
Conduct Experiments and Data Analysis
MSE-EE Student Learning Outcome 3

Course#: _____

Evaluate each item on a scale of 1 to 5 (5 is the highest).

Item		Proficiency					
		5	4	3	2	1	N/A
Experiments and analysis of data	<i>Predefined Objectives and Goals</i>	<i>Understand the objectives and goals of conducting experiments</i>				<i>Conduct experiments without goals</i>	
	<i>Proper Methodology</i>	<i>Prepare the experiments with equipment and well-thought procedures</i>				<i>No preparation</i>	
	<i>Data analysis</i>	<i>Data analysis using mathematical tools and engineering modeling</i>				<i>No verification of the data from experiments</i>	

Average Score: _____

Evaluator: _____

Date: _____

Rubric
Technical Communication Skills
MS-ECE Student Learning Outcome 4

Course#: _____

Evaluate each item on a scale of 1 to 5 (5 is the highest).

Item		Proficiency					
		5	4	3	2	1	N/A
Verbal communication	<i>Delivery</i>	<i>Proper choice of verbal language</i>				<i>Use of casual, conversational, impolite language</i>	
	<i>Time</i>	<i>Effective use of time</i>				<i>Untimely delivery (Overtime)</i>	
	<i>Interaction with Audience</i>	<i>Eye contacts, Posture, and Q/A</i>				<i>Showing nervousness</i>	
Written Communication	<i>Grammar</i>	<i>Free from grammar errors</i>				<i>Need a proof reading.</i>	
	<i>Technical Writing Style</i>	<i>Paragraphs were written and organized to support thesis statements.</i>				<i>Paragraphs were written without a direction.</i>	
	<i>Focus and Organization</i>	<i>Introduction, main body, and conclusions were written coherently to deliver a main theme of the document.</i>				<i>Lack of structure and focus</i>	

Average Score: _____

Evaluator: _____

Date: _____

Rubric
Literature Search and Critical Thinking
MS-ECE Student Learning Outcome 5

Course#: _____

Evaluate each item on a scale of 1 to 5 (5 is the highest).

Item		Proficiency					
		5	4	3	2	1	N/A
Literature Searches	<i>Relatedness</i>	<i>All the cited references were related to the study.</i>				<i>Most references were not related to the study.</i>	
	<i>Sufficiency</i>	<i>Enough number of major references were cited and studied.</i>				<i>The number of references is too small.</i>	
Critical Thinking	<i>Formulate</i>	<i>Problem formulation was supported by preliminary study and a sequence of logical reasoning.</i>				<i>Problem formulation was not justified.</i>	
	<i>Approach</i>	<i>The solution of problem was approached scientifically using a sequence of logical steps.</i>				<i>No systematic approach.</i>	
	<i>Correctness</i>	<i>The correctness of problem solution was verified using scientific method, mathematically or engineering modeling.</i>				<i>The correctness of problem was not discussed.</i>	
	<i>Completeness</i>	<i>The pros and cons of the problem solution were discussed using well-versed logic and justification.</i>				<i>The problem solution was given without reasonable justification.</i>	

Average Score: _____

Evaluator: _____

Date: _____



Jim Marshall <jamesm@mail.fresnostate.edu>

Fwd: Substantive Change Screening Determination: No further review of program needed

1 message

Xuanning Fu <xfu@csufresno.edu>

Thu, Jan 30, 2020 at 12:20 PM

To: James Marshall <jamesm@csufresno.edu>, "Goto, Laraine" <laraineg@csufresno.edu>

FYI. Please note the activation requirement within 30 days of program implementation.

Xuanning

Xuanning Fu, Ph.D.
Interim Vice Provost
California State University, Fresno
Fresno, CA 93740-8014
Phone: (559) 278-2636 | Fax: (559) 278-7987
xfu@csufresno.edu

----- Forwarded message -----

From: **John Hausaman** <jhausaman@wscuc.org>

Date: Thu, Jan 30, 2020 at 9:25 AM

Subject: Substantive Change Screening Determination: No further review of program needed

To: xfu@csufresno.edu <xfu@csufresno.edu>



WASC Senior College and University Commission

Dear ALO:

Thank you for submitting the Substantive Change Screening form. Following a review of the information submitted, it has been determined that no substantive change review will be necessary for the proposed program.

Program Implementation Notification Required

You are required to confirm implementation of the program in order for the program or location to be listed on the WSCUC website for purposes of financial aid eligibility verification by the U.S. Department of Education.

Login to the Accreditation Management Portal and the Master of Science in Electrical and Computer Engineering (MS-ECE) as Active within 30 days of implementation. Failure to report implementation may result in the suspension of financial aid eligibility for enrolled students.

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