Brothers, Sheila C.

From:	Vincent, Leslie H.
Sent:	Friday, November 15, 2019 2:30 PM
To:	Bird-Pollan, Jennifer; Brothers, Sheila C.; Woolery, Stephanie L.; Ett-Mims, Joanie; Cramer, Aaron M.
Cc:	Raphael Finkel
Subject:	NEW MS: Computer Engineering

Proposed New MS in Computer Engineering

This is a recommendation that the University Senate approve, for submission to the Board of Trustees, the establishment of a new MS in Computer Engineering, in the Department of Computer Science, in the College of Engineering.

Rationale:

The proposed program will provide an advanced degree in the area of Computer Engineering, an area in which we already have a successful undergraduate program and successful faculty research. The field of computer engineering integrates expertise from both electrical engineering and computer science, emphasizing an understanding of computer architecture, hardware/software interface, and the integration of computers into products and systems at a larger scale. The program would include faculty from both the ECE and CS departments working collaboratively with the program being housed in the Department of Computer Science. The proposed program will support the College of Engineering's mission "to provide education, research, and service in a scholarly environment in a way that prepares our students for successful professional careers, addresses the changing needs of our other constituents, and responds to the technological challenges facing the Commonwealth and the Nation." Development of graduate programs in Computer Engineering will further enhance the College's ability to pursue its "Top 50" vision of being internationally recognized and ranked as one of the top 50 colleges of engineering in the United States. Demand and salaries in computer engineering continue to be strong. Enrollment of 10-20 new students per year is anticipated.

SAPC Statement: SAPC considered the required collaboration between the Department of ECE and CS extensively as indicated within the proposal. Throughout the review process the committee asked for a formal MOU between the departments. Furthermore, we asked the proposer to document faculty support for the MOU developed and the response was that faculty did not vote on the MOU. There was concern among the SAPC regarding the potential for differing levels of faculty support from both departments. The proposal was evaluated based on SAPC's charge to consider programs based on academic excellence, need, and impact, desirability, and priority of the new academic program in relation to other programs, and its recommendation to approve the program was based on a vote of: 2 in favor, 1 opposed, and 3 abstaining.

Leslie H. Vincent, PhD
Department of Marketing & Supply Chain
Gatton College of Business & Economics
University of Kentucky
leslie.vincent@uky.edu

1. *This form has two sections. Section A contains information required by the University Senate and Registrar's office and Section B contains information required by two external entities, the CPE (Council on Postsecondary Education) and SACS-COC (Southern Association of Colleges and Schools Commission on Colleges). Although only Section A is required for University Senate approval, every question must be answered to receive CPE approval. Please write "not applicable" wherever that is the appropriate response, leaving no area blank.*

2. *The CPE requires that a pre-proposal and full proposal be submitted. The pre-proposal is submitted after a proposed program has received college-level approval. Answers to questions identified with a * by the question number on this form should be used for the CPE's pre-proposal. Such questions are in both Section A and Section B. Please email institutionaleffectiveness@uky.edu for more information about the CPE's pre-proposal process. The CPE's full proposal requires completion of both Sections A and B of this form and is submitted after approval by UK's Board of Trustees.*

3. *Once approved at the college level, your college will send the proposal to the appropriate Senate academic council (HCCC and/or GC) for review and approval. Once approved at the academic council level, the academic council will send your proposal to the Senate Council office for additional review via a committee and then to the Senate for approval. Once approved by the Senate, the Senate Council office will send the proposal to the appropriate entities for it to be placed on an agenda for the Board of Trustees. The contact person listed on the form will be informed when the proposal has been sent to committee and other times as appropriate.*

1a	Date of contact with Institutional Effectiveness[1]:	*July 16, 2018*
	☒ Appended to the end of this form is a PDF of the reply from Institutional Effectiveness.	
1b	Home College: *Engineering*	
1c	Home Educational Unit (school, department, college[2]): *Computer Science*	
ECE and CS are collaborating for this joint program. About half the courses come from each of these departments. ECE is the home department for the undergraduate program; for balance, both ECE and CS have agreed that CS should be the home department for the graduate programs (MS and PhD). Both departments will work closely together to make sure the programs are intellectually sound.		
1d*	Degree Type (Master's of Science, Master's of Business Administration, etc.): *MS*	
1e*	Program Name (Biology, Finance, etc.): *Computer Engineering*	
1f*	CIP Code (provided by Institutional Effectiveness): *14.09 01*	
1g	Is there a specialized accrediting agency related to this program?	Yes ☐ No ☒
	If "Yes," name:	
	The ABET and CSAB agencies only accredit undergraduate programs.	
1h	Was this particular program ever previously offered at UK but subsequently	Yes ☐ No ☒

---

1   You can reach Institutional Effectiveness by phone or email (257-2873 or institutionaleffectiveness@uky.edu).

2   Only interdisciplinary graduate degrees may be homed at the college level.

	suspended?				
	If "Yes," describe. (*300 word limit*)				

1i*	Requested effective date:	☒ Fall semester following approval.	OR		☐	Specific Date[3]:*Fall 20*

1j*	Anticipated date for granting first degree(s): *Spring 2020*

1k*	Contact person name: *Raphael Finkel*	Email: *raphael@cs.uky.edu*	Phone: *257-3885*

██

2a*	Provide a brief description of the proposed program. (*300 word limit*)
	The proposed Master's program in Computer Engineering (MS-CompE) will offer both a Plan A Thesis Option (24 hours of coursework plus a 6-credit thesis) and a Plan B Non-Thesis (30 hours of coursework which may include a 3-credit project) option. The proposed program will provide an advanced degree in the area of Computer Engineering, an area in which we already have a successful undergraduate program and successful faculty research.
	The field of computer engineering integrates expertise from both electrical engineering and computer science, emphasizing an understanding of computer architecture, hardware/software interface, and the integration of computers into products and systems at a larger scale. It involves developing technical skills in traditional areas of electrical engineering, such as analog and digital circuit design and communications systems, as well as in areas related to computer science, such as software development and operating systems. Sub-disciplines within Computer Engineering include Computer Software Engineering and Computer Hardware Engineering, which emphasize the software and hardware sides of computer systems, respectively. As might be expected in such a broad field, there are a great many specialty areas as well, which change regularly to match the needs of the job market.
	The proposed program will support the College of Engineering's mission "to provide education, research, and service in a scholarly environment in a way that prepares our students for successful professional careers, addresses the changing needs of our other constituents, and responds to the technological challenges facing the Commonwealth and the Nation." Development of graduate programs in Computer Engineering will further enhance the College's ability to pursue its "Top 50" vision of being internationally recognized and ranked as one of the top 50 colleges of engineering in the United States.

2b	(*similar to 13a*) What is the need for the proposed program? For example, is there a shortage of trained professionals or has an accrediting/professional/government body expressed a need for this type of program? Provide justification and evidence to support the need and demand for this proposed program. Include any data on student demand; career opportunities at the regional, state, and national levels; and any changes or trends in the discipline(s) that necessitate a new program. (*300 word limit*)
	Strong motivating factors support the need to implement graduate programs in the area of Computer Engineering. This program will enable us to:
	• Provide advanced training in the areas of computer hardware and software engineering needed to support continued regional and national workforce demands.
	• Improve our ability to recruit and retain faculty in this area, in support of not only the CompE undergraduate program but the CS and EE undergraduate and graduate programs as well.
	• Improve our ability to recruit qualified graduate Teaching Assistants with backgrounds in Computer Engineering, in support of CompE, CS, and EE programs.
	• Create an appropriate curriculum and program infrastructure for those faculty and graduate students

3   Programs are effective the semester following approval. No program will be made effective unless all approvals, up through and including Board of Trustees and CPE approval, are received.

NEW MASTER'S DEGREE   Page 2 of 30

	who are already doing research in the area of Computer Engineering. (Currently graduate students doing work in this area must identify as either CS or EE and fulfill those program requirements.) • *Strengthen our research infrastructure by providing much-needed research and technical support for the many other disciplines and projects throughout UK who rely on expertise in Computer Engineering to support and carry out their scholarly work. The need for advanced knowledge in high-performance computing systems is growing across nearly all branches of scholarship.* *Demand and salaries in computer engineering continue to be strong. According to Bureau of Labor Statistics estimates, employment in computer occupations is projected to increase by 12.5 percent from 2014 to 2024; this growth is expected to result in nearly half a million new jobs, far more than in any other STEM field. Currently, the median annual wage for Computer Engineers ranges from $107K to $150K depending on factors such as employment sector (industry, academia, government) and geographical location.(Bureau of Labor Statistics, 2015)*
2c*	(*similar to 11a*) List the program objectives. These objectives should deal with how students will benefit from the program, both tangibly and intangibly. Give evidence that they will benefit. *(300 word limit)*
	The goal of this program is to provide students advanced training in the areas of computer hardware and software engineering needed to support continued regional and national workforce demands. *Specific program objectives, reflecting expectations for accomplishments of our students in the years following graduation, are that graduates of our program will:* *1. Obtain employment and advance in careers appropriate to an advanced technical degree, through technical and leadership in the industrial sector, entrepreneurship and business development, or pursuit of further graduate study.* *2. Use their technical and professional skills to make a positive impact on society and the world.* *3. Engage in continued professional development and life-long learning.*
2d*	List the student learning outcomes (SLOs) for the proposed program. (*300 word limit*) (*More detailed information will be addressed in Section A, part 5.*)
	Student Learning Outcomes (SLOs) for the proposed program, reflecting skills and abilities that students are expected to possess by the time they graduate, include the ability to: *1. Identify, analyze and solve technical problems related to computer engineering.* *2. Design and conduct experiments and detailed data analysis.* *3. Participate and make contributions to scholarly research activities.* *4. Communicate technical concepts effectively, both orally and in writing.*
2e	Provide the rationale and motivation for the program. Give reference to national context, including equivalents at benchmark institutions. *(150 word limit)*
	The number of undergraduate and graduate programs in the area of Computer Engineering is growing rapidly nationally. The fastest growth in STEM fields in recent years has been in fields related to computer engineering. For example, from the most recent ASEE data, growth in Bachelor's degrees in Computer Engineering from 2014 to 2015 was 16.2% while combined Electrical and Computer Engineering Bachelor's grew 21.3%. At the graduate level, computer engineering-related programs had some of the largest percentage increases among all engineering fields. The number of MS degrees granted in Computer Engineering has grown more than 30% over the past 15 years to more than 2,000 nationally (Yoder, 2016). Expressing this discipline as a program of its own brings us into conformity with the trend in our 23 benchmark institutions. At the Master's level, 11 of the 23 programs (48%) offer separate MS EE and MS CpE degrees, 8 (35%) offer an MS in ECE, and 4 (17%) offer just

	an MS EE degree option.		
2f	Describe the proposed program's uniqueness within UK. *(250 word limit)*		
	The proposed Computer Engineering program does not duplicate existing programs.		
	First, Computer Engineering is a well-established discipline, separate from either Electrical Engineering or Computer Science. The undergraduate engineering accrediting organization, ABET, recognizes and accredits these as three separate disciplines (Electrical Engineering, Computer Science, Computer Engineering). Nearly all R1 institutions offers all three as separate undergraduate degrees. At the graduate level, the trend and most common structure is also to have a separately named degree program, as we propose. A complete discussion of the discipline and benchmark programs is included in Section 5 of the full proposal document attached with the senate forms.		
	Second, Computer Engineering fits in the intersection between the CS and the ECE programs. There are large CS and EE areas that lie outside the scope of the proposed program. CS MS students are required, for instance, to take at least two of CS515 (Algorithms), CS537 (Numerical), CS575 (Theory). These courses are irrelevant for Computer Engineering. EE MS students are required to take at least three of EE611 (Deterministic Systems), EE621 (Electromagnetic Fields), EE640 (Stochastic Systems), EE661 (Solid State Electronics), EE685 (Digital Computer Structure), EE641 (Advanced Power Systems). Of these only EE661 and EE685 are relevant to Computer Engineering.		
	Third, neither ECE nor CS provides the full scope of the proposed program. An MS student who wishes to concentrate in Computer Engineering would not be able to do that in either program without taking a significant amount of outside coursework.		
2g	Describe the target audience. *(150 word limit)*		
	The target audience includes strong undergraduate students in Computer Engineering, Electrical Engineering, and Computer Science wishing to pursue graduate studies. It includes students wishing to continue their graduate studies and pursue a PhD as well as students wishing to get jobs in the industrial sector.		
2h*	Does the program allow for any concentrations?	Yes ☐	No ☒
	If "Yes," name the concentration(s). *(Specific course requirements will be described in Section A, part 7.)*		
2j*	Are necessary resources available for the proposed new program? *(A more detailed answer is requested in Section A, part 4.)*	Yes ☒	No ☐
2k	Describe how the proposed program will be administered, including admissions, student advising, retention, etc. *(150 word limit)*		
	The Computer Engineering MS program will be administered by the CS department.. The DGS will be in charge of advising and retention. The DGS will chair a Computer Engineering Graduate Committee consisting of 6 members of the faculty of record, appointed by the Chairs of CS (3 members, including the DGS) and ECE (3 members).		
2l	Are multiple units/programs collaborating to offer this program?	Yes ☒	No ☐
	If "Yes," please discuss the resource contribution(s) from each participating unit/program. *(150 word limit)* *(Letters of support will be addressed in Part A, section 7.)*		
	The faculty of record will include a subset of the graduate faculty from the CS and ECE departments; the DGS		

	will be a CS member of the faculty of record. (Details are in Question 2n.)		
2m	Are there any UK programs, which the proposed program could be perceived as replicating?	Yes ☐	No ☒
	If "Yes," give a rationale for why this is not duplication, or is a necessary duplication. *(250 word limit)*		
	See description of proposed program for summary of field and how it is different from Electrical Engineering and Computer Science		
	If "Yes," two pieces of supporting documentation are required. ☐ Check to confirm that appended to the end of this form is a letter of support from the unit chair/director who may perceive this program as a replicate. ☐ Check to confirm that appended to the end of this form is verification that the chair/director of the other unit has agreement from the faculty members of the unit. This typically takes the form of meeting minutes.		
2n	Will the faculty of record for the proposed new master's degree be the graduate faculty of the department/school offering the proposed new degree?	Yes ☐	No ☒
	If "No," please describe the faculty of record for the proposed master's program, including: selection criteria; term of service; and method for adding/removing members. Will the existing director of graduate studies (DGS) in the department/school be the DGS for this proposed master's degree?		
	The faculty of record will include a subset of the graduate faculty from the CS and ECE departments. The selection criteria will be the vote of the faculty of each of CS and ECE for their respective members. Term of service will be unlimited; faculty may be added and removed by vote of the CS or ECE faculty with respect to their respective members. The DGS will be a CS member of the faculty of record of the proposed program, selected by the chair of the CS department, subject to the approval of the chair of the ECE department.		
2o	Will the program have an advisory board[4]?	Yes ☐	No ☒
	If "Yes," please describe the standards by which the faculty of record will select members of the advisory board, the duration of service on the board, and criteria for removal. *(150 word limit)*		
	Both the CS and ECE departments have advisory boards that include alumni who are in the Computer Engineering discipline. Rather than form a separate advisory board, we plan to have each of these existing advisory boards provide input and feedback into the new Computer Engineering MS program.		
	If "Yes," please list below the number of each type of individual (as applicable) who will be involved in the advisory board.		
		Faculty within the college who are within the home educational unit.	
		Faculty within the college who are outside the home educational unit.	
		Faculty outside the college who are within the University.	
		Faculty outside the college and outside the University who are within the United States.	
		Faculty outside the college and outside the University who are outside the United States.	
		Students who are currently in the program.	
		Students who recently graduated from the program.	
		Members of industry.	
		Community volunteers.	
		Other. Please explain:	
		Total Number of Advisory Board Members	

---

[4]   An advisory board includes both faculty and non-faculty who are expected to advise the faculty of record on matters related to the program, e.g. national trends and industry expectations of graduates.

		UK DLP and eLearning Office	
3a*	Initially, will any portion of the proposed program's core courses be offered via distance learning[6]?	Yes ☐	No ☒

	If "Yes," please indicate below the percentage of core courses that will be offered via distance learning.				
(check one)	1% - 24% ☐	25% - 49% ☐	50% - 74% ☐	75 - 99% ☐	100% ☐

	NOTE: Programs in which 25% or more of the program will be offered via distance learning may need to submit a substantive change prospectus to SACS. Please contact institutionaleffectiveness@uky.edu for assistance. *The prospectus is required by SACS, but it is NOT required for Senate review.*

3b*	If *any* percentage of the program will be offered via the alternative learning formats below, check all that apply, below.
	☐ Distance learning.
	☐ Courses that combine various modes of interaction, such as face-to-face, videoconferencing, audio-conferencing, mail, telephone, fax, email, interactive television, or World Wide Web.
	☐ Technology-enhanced instruction.
	☐ Evening/weekend/early morning classes.
	☐ Accelerated courses.
	☐ Instruction at nontraditional locations, such as employer worksite.
	☐ Courses with multiple entry, exit, and reentry points.
	☐ Modularized courses.

3c	Give pedagogical rationale for the use of alternative delivery modes in the proposed program. Consider the aspects below and elaborate as appropriate. *(200 word limit)* • Synchronous and asynchronous components. • Balance between traditional and non-traditional aspects. • Hybrid elements.
	None of the existing courses for the program include these alternative learning formats at this time.

4a*	Will the program's home educational unit require new or additional faculty?	Yes ☐	No ☒
	If "Yes," provide a plan to ensure that appropriate faculty resources are available, either within UK or externally, to support the program. Note whether the new and additional faculty will be part-time or full-time faculty. If "No," explain why. *(150 word limit)*		
	We currently have enough faculty to support the core MS program as laid out in this proposal. See attached proposal for full discussion.		
	If "Yes," when will the faculty be appointed? *(150 word limit)*		

4b*	Will the program's home educational unit require additional non-faculty resources, e.g. classroom space, lab space, or equipment?	Yes ☐	No ☒
	If "Yes," provide a brief summary of additional non-faculty resources that will be needed to implement this program over the next five (5) years. If "No," explain why. *(150 word limit)*		
	There is no specific additional space need for this proposed MS program.		

---

5   For questions about alternative delivery modes, please contact UK's Distance Learning Programs and e-Learning office (http://www.uky.edu/DistanceLearning/).

6   Per the Southern Association of Colleges and Schools Commission on Colleges (SACS) definition of distance education, distance education is a formal educational process in which the majority of the instruction (interaction between students and instructors and among students) in a course occurs when students and instructors are not in the same place. Instruction may be synchronous or asynchronous.

4c	Will the program include courses from another educational unit(s)?	Yes ☐	No ☒
	If "Yes," list the courses and identify the other educational units and subunits that have approved the inclusion of their courses. *(150 word limit)*		
	ECE and CS will provide all primary required courses. There will be some electives permitted that could include courses from other educational units as appropriate, but there is no requirement to do so.		
	If "Yes," two pieces of supporting documentation are required. ☐ Check to confirm that appended to the end of this form is a letter of support from the other units' chair/director from which individual courses will be used. The letter must include demonstration of true collaboration between multiple units[7] and impact on the course's use on the home educational unit. ☐ Check to confirm that appended to the end of this form is verification that the chair/director of the other unit has consent from the faculty members of the unit. This typically takes the form of meeting minutes.		

---

7 Show evidence of detailed collaborative consultation with such units early in the process.

4d	*(similar to question 19)* Fill out the faculty roster below for full-time and part-time faculty teaching major core courses in the proposed new master's program.		
NAME List name & identify faculty member as FT (full-time) or PT (part-time).	**FACULTY CIP CODE[8]** List the applicable CIP Code for the faculty member.	**MAJOR CORE COURSES IN THE PROGRAM** List the major core courses in the program that the faculty member will teach and the frequency of the offering (e.g. "every spring")	**OTHER QUALIFICATIONS** *If applicable*, list any other qualifications and comment on how they pertain to the courses in the program the faculty member will teach. *If not applicable*, mark with "n/a."
Dakshramoorthy Manivannan FT	*11.07*	*CS570 Operating Systems, every fall*	*N/A unless indicated otherwise*
Raphael Finkel FT	*11.07*	*CS541 Compiler Design, every second year; CS655 Programming Language Design, every Fall.*	
James Lumpp FT	*14.10*	*EE585 Fault Tolerant Computing, every other spring; EE580 Adv Em Sys, EE588 RT OS, occasional*	
Himanshu Thapliyal FT	*14.10*	*EE599 Nanocomputing, every fall*	
Henry Dietz FT	*14.10*	*EE599 Camera computing, every fall, EE599 Cluster computing, occasional spring*	
Sen-ching Cheung FT	*14.10*	*EE599 Cybersecurity, every spring*	
Kenneth Calvert FT	*11.07*	*CS585 Network security, occasional*	
Mirek Truszczynski FT	*11.07*	*CS515 Algorithms, every fall*	
Nathan Jacobs FT	*11.07*	*CS636 Computer Vision, every other spring, CS460G Machine Learning, every fall*	
Lircng Cui FT	*11.07*	*CS585 Advanced Data Science, every fall*	
Joseph Elias PT	*14.10*	*EE584 VLSI Design, every semester; EE589 advancd VLSI, occasional*	

[8]   Consult your college's associate dean for faculty affairs for specific assistance with Classification of Instructional Programs codes (CIP codes).

5a	Referring to program objectives, student benefits, and the target audience (questions 2c and 2g), explain how the *program* will be assessed, which is different from assessing student learning outcomes. Include how the faculty of record will determine whether the program is a success or a failure. List the benchmarks, the assessment tools, and the plan of action if the program does not meet its objectives. *(250 word limit)*
	The graduate committee for the program will meet annually to review the program benchmark data and SLO assessment data and to assess the overall program quality and success. Primary program benchmarks include FT and PT enrollment numbers, GPA, time to graduation statistics, student placement data including job placement and continued graduate study, and the results of alumni surveys (planned for every 3-5 years).
5b	*(related to 2d and 14.c)* Based on the SLOs from question 2c, append a PDF of the program's curriculum map[9] to the end of this form.
5c	Append an assessment plan[10] for the SLOs to the end of this form.

6a	Will the program require completion of a bachelor's degree from a fully accredited institution of higher learning?	Yes ☐	No ☒
	If "No," explain below. (*150 word limit*)		
6b	The Graduate School requires applicants to have an overall GPA of 2.75 on undergraduate work. Will the program have a higher undergraduate GPA requirement?	Yes ☒	No ☐
	If "Yes," describe below. (*150 word limit*)		
	Admission requirements include a minimum GPA of 3.0 in an ABET or CSAB accredited program in Computer Engineering, Computer Science, or Electrical Engineering. (These agencies only accredit undergraduate programs.)		
6c	Will the proposed program include requirements for testing (e.g. GRE, GMAT, TOEFL) to be considered for admission?	Yes ☒	No ☐
	If "Yes," name each test and describe the specific requirements, scores, etc. below. (*150 word limit*)		
	GRE quantitative and verbal tests are required, as well as TOEFL or IELTS for international or ESL applicants. There are no explicit minimum scores beyond any criteria established by the UK graduate school, but the overall strength of the application package including standardized test scores is considered in its entirety.		
6d	Will the program have a world language requirement?	Yes ☐	No ☒
	If "Yes," describe below. (*150 word limit*)		

---

9   Course mapping (or "curricular mapping") is a representation of how faculty intend to approach and assess each of the student learning outcomes identified for the courses for the degree program, with an emphasis on only those courses required for all degree candidates. It is a master chart that indicates which objectives are being met, to what extent, and how often. This identifies whether an objective is "introduced," "developed," and/or "mastered" within a given course; it may be helpful also to chart any classroom-based assessment measures used to demonstrate that claim.

10   An assessment plan is typically a tabular grid that illustrates the artifacts, rubrics, assessment team, and periods of assessment for the SLOs.

6e	The Graduate School allows transfer of up to nine credits or 25% of course work. Please describe transfer credit limitations below for the proposed program. (*150 word limit*)
	None other than the established graduate school limitations.

6f	Will the program have a thesis requirement (Plan A)? (If "Yes," explain the requirements below. If "No," proceed to question 6g)	Yes ☒	No ☐
	24 credits of course work plus a 6-credit thesis advised by a primary advisor and thesis committee. Full details outlined in attached program proposal.		

6g	Will the program have a non-thesis requirement (Plan B)? (If "Yes," explain the requirements below. If "No," proceed to question 6h)	Yes ☒	No ☐
	If "Yes," explain the requirements below.		
	30 credits of course work that may include a 3-credit project course. The non-thesis option requires a project (of smaller scale than a full thesis), also advised by a primary advisor and thesis committee. Full details outlined in attached program proposal.		

6h	Provide the final examination criteria.	Yes ☒	No ☐
	Both thesis and non-thesis students have an oral thesis/project defense as well as a written document. Committee members examine the technical competency of students at the oral defense, which acts as the program final exam.		

6i	Describe termination criteria.	Yes ☒	No ☐
	Students must maintain a GPA of 3.0 to be considered as making satisfactory academic progress. A student whose GPA is less than 3.0 at the end of a semester is on probation; if the GPA is still below 3.0 at the end of the subsequent regular semester (Spring or Fall), the DGS may dismiss the student.		

████████████

7a	Document the total credit hours required by level below. At least two-thirds of the minimum requirements for the master's or specialist degree must be in regular courses, and at least half of the minimum course requirements (excluding thesis, practicum, or internship credit) must be in 600- or 700-level courses.

400G-level: *See below*	500-level: *See below*	600-level: *See below*	700-level: *See below*

7b*	What is the total number of credit hours required for the degree?[11] (e.g. 24, 32)		*30*
	If an explanation about the total credit hours is necessary, use the space below. (*150 word limit*)		
	Thesis option: The student may take up to 6 credits of Thesis Research. Of the remaining 24 required coursework credits, at least 18 credits must be in courses in CS, EE, or CPE. At least 12 credits of the total coursework, including at least 9 credits of the CS/EE/CPE coursework, must be taken at the 600 or 700 level. *Non-thesis option: Of the 30 coursework credits, at least 21 credits must be courses in CS, EE, or CPE. At least 15 credits of thee total coursework, including at least 12 credits of the CS/EE/CPE coursework , must be taken at the 600 or 700 level.*		

	Use the grids below to list core courses, electives, courses for a concentration, etc. *Use the course title from the Bulletin or from the most recent new/change course form.*

7c*	**Program Major Core Courses.** These courses are required for all students in the program and include prerequisite courses. Check the appropriate box to describe the course as either "program core" or

---

11   A non-thesis option (Plan B) requires that six or more graduate credit hours of coursework be submitted in lieu of a thesis.

NEW MASTER'S DEGREE   Page 10 of 30

Prefix & Number	Course Title	Type of Course	Credit Hrs	Course Status[12]
	"prerequisite."			
CS315	Algorithm Design, or equivalent	☐ Pgm Core ☒ Prerequisite	3	No Change
CS275	Discrete Mathematics, or equivalent	☐ Pgm Core ☒ Prerequisite	3	No Change
EE280	Digital Logic, or equivalent	☐ Pgm Core ☒ Prerequisite	3	No Change
CPE287	Embedded Systems, or equivalent	☐ Pgm Core ☒ Prerequisite	3	No Change
CPE380	Computer Architecture, or equivalent	☐ Pgm Core ☒ Prerequisite	3	No Change
CS570	Operating Systems	☒ Pgm Core ☐ Prerequisite	3	No Change
EE685	Digital Computer Structure	☒ Pgm Core ☐ Prerequisite	3	No Change
CS541	Compiler Design	☒ Pgm Core ☐ Prerequisite	3	No Change
EE580	Embedded Systems	☒ Pgm Core ☐ Prerequisite	3	No Change

Total **Core Courses** Credit Hours: 12   (9 required)

7d	Is there any narrative about prerequisite courses for the program that should be included in the Bulletin? If "Yes," note below. (*150 word limit*)	Yes ☒ No ☐

Specific MS prerequisites include a programming background (equivalent to CS215 or higher) and at least 3 of the following 5 undergraduate courses: Algorithm Design (CS315 or equivalent), Discrete Mathematics (CS275 or equivalent), digital logic (EE280 or equivalent), Embedded Systems (CPE287 or equivalent), and Computer Architecture (CPE380 or equivalent)

7e	Is there any narrative about core courses for the program that should be included in the Bulletin? If "Yes," note below.	Yes ☒ No ☐

Students are required to take 9 credits of core coursework, to include 3 of the following 4 courses:
CS570 Operating Systems
EE685 Digital Computer Structure
CS541 Compiler Design
EE580 Embedded Systems
CS612/EE612 Independent work (6 credits, for thesis option only)

Program Guided Electives[13] (Guided electives for <u>all</u> students in the program.)

7f*	Does the program include any guided electives? (If "Yes," indicate and note the specific courses in the grid below. If "No," indicate and proceed to question 7i.)	Yes ☐ No ☒

---

12   Use the drop-down list to indicate if the course is a new course ("new"), an existing course that will change ("change"), or if the course is an existing course that will not change ("no change").

13   Guided electives are available to all students in the program and are organized as groups of elective courses, from which a student chooses one (or two, or three, etc.).

7g*	Using the grid provided, list the guided electives below.		
Prefix & Number	Course Title	Credit Hrs	Course Status[14]
			Select one….
			Select one….
			Select one….
			Select one….
			Select one….
			Select one….
			Select one….
			Select one….
			Select one….
			Select one….
	Total Credit Hours as Guided Electives:		

7h	Is there any narrative about guided electives courses that should be included in the Bulletin? If "Yes," note below. (*150 word limit*)	Yes ☐ No ☒

Program Free Electives[15]. (Free electives for <u>all</u> students in the program.)

7i*	Does the program include any free electives? (If "Yes," indicate and proceed to question 7j. If "No," indicate and proceed to 7l.)	Yes ☒ No ☐

7j*	What is the total number of credit hours in free electives?	*15 (thesis), 9 (non-thesis)*

7k	Provide the free electives courses language that will be included in the Graduate School Bulletin. (*150 word limit*)
	For the thesis option, aside from the 6 thesis-course credits and the 9 core-course credits, the student may select the remaining 15 credits from any graduate course in CS/EE/CPE. For the non-thesis option, aside from the 9 core-course credits, the student may select the remaining 21 credits from any graduate course in CS/EE/CPE. Courses outside these departments may also count to the requirement of 30 credits with the approval of the DGS.

Courses for a program's concentration(s).

	Click HERE for a template for additional concentrations[16].	
7l	Does the program include any concentrations? (If "Yes," indicate and proceed to question 7m. If "No," indicate and proceed to 7p.)	Yes ☐ No ☒

---

14   Use the drop-down list to indicate if the course is a new course ("new"), an existing course that will change ("change"), or if the course is an existing course that will not change ("no change").

15   Program free electives are available to all students in the program (regardless of any concentration(s)) and the choice of which course(s) to take is up to the student. Courses are not grouped but can be described as "student must take three courses at the 600-level or above."

16   Append a PDF with each concentration's courses to the end of this form.

Prefix & Number	Course Title (Check the appropriate box to describe the course as "a core course for the concentration" or "an elective course for the concentration.")		Credit Hrs	Course Status[17]
		☐ Core ☐ Elective		Select one....
		☐ Core ☐ Elective		Select one....
		☐ Core ☐ Elective		Select one....

7n	Provide concentration-related language that should be included in the Graduate School Bulletin. (150 word limit)

7o	Does the program have an additional concentration? (If "Yes," indicate and proceed to question 7p. If "No," indicate and proceed to 7r.)	Yes ☐ No ☒

7p	Concentration #2 Name:			
Prefix & Number	Course Title (Check the appropriate box to describe the course as "a core course for the concentration" or "an elective course for the concentration.")		Credit Hrs	Course Status[18]
		☐ Core ☐ Elective		Select one....
		☐ Core ☐ Elective		Select one....

	Total Credit Hours, Concentration #2:	
7q	Provide concentration-related language that should be included in the Graduate School Bulletin for the second concentration. (150 word limit)	

7r	Is there anything else about the proposed program that should be mentioned? *(150 word limit)*

8a	Create a degree plan for the proposed program by listing in the table below the courses that a typical student would take each semester. Use the spaces for "Year 3" only if necessary. If multiple concentrations are available, click HERE for a template for additional concentrations. Append a PDF with each concentration's semester-by-semester program of study to the end of this form.

	YEAR 1 - FALL:	*Thesis plan* *CS570 Operating Systems* *EE685 Digital Computer*	**YEAR 1 - SPRING:**	*Elective* *Elective* *Elective*

---

17   Use the drop-down list to indicate if the course is a new course ("new"), an existing course that will change ("change"), or if the course is an existing course that will not change ("no change").

18   Use the drop-down list to indicate if the course is a new course ("new"), an existing course that will change ("change"), or if the course is an existing course that will not change ("no change").

		Structure Elective		
	YEAR 2 - FALL :	CS541 Compiler Design Elective	**YEAR 2 - SPRING:**	*(MS Thesis work)*
	YEAR 3 - FALL:		**YEAR 3 - SPRING:**	

8b	With reference to the degree plan above, explain how there is progression in rigor and complexity in the courses that make up the program. *(150 word limit)*
	Students in the program typically start with the core courses most connected to their area of interest, then progress to more advanced courses as well as to additional core courses. In parallel, early in their program students find a thesis or project advisor, identify a specific problem of interest, and then work through the process of problem characterization, literature review and study of prior work, hypothesized solution and detailed experimental design, study implementation, data analysis and dissemination of work. Students work closely with their thesis or project advisor to understand and move through this process.

Information below does not supersede the requirement for individual letters of support from educational unit administrators and verification of faculty support (typically takes the form of meeting minutes).

	Reviewing Group Name	Date Approved	Contact Person Name/Phone/Email
9a	(Within College) *In addition to the information below, attach documentation of department and college approval. This typically takes the form of meeting minutes but may also be an email from the unit head reporting department- and college-level votes.*		
			/ /
			/ /
			/ /
			/ /
9b	(Collaborating and/or Affected Units)		
			/ /
			/ /
			/ /
			/ /
			/ /
			/ /
			/ /
			/ /
			/ /

9c	(Senate Academic Council)	Date Approved	Contact Person Name
	Health Care Colleges Council (if applicable)		
	Graduate Council		

From:	Nikou, Roshan
Sent:	Tuesday, February 26, 2019 9:19 AM
To:	Bird-Pollan, Jennifer; Jackson, Brian; Brothers, Sheila; Ett-Mims, Joanie; Price, Cleophus; Congleton, Nathan; Nikou, Roshan
Cc:	Finkel, Raphael; Truszczynski, Miroslaw
Subject:	Transmittals
Attachments:	MS in Computer Enginnering.pdf; PhD in Computer Engineering.pdf; MS in Data Science.pdf

TO: Jennifer Bird-Pollan, Chair and Sheila Brothers, Coordinator

FROM: Brian Jackson, Chair and Roshan Nikou, Coordinator
          Graduate Council

The Graduate Council approved the following proposals and is now forwarding them to the Senate Council to approve.

 Programs:

MS in Computer Engineering
PhD in Computer Engineering
MS in Data Science

University of Kentucky
The Graduate School

Roshan Nikou, MA
Graduate Council Coordinator
101 Ezra Gillis Building | Lexington, KY 40506-0033
(859)257-1457 | www.gradschool.uky.edu
roshan.nikou@uky.edu

University of Kentucky
College of Engineering
Office of the Dean

353 Ralph G. Anderson Bldg.

Lexington, KY 40506
P: 859-257-1687
F: 859-257-5727 www.uky.edu

February 25, 2019

Brian Jackson
Interim Dean, Graduate School
University of Kentucky Graduate School
Ezra Gillis Building
502 Administration Drive
Lexington, KY 40506-0033

Dear Dean Jackson,

The College of Engineering has reviewed the proposal for the MS in Computer Engineering. This review included the educational aspects and administrative feasibility of the proposed structure. I confirm that the proposal is administratively feasible, and it has the support of our college.

Sincerely,

Rudolph G. Buchheit
Dean, College of Engineering
Professor, Chemical and Materials Engineering

SECTION B – INFORMATION REQUIRED BY CPE AND SACS	
10. Program Overview – Program Quality and Student Success	
10a*	Highlight any distinctive qualities of the proposed program. Are any faculty nationally or internationally recognized for expertise in this field? Does this program build on the expertise of an existing locally, nationally, or internationally recognized program at UK? *(300 word limit)*
	This program is a logical continuation of the undergraduate program in Computer Engineering, which started in 2006. The original proposal for that program, approved at the department and college levels, included both MS and PhD programs. The undergraduate program has grown from zero to over 200 students in the past 10 years, and CS and ECE departments have multiple faculty who do research in areas related to Computer Engineering. These faculty regularly bring in funding and carry out research in this area, but it is challenging to recruit graduate students (as well as TAs to support the undergraduate program) given the lack of a graduate program in this area.
10b*	*(similar to 2b)* What are the intended student learning outcomes (SLOs) of the proposed program? Address one or more of the five areas of learning – broad, integrative knowledge; specialized knowledge; intellectual skills; applied learning; and civic learning. *(300 word limit)*
	Student Learning Outcomes (SLOs) for the proposed program, reflecting skills and abilities that students are expected to possess by the time they graduate, include that our graduates will be able to: *1. Identify, analyze and solve technical problems related to computer engineering.* *2. Design and conduct experiments and detailed data analysis.* *3. Participate and make contributions to scholarly research activities.* *4. Communicate technical concepts effectively, both orally and in writing.*
10c	Clearly state the student admission, retention, and completion standards designed to encourage high quality. *(300 words)*
	Applicants to the MS program in Computer Engineering are expected to have an ABET or CSAB accredited undergraduate degree in Computer Engineering, Computer Science, or Electrical Engineering. (These agencies only accredit undergraduate programs.) In addition to the graduate school admissions criteria, specific MS prerequisites include a programming background (equivalent to CS215 or higher) and at least 3 of the following 5 undergraduate courses: Algorithm Design (CS315 or equivalent), Discrete Mathematics (CS275 or equivalent), Digital Logic (EE280 or equivalent), Embedded Systems (CPE287 or equivalent), and Computer Architecture (CPE380 or equivalent). *Students may also be admitted to the program through the University Scholars Program, including the BSCPE-MSCPE, BSCS-MSCPE, and BSEE-MSCPE scholars programs. Students must meet the published GPA and status requirements to apply for this program. Students must maintain a 3.0 or better GPA across all CS and ECE courses, and they must have an overall GPA of 3.0 or better to complete the degree.*
10d*	Describe how the proposed program will articulate with related programs in the state. Include the extent to which student transfer has been explored and coordinated with other institutions. Note: Convert all draft articulation agreements related to this proposed program to PDF and append to the end of this form. *(300 word limit)*
	The University of Louisville is currently the only university in Kentucky with graduate programs that include the area of Computer Engineering, offering both MS and PhD degrees in "Computer Engineering and Computer Science". (However, they do not have standalone Computer Engineering degrees.) In addition, U of L, UK, and Western Kentucky have accredited undergrad EE programs, and U of L, UK, and Eastern Kentucky have accredited undergrad CS programs, and students from any of those programs would be eligible to apply to the proposed MS program.
11. Mission: Centrality to the Institution's Mission and Consistency with State's Goals	
11a*	*(similar to question 2c)* List the objectives of the proposed program? These objectives should deal with the specific institutional and societal needs that the program will address. *(300 word limit)*
	The goal of this program is to provide students advanced training in the areas of computer hardware and software engineering needed to support continued regional and national workforce demands. *Specific program objectives include that graduates of our program will:*

1. Obtain employment and advance in careers appropriate to an advanced technical degree
2. Use their technical and professional skills to make a positive impact on society and the world.
3. Engage in continued professional development and life-long learnin

Strong motivating factors support the need to implement graduate programs in the area of Computer Engineering. This program will enable us to:
•   Provide advanced training in the areas of computer hardware and software engineering needed to support continued regional and national workforce demands.
•   Improve our ability to recruit and retain faculty in this area, in support of not only the CompE undergraduate program but the CS and EE undergraduate and graduate programs as well.
•   Improve our ability to recruit qualified graduate Teaching Assistants with backgrounds in Computer Engineering, in support of CompE, CS, and EE programs.
•   Create an appropriate curriculum and program infrastructure for those faculty and graduate students who are already doing research work in the area of Computer Engineering. (Currently graduate students doing work in this area must identify as either CS or EE and fulfill those program requirements.)
•   Strengthen our research infrastructure by providing much-needed research and technical support for the many other disciplines and projects throughout UK who rely on expertise in Computer Engineering to support and carry out their scholarly work.

Demand and salaries in computer engineering continue to be strong. According to Bureau of Labor Statistics estimates, employment in computer occupations is projected to increase by 12.5 percent from 2014 to 2024; this growth is expected to result in nearly half a million new jobs, far more than in any other STEM field.

11b*	Explain how the program objectives above in item 11a support at least two aspects of UK's institutional mission and academic strategic plan? *(150 word limit)*
	As a key area of national growth and prominence with great cross-disciplinary impact, Computer Engineering supports UK's dedication to "improving people's lives through excellence in education, research and creative work, service, and health care" through facilitating learning, expanding knowledge, and serving as a global community for dissemination of knowledge. *Similarly, the proposed program will support the College of Engineering's mission "to provide education, research, and service in a scholarly environment in a way that prepares our students for successful professional careers, addresses the changing needs of our other of our other constituents, and responds to the technological challenges facing the Commonwealth and the Nation."*
11c*	How do the program objectives above in item 11a support at least two aspects of the Council on Postsecondary Education's (CPE) Strategic Agenda and the statewide implementation plan? *(300 word limit)*
	This program will support the CPE priority to "Increase degree and certificate completion, fill workforce shortages, and guide more graduates to a career path" as well as to "Create economic growth and development and make our state more prosperous". As noted above, demand and salaries in the area of computer engineering are a strong long-term growth area.
11d*	If an approval letter from an Education Professional Standards Board (EPSB) is required, check the box below and append a PDF version of the letter to this form. ☐ (E.g. any program leading to teacher, principal, or superintendent certification, rank change, etc.)

12. Resources

12a*	How will the program support or be supported by other programs within the institution? For example, shared faculty, shared courses, collaborative research, etc. *(300 word limit)*
	In addition to the value to the CS and ECE programs, Computer Engineering has tremendous positive impact on numerous other disciplines, including health sciences, bioinformatics, biomedical engineering, information technology, and many others. Growth in this area will lead to further opportunities for collaborative research and shared curriculum with other colleges and units.

12b	What will be the projected "faculty-to-student in major" ratio? *(150 word limit)*
	We expect a steady state of approximately 20 students in this program. A proximately 10 faculty members will be involved in presenting classes and supervising projects and theses at any time pertaining to this program. So the faculty-to-student ratio will be 1:2. However, this program is administered by the faculty of two departmental units,who already support multiple undergraduate programs and graduate programs, so this measure is misleading.
12c	Describe the library resources available[19] to support this program. Access to the qualitative and quantitative library resources must be appropriate for the proposed program and should meet recognized standards for study at a particular level or in a particular field where such standards are available. Adequacy of electronic access, library facilities, and human resources to service the proposed program in terms of students and faculty will be considered. *(300 word limit)*
	UK library resources are already sufficient to support this program.
12d	Describe the physical facilities and instructional equipment available to support this program. Physical facilities and instructional equipment must be adequate to support a high-quality program. Address the availability of classroom, laboratory, and office space, as well as any equipment needs. *(300 word limit)*
	Physical facilities and instructional resources are already available to support this program. The addition of this MS program is not likely to place undue pressure on those resources.

13. Demand and Unnecessary Duplication

13a*	Provide justification and evidence to support the need and demand for this proposed program. Include any data on student demand, employer demand, career opportunities at any level, or any recent trends in the discipline that necessitate a new program. *(300 word limit)* • This evidence is typically in the form of surveys of potential students, enrollments in related programs at the institution, employer surveys, and current labor market analyses. • Anecdotal evidence is insufficient. Demonstrate a systematic collection of data, thorough study of the data, and a reasonably estimated student demand for the program. • Provide evidence of student demand at state and national levels.
	STEM fields continue their upward growth in undergraduate and graduate degrees awarded. Of those degrees, the largest percentage increases in recent years have been in fields related to computer engineering. For example, from the most recent ASEE data, growth in Bachelor's degrees in Computer Engineering from 2014 to 2015 was 16.2% while combined Electrical and Computer Engineering Bachelor's grew 21.3%. At the graduate level as well, computer engineering-related programs had some of the largest percentage increases among all engineering fields. Nationally, MS degrees in Computer Engineering have grown more than 40% in the past 15 years (Yoder, 2016). *Salary growth in computer engineering continues to be strong. According to Bureau of Labor Statistics estimates, employment in computer occupations is projected to increase by 12.5 percent from 2014 to 2024; this growth is expected to result in nearly half a million new jobs, far more than in any other STEM field. Currently, the median annual wage for Computer Engineers ranges from $107K to $150K depending on factors like employment sector (industry, academia, government) and geographical location.(Bureau of Labor Statistics, 2015)* *In fact, nearly all of the 10 fastest growing STEM occupations that require a bachelor's or higher degree are in the computer and mathematics groups. Some of the fastest growing of these are in computer systems design and related services. The rapid growth projected is due in large part to the projected growth for the industry of 23 percent. (Fayer, 2017)* *The following table shows a 5-year prediction of number of jobs and average salary (or salary range) for several job categories related to this degree program. The data come from the Kentucky Future Skills Report at* kcews.ky.gov *and the Federal Department of Labor Bureau of Labor Statistics at* www.bls.gov*. The categories do not exactly fit the range of jobs that graduates of this program will seek.*

Job category	Regional	State	National

19   Please contact Institutional Effectiveness (institutionaleffectiveness@uky.edu) for more information.

NEW MASTER'S DEGREE   Page 17 of 30

Network and Computer Systems administrator	85 ($61K)	395 ($53K-$77K)	1,956,500 ($81K)
Computer Systems Analyst	193 ($76K)	973 ($66K-$80k)	3,002,500 ($88K)
Software Developers, Systems Software	107 ($84K)	341 ($72K-$91K)	6,281,000 ($104K)

13b	Clearly state the degree completion requirements for the proposed program. *(150 word limit)*	
	Thesis option:24 credit hours of courses plus a Master's thesis. Students take 9 credits of core coursework, 3 of 4 listed core courses. Of the 24 course credits, 2/3 (minimum 18 credits) must in CS, EE, or CPE. Half of the total coursework (minimum 12 credits) and half of the CS/EE/CPE coursework (minimum 9 credits) must be at the 600 or 700 level. Thesis defense and document are completed per graduate school requirements. *Non-thesis option: 30 credit hours of courses. Students take 9 credits of core coursework. Of the 30 course credits, 21 credits must be courses in CS, EE, or CPE. Half of the total coursework (minimum 15 credits) and 12 credits of the CS/EE/CPE coursework must be at the 600 or 700 level. Students must complete a mentored project with defense and report .*	
13c*	Will this program replace or enhance any existing program(s) or tracks (or concentrations or specializations) within an existing program? *(300 word limit)*	Yes ☐ No ☒
	If "Yes," explain:	
13d	Identify the primary feeders for the program. *(150 word limit)*	
	All state and national undergraduate programs in EE, CS, or Computer Engineering. Primary feeders are UK undergraduate programs, and faculty-recruited graduate students in specific research areas.	
13e	Describe the student recruitment and selection process. *(300 word limit)*	
	Many students will come through our own CS, EE, or Computer Engineering undergraduate programs. Eligible students will be considered for TAs in the CS or ECE departments to support Computer Engineering courses, and faculty in both CS and EE will recruit applicants for RA positions as well. The graduate committee, led by the DGS for the program, will be in charge of the recruitment and selection process for the program.	
13f*	Specify any distinctive qualities of the proposed program. *(300 word limit)* • *Are any of your faculty nationally or internationally recognized for expertise in this field?* • *Does this program build on the expertise of an existing locally, nationally, or internationally recognized program at your institution?* • *Do you have any specialized research facilities or equipment that are uniquely suited to this program?*	
	Professor Hank Dietz is internationally known for his work on compiler construction, optimizing compilers, and cluster computing. Professor James Griffioen is internationally known for his work in computer networks. Our ECE and CS programs are internationally recognized. Our specialized equipment includes the KAOS clusters managed by Dr. Dietz and high-performance computing equipment in the University of Kentucky Center for Computational Sciences.	
13g	Provide any evidence of a projected net increase in total student enrollments to the campus as a result of the proposed program. *(300 word limit)*	
	We estimate 20-25 MS students in this program (10-12 new students per academic year) based on the current size of the undergraduate population and of enrollments in the CS and EE graduate programs. (A few of these may be students who are already doing work in this area but are forced to choose either CS or EE graduate programs because there is not one yet in Computer Engineering.)	
13h	Use table below to estimate student demand for the first five years following implementation.	

	Academic Year	# Degrees Conferred	Majors (headcount) Fall Semester
	2018 - 2019	*0*	*10*
	2019 - 2020	*5*	*15*
	2020 - 2021	*10*	*20*
	2021 - 2022	*10*	*20*
	2022 - 2023	*10*	*20*

13i	Clearly describe all evidence justifying a new program based on changes in the academic discipline or other academic reasons. *(300 word limit)*		
	(See question 13a)		

13j	Has the Council on Postsecondary Education identified similar programs?[20]	Yes ☒	No ☐
	If "Yes," the following questions (5h1 – 5h5) must be answered.		

(1)	Does the program differ from existing programs in terms of curriculum, focus, objectives, etc.? *(150 word limit)*	Yes ☐	No ☒
	If "Yes," explain: *The University of Louisville has an* MS program *in "Computer Science and Computer Engineering" . Its curriculum, is strictly Computer Science, however, requiring some subjects that our proposed program omits (in the area of foundational (theory) and analytic (modeling) courses. It omits subjects that our proposed program requires, including embedded systems, digital computer structure, and compiler construction. The focus of the Louisville program is therefore "classical" computer science. The focus of the proposed program is the intersection of computer science and electrical engineering.*		

(2)	Does the proposed program serve a different student population (e.g., students in a different geographic area or nontraditional students) from existing programs? *(150 word limit)*	Yes ☒	No ☐
	If "Yes," explain: *The proposed program will in particular better serve the UK undergraduate population. It will also better distinguish the CS, ECE, and Computer Engineering disciplines.*		

(3)	Is access to existing programs limited? *(150 word limit)*	Yes ☒	No ☐
	If "Yes," explain: *Geographically, students from the central and eastern parts of the state have better access to UK.*		

(4)	Is there excess demand for existing programs? *(150 word limit)*	Yes ☒	No ☐
	If "Yes," explain: *There is a tremendous need and growth in this discipline, more than enough to justify multiple programs within one state. There are currently at least 86 U.S. universities with MS programs in Computer Engineering (per ASEE data 2016), and more than 200 undergraduate programs in the field.*		

(5)	Will there be collaboration between the proposed program and existing programs? *(150 word limit)*	Yes ☒	No ☐
	If "yes," explain the collaborative arrangements with existing programs. If "no," explain why there is no collaboration with existing programs.		
	Although there is no explicit collaboration between Louisville and UK engineering programs, undergraduate students from each institution are eligible and welcome to apply to the other for graduate programs. There is sufficient growth and demand for this field that having two programs within the state should not create any unnecessary competition for students. Faculty at the two institutions have collaborated in the past: Dr. Hayes at UKY has worked with Drs. Graham and Ragade at UofL; Dr. Farag of UofL has presented at a UKY research colloquium. We recently submitted an EPSCoR proposal that involves UKY, UofL, EKYU, WKU, and MoSU. One aspect is called Collaborative Human Machine interfaces, involving new types of computational hardware		

20

Please contact Institutional Effectiveness (institutionaleffectiveness@uky.edu) for help with this
question.

NEW MASTER'S DEGREE   Page 19 of 30

	architectures. We expect that the proposed program will enhance such collaborative ventures.		
13k*	Are there similar programs in other Southern Regional Education Board (SREB) states in the nation?	Yes ☒	No ☐
	If "Yes," please answer the questions below to demonstrate why this proposed program is needed in addition to the one(s) currently in existence.		
13k. i*	Identify similar programs in other SREB states and in the nation.		
	There are currently at least 86 U.S. universities with MS programs in Computer Engineering (per ASEE data 2016).		
13k.ii*	Does the program differ from existing programs in terms of curriculum, focus, objectives, etc.?	Yes ☒	No ☐
	If "Yes," explain. *(300 word limit)*		
	Our program is at the intersection of two fields. Its focus, therefore, is on the "systems" side of computer science and the "computer" side of Electrical Engineering.		
13k.iii*	Does the proposed program serve a different student population (e.g., students in a different geographic area and non-traditional students) from existing programs?	Yes ☒	No ☐
	If "Yes," explain. *(300 word limit)*		
	There are many diverse student populations served, particularly students from Central Kentucky.		
13k.iv*	Is access to existing programs limited?	Yes ☒	No ☐
	If "Yes," explain. *(300 word limit)*		
	There are many regional and access differences across programs.		
13k.v*	Is there excess demand for existing similar programs?	Yes ☒	No ☐
	If "Yes," explain. *(300 word limit)*		
	The number of total degrees being granted and the number of job opportunities in the field continues to grow both regionally and nationally.		
13k.vi*	Will there be collaboration between the proposed program and existing programs?	Yes ☐	No ☒
	If "No," explain. *(300 word limit)*		
	There is no need for explicit collaboration between existing programs, although many faculty collaborate across universities and share curricular and other teaching resources to avoid duplication of effort in developing such materials.		
13l	Would your institution like to make this program available through the Academic Common Market[21]?	Yes ☐	No ☒
13m	Clearly describe evidence of employer demand. Such evidence may include employer surveys, current labor market analyses, and future human resources projections. Where appropriate, evidence should demonstrate employers' preferences for graduates of the proposed program over persons having alternative existing credentials and employers' willingness to pay higher salaries to graduates of the proposed program. *(300 word limit)*		
	(See question 13a.) *Salary growth in computer engineering continues to be strong. According to Bureau of Labor Statistics estimates, employment in computer occupations is projected to increase by 12.5 percent from 2014 to 2024; this*		

21 Please contact Institutional Effectiveness (institutionaleffectiveness@uky.edu) for more information.

NEW MASTER'S DEGREE   Page 20 of 30

	growth is expected to result in nearly half a million new jobs, far more than in any other STEM field. Currently, the median annual wage for Computer Engineers ranges from $107K to $150K depending on factors like employment sector (industry, academia, government) and geographical location.(Bureau of Labor Statistics, 2015) *In fact, nearly all of the 10 fastest growing STEM occupations that require a bachelor's or higher degree are in the computer and mathematics groups. Some of the fastest growing of these are in computer systems design and related services. The rapid growth projected is due in large part to the projected growth for the industry of 23 percent. (Fayer, 2017)* *Starting salaries for a graduate with a MS in Computer Engineering have a median of $85,000, compared to $69,000 for a BS in Computer Engineering (NACA salary report, spring 2016).*
13n*	Describe the types of jobs available for graduates, average wages for these jobs, and the number of anticipated openings for each type of jobs at the regional, state, and national levels.
	(See previous question.) *Computer Engineering graduates work in a wide variety of jobs and disciplines, since the computer field now significantly affects almost every sector of industry. Areas include technology-driven companies but also finance, health care, transportation, energy, and other fields.*

14. Assessment and Oversight

14a*	Describe how each program-level student learning outcome will be assessed and how assessment results will be used to improve the program. *(250 word limit)*

Student Learning Outcomes

Student Learning Outcomes (SLOs) for the proposed program, reflecting skills and abilities that students are expected to possess by the time they graduate, include the ability to:

1. *Identify, analyze and solve technical problems related to computer engineering.*
2. *Design and conduct experiments and detailed data analysis.*
3. *Participate and make contributions to scholarly research activities.*
4. *Communicate technical concepts effectively, both orally and in writing.*

Required curricular program elements include:

- *3 of the following 4 core courses; CS570 Operating Systems, EE685 Digital Computer Structure, CS541 Compiler Design, EE580 Embedded Systems*
- *A Masters Thesis (thesis option) or project (non-thesis option) that involves a mentored scholarly project, written report, and oral defense*

SLO Curriculum mapping

	Problem Solving	Experimental Design	Contribution to Scholarly Work	Effective Communication
CS570	Dev		Introduce	Dev
EE685	Dev	Dev	Introduce	Dev
CS441	Dev		Introduce	Dev
EE580	Dev	Dev	Introduce	Dev
Thesis/project	Master	Master	Dev and Master	Master

SLO Assessment

SLOs are assessed through SLO-targeted assignments and test questions in each of the core courses, as well as through the written and oral components of the Master's thesis/project.

	Specifically, CS570 and CS441 will include assessment of SLO 1 and 3 in the developing phase. CS685 and EE580 will include assessment of SLO2 and 4 in the developing phase. A rubric with separate sub-elements for each of the 4 SLOs will be filled out by committee members at the time of the thesis or project oral defense, assessing both the written report document and the oral defense as primary assessment artifacts. *The DGS for the program will collect this data from course instructors and student committee members. The program graduate curriculum committee will meet annually to review this data, identify any concerns or weaknesses, and recommend course or program changes to address those concerns.*
14b*	Describe *program* evaluation procedures for the proposed program. These procedures may include evaluation of courses and faculty by students, administrators, and departmental personnel as appropriate. Program review procedures shall include standards and guidelines for the assessment of student outcomes implied by the program objectives and consistent with the institutional mission. *(300 word limit)*
	(See question 5a.) *The graduate committee for the program will meet annually to review the program benchmark data and SLO assessment data, and assess the overall program quality and success. Primary program benchmarks include FT and PT enrollment numbers, GPA, time to graduation statistics, student placement data including job placement and continued graduate study, and the results of alumni surveys (planned for every 3-5 years).*
14c	Identify both the direct and indirect methods by which the intended student learning outcomes (SLOs) will be assessed. *(300 word limit)*
	(See question 14a, as well as attached curriculum map and assessment plan.) *All currently planned SLO assessment is through direct methods. We will likely include some additional indirect assessment, especially early in the program implementation, in the form of student surveys that include questions about their opinions of SLO achievement through the program.* *SLOs are assessed through SLO-targeted assignments and test questions in each of the core courses, as well as through the written and oral components of the Master's thesis/project.* *Specifically, CS570 and CS441 will include assessment of SLO 1 and 3 in the developing phase. CS685 and EE580 will include assessment of SLO2 and 4 in the developing phase. A rubric with separate sub-elements for each of the 4 SLOs will be filled out by committee members at the time of the thesis or project oral defense, assessing both the written report document and the oral defense as primary assessment artifacts.*
14d	**Procedures for Course Mapping of SLOs** *(related to question 5b)*
14d.i	Which components will be evaluated, i.e. course mapping? *(300 word limit)*
	Instructors will select specific assignment components and test questions to assess the desired SLO for the course. Specifically, CS570 And CS541 will include assessment of SLO 1 And 3; EE685 and EE580. will include assessment of SSLO 2 And 4. *A standard rubric will cover all 4 SLOs for the thesis or project defense and report document.*
14d.ii	When will components be evaluated? *(150 word limit)*
	Instructors will be contacted by the DGS and Computer Engineering graduate committee regarding the needed assessment, and the committee will review the selected components on a semi-annual basis.
14d.iii	When will the data be collected? *(150 word limit)*
	Course-based assessment will be assessed by instructors during the course. All 4 SLOs will be assessed at the time of the thesis/project defense.
14d.iv	How will the data be collected? *(150 word limit)*

	For course assessment as well as for thesis/project assessment, instructors will assess the applicable SLO via a standardized rubric.	
14d.v	What will be the benchmarks and/or targets to be achieved? *(150 word limit)*	
	The rubrics will include sub-elements with categories of "below expectations"=1, "meets expectations"=2, and "exceeds expectations"=3. The mean of these sub-elements will be computed, with a benchmark of a mean value of at least 2 for each SLO.	
14d.vi	What individuals or groups will be responsible for data collection? *(150 word limit)*	
	Course instructors and faculty committee members will collect the data and give it to the DGS for aggregation and review by the graduate committee.	
14d.vii	How will the data and findings be shared with faculty? *(150 word limit)*	
	The graduate committee will review and make recommendations for action items, which will be distributed to faculty in ECE and CS departments for approval at faculty assessment meetings held each fall semester.	
14d.viii	How will the data be used for making programmatic improvements? *(150 word limit)*	
	The graduate committee will make recommendations for programmatic improvements based on the assessment results.	
14d.ix	What are the measures of teaching effectiveness? *(150 word limit)*	
	Evaluation of teaching effectiveness is separate from program evaluation or evaluation of SLOs. Instructors in the program will be individually assessed for teaching effectiveness using TCE as well as peer review and other measures in accordance with the performance evaluation standards used in each instructors home department. If SLO assessment indicates problems with teaching effectiveness within specific core courses, that information will be shared with the department chair for discussion and follow up with instructors as a part of the regular performance evaluation process.	
14d.x	What efforts to improve teaching effectiveness will be pursued based on these measures? *(150 word limit)*	
	Efforts to improve teaching effectiveness will be pursued on a case-by-case basis with individual faculty involved with the program.	
14d.xi	What are the plans to evaluate students' post-graduate success? *(150 word limit)*	
	We plan to conduct an alumni survey approximately every 3-5 years (more frequently in the first few years after the program has started operating).	

15. Cost and Funding of the Proposed Program[22]

15a	Will this program require additional resources?	Yes ☒ No ☐
	If "Yes," please provide a brief summary of additional resources that will be needed to implement this program over the next five years. *(300 word limit)*	
	The primary need is for additional faculty to support this program while still supporting the undergraduate program in Computer Engineering, which has grown from 0 to over 200 students in the past 10 years without any increase in the number of faculty in that area. The additional faculty will provide sufficient curricular and research strength and diversity to support both the undergraduate and graduate programs. However, we currently have adequate faculty to support the core MS program as laid out in this proposal. A secondary need is for additional TAs to support the undergraduate program.	
15b	Will this program impact existing programs and/or organizational units within your institution? *(300 word limit)*	Yes ☒ No ☐

---

22   For questions about cost and funding of the program, please contact your department chair, business officer, or associate dean for academic affairs.

	If "Yes, briefly describe.
	The ECE and CS departments will administer this program jointly, as they do the undergraduate Computer Engineering program. The DGS and graduate committee will come from the faculty of those departments. All faculty with research related to this area will be positively affected by the addition of graduate students and programs that better align to their field.
15c	Provide adequate documentation to demonstrate sufficient return on investment to the state to offset new costs and justify approval for the proposed program. *(300 word limit)*
	See question 2e and 13a. *There is minimal new investment required for implementing either the MS or PhD programs in this area.* *The benefit is significant — implementing these graduate programs is a top priority of the CS and ECE faculty, because lack of the programs has impeded our ability to recruit both faculty and graduate students and restricts our ability to perform cutting edge research in this important growth area.* *Computer Engineering is an area of national need, rapid workforce development, and one in which we already have an undergraduate program but not the graduate programs that are necessary to recruit faculty, support research work, or recruit TAs for those undergraduate programs. Since the undergraduate program and departmental support structure is already in place, the cost of adding the proposed program is minimal.*

16.* Budget Funding Sources, by Year of Program

All the fields in number 16 are required for the CPE's pre-proposal form. Estimate the level of new and existing resources that will be required to implement and sustain the program using the spreadsheet below. Please answer in terms of dollar amounts. All narratives have a 100-word limit.

Total Resources Available from Federal Sources (Federal sources include grants, earmarks, etc.)	1st Year	2nd Year	3rd Year	4th Year	5th Year
New	*0*	*0*	*0*	*0*	*0*
Existing	*0*	*0*	*0*	*0*	*0*
Narrative/Explanation:	*No known federal resources for creation of new program in this area*				

Total Resources Available from Other Non-State Sources (Non-state sources include philanthropies, foundations, individual donors, etc.)	1st Year	2nd Year	3rd Year	4th Year	5th Year
New	*0*	*0*	*0*	*0*	*0*
Existing	*0*	*0*	*0*	*0*	*0*
Narrative/Explanation:	*No established donors identified for this effort.* *Initial creation of Computer Engineering program was aided by $650k grant from Lexmark, which at that time was intended to fund undergraduate and graduate programs in this area.*				

`

State Resources (State sources include general fund revenue, grants, pass-thru funds, etc.)	1st Year	2nd Year	3rd Year	4th Year	5th Year
New	*0*	*0*	*0*	*0*	*0*
Existing	*0*	*0*	*0*	*0*	*0*
Narrative/Explanation:	*No specific state allocations have been made.*				

Internal (The source and process of allocation and reallocation	1st Year	2nd Year	3rd Year	4th Year	5th Year

should be detailed, including an analysis of the impact of the reduction on existing programs and/or organization units.)[23]:					
(New) Allocated Resources	*0*	*0*	*0*	*0*	*0*
(Existing) Reallocated Resources	*0*	*0*	*0*	*0*	*0*
Narrative/Explanation:	*There is already an undergraduate program in this area operated by CS and ECE together, and an existing departmental structure with allocated faculty lines in CS and ECE. Because budgeting is at the unit level and there is no budgeting differentiation between resources at the programmatic level (i.e. specific allocations to individual undergraduate and graduate programs), there is no need for any re-budgeting to support the proposed graduate program.* *For student tuition below (narrative box in form is locked to numeric data only), Estimated enrollments in program of 10, 15, 20, 20, 20, with about 1/3 of those students who would otherwise be in either CS or ECE. (New = 4, 9, 14, 14, 14, Existing = 6, 6, 6, 6, 6) Approximately 50% of our current student base are in-state, so a 50/50 balance has been assumed for tuition rates*				

Student Tuition (Describe the impact of this program on enrollment, tuition, and fees.)	1st Year	2nd Year	3rd Year	4th Year	5th Year
New	*40600*	*91400*	*142200*	*142200*	*142200*
Existing	*60900*	*60900*	*60900*	*60900*	*60900*
Narrative/Explanation:					

Total Funding Sources	1st Year	2nd Year	3rd Year	4th Year	5th Year
Total New	*40600*	*91400*	*142200*	*142200*	*142200*
Total Existing	*60900*	*60900*	*60900*	*60900*	*60900*
TOTAL FUNDING SOURCES	101500	152300	203100	203100	203100

17. Breakdown of Program Expenses/Requirements[4]
(Please note – all the fields in number 17 are required for the CPE's pre-proposal form.)

Staff: Executive, Administrative & Managerial (Include salaries and whether new hires will be part time or full time.)	1st Year	2nd Year	3rd Year	4th Year	5th Year
New	*7500*	*7500*	*7500*	*7500*	*7500*
Existing	*3250*	*3250*	*3250*	*3250*	*3250*
Narrative/Explanation[24]:	*Primary administrative and logistical support is already in place in CS and ECE departments. New cost is reflective of the need for a new DGS position, including 1 month of summer salary, which would support both proposed MS and PhD programs (so 1/2 of position included in this proposal). Existing cost is reflective of administrative support within departments for additional students. Currently grad student logistics represents less than 1/4 time of a staff member, estimate is that*				

---

23   The source and process of allocation and reallocation should be detailed, including an analysis of the impact of the reduction on existing programs and/or organizational units.

24   Discuss whether new hires will be full-time or part-time.

	additional students causes increase in workload by less than 50%, so equivalent to 1/8 of a staff person. As with DGS, 1/2 of this included in this proposal, 1/2 in the PhD program proposal.				

Other Professional (Include salaries.)	1st Year	2nd Year	3rd Year	4th Year	5th Year
New	0	0	0	0	0
Existing	0	0	0	0	0
Narrative/Explanation:					

Faculty (Include salaries and whether new hires will be part time or full time.)	1st Year	2nd Year	3rd Year	4th Year	5th Year
New	*0*	*0*	*0*	*0*	*0*
Existing	*0*	*0*	*0*	*0*	*0*
Narrative/Explanation[25]:					

Graduate Assistants (Include salaries and/or stipends.)[26]	1st Year	2nd Year	3rd Year	4th Year	5th Year
New	*27000*	*27000*	*27000*	*27000*	*27000*
Existing	*0*	*0*	*0*	*0*	*0*
Narrative Explanation/Justification:	*Budgeting 1 additional TA position in both CS and ECE to support courses, approximately 54k per year including 30k stipends and 24k tuition. As with other costs, 1/2 of this included in this proposal and 1/2 in the PhD proposal.*				

Student Employees (Include salaries and/or stipends.)	1st Year	2nd Year	3rd Year	4th Year	5th Year
New	*0*	*0*	*0*	*0*	*0*
Existing	*0*	*0*	*0*	*0*	*0*
Narrative Explanation/Justification:					

Equipment and Instructional Materials	1st Year	2nd Year	3rd Year	4th Year	5th Year
New	*0*	*0*	*0*	*0*	*0*
Existing	*0*	*0*	*0*	*0*	*0*
Narrative Explanation/Justification:					

Library (Include new journal subscriptions, collections, and electronic access.)	1st Year	2nd Year	3rd Year	4th Year	5th Year
New	*0*	*0*	*0*	*0*	*0*
Existing	*0*	*0*	*0*	*0*	*0*
Narrative Explanation/Justification:					

Contractual Services	1st Year	2nd Year	3rd Year	4th Year	5th Year
New	*0*	*0*	*0*	*0*	*0*
Existing	*0*	*0*	*0*	*0*	*0*

---

25 If new hires are involved, explain whether new hires will be full-time or part-time.

26 Identify the number of assistantships/stipends to be provided; Include the level of support for each.

Narrative Explanation/Justification:					

Academic and/or Student Services	1st Year	2nd Year	3rd Year	4th Year	5th Year
New	*0*	*0*	*0*	*0*	*0*
Existing	*0*	*0*	*0*	*0*	*0*
Narrative Explanation/Justification:	*Included with administrative costs*				

Other Support Services	1st Year	2nd Year	3rd Year	4th Year	5th Year
New	*0*	*0*	*0*	*0*	*0*
Existing	*0*	*0*	*0*	*0*	*0*
Narrative Explanation/Justification:					

Faculty Development (Include travel, conference fees, consultants, etc.)	1st Year	2nd Year	3rd Year	4th Year	5th Year
New	*0*	*0*	*0*	*0*	*0*
Existing	*0*	*0*	*0*	*0*	*0*
Narrative Explanation/Justification:					

Assessment (Include personnel, software tools, data collection tools, survey administration, outside consulting services, etc.)	1st Year	2nd Year	3rd Year	4th Year	5th Year
New	*0*	*0*	*0*	*0*	*0*
Existing	*0*	*0*	*0*	*0*	*0*
Narrative Explanation/Justification:	*Both departments already have assessment plans and processes in place, negligible new cost to implement this process.*				

Student Space and Equipment	1st Year	2nd Year	3rd Year	4th Year	5th Year
New	*0*	*0*	*0*	*0*	*0*
Existing	*0*	*0*	*0*	*0*	*0*
Narrative Explanation/Justification:	*Students are expected to reside in faculty research labs. This is a pressing issue due to overall growth in the department and the college, but will be negligibly impacted by this new program.*				

Other	1st Year	2nd Year	3rd Year	4th Year	5th Year
New	*0*	*0*	*0*	*0*	*0*
Existing	*0*	*0*	*0*	*0*	*0*
Narrative Explanation/Justification:					

Total Expenses/Requirements	1st Year	2nd Year	3rd Year	4th Year	5th Year
New	*34500*	*34500*	*34500*	*34500*	*34500*
Existing	*3250*	*3250*	*3250*	*3250*	*3250*
TOTAL Program Budgeted Expenses/Requirements:	*37750 annual continuing cost*				

GRAND TOTAL	1st Year	2nd Year	3rd Year	4th Year	5th Year
Total Funding Sources	*101500*	*152300*	*203100*	*203100*	*203100*

Total Expenses/Requirements	_37750_	_37750_	_37750_	_37750_	_37750_
TOTAL NET COST:	_-63750_	_-63750_	_-63750_	_-63750_	_-63750_

18. Course Descriptions

18a Program Core Courses (includes pre-major and pre-professional courses)

Prefix & Number	Course Description (from the Bulletin or the most recent new/change course form)
CS570	*Modern Operating Systems* *Brief review of classical operating system concepts (process and memory management, process coordination, device drivers, file systems, starvation/deadlock). Modern topics of files systems (log-structured file systems, distributed file systems, memory-based file systems), operating system design (monolithic, communication-kernel, extensible/adaptable, distributed shared memory), multiprocessor issues (scheduling, synchronization, IPC), security (Internet attacks, encryption, defenses). Inspection and modification of actual operating system code (Linux).*
EE580	*Embedded System Design* *Embedded System Design covers the design and implementation of hardware and software for embedded computer systems. Topics include architectural support for embedded systems, power management, analog and digital I/O, real-time processing design constraints and the design of embedded systems using a real-time operating systems. Prereq: EE/CPE 287, EE/CPE 380, and engineering standing or consent of instructor.*
CS541	*Compiler Design* *Intermediate aspects of a compilation process with an emphasis on front-end issues. Practical issues in using compiler writing tools. Code generation for expressions, control statements and procedures (including parameter passing). Symbol tables, runtime organization for simple and structured variables. Using compilers and translators for automation (filters, programs writing programs).*
EE685	*Digital Computer Structure* *Study of fundamental concepts in digital computer system structure and design. Topics include: computer system modeling based on instruction set processor (ISP) and processor-memory-switch (PMS) models, design and algorithms for ALU, processor, control unit and memory system. Special topics include floating-point arithmetic, cache design, pipeline design technologies, and parallel computer architectures. Prereq: EE 380 and EE 581 or consent of instructor.*

18b Program Guided Electives Courses (for the major)

Prefix & Number	Course Description (from the Bulletin or the most recent new/change course form)

18c	**Program Free Electives Courses**	
Prefix & Number	Course Description (from the Bulletin or the most recent new/change course form)	
	Free electives include all CS, EE, and CPE 500 or 600 level courses. (More than 100 courses.)	

18d	**Courses for a Track.** (If multiple tracks are available, click HERE for a template for additional tracks. Append a PDF to the end of this form with each track's courses and descriptions.	
Prefix & Number	Course Type	Course Description (from the Bulletin or the most recent new/change course form)
	☐ Track Core	
	☐ Track Elective	
	☐ Track Core	
	☐ Track Elective	
	☐ Track Core	
	☐ Track Elective	
	☐ Track Core	
	☐ Track Elective	

19. Specific faculty involved in the degree program.

(similar to question 4d) Fill out the SACS-required faculty roster below, for full-time and part-time faculty teaching in the program. Abbreviations for the NAME and COURSES TAUGHT columns are below the table. *Please contact Institutional Effectiveness (institutionaleffectiveness@uky.edu) for help with this question.*

NAME List name & Identify faculty member as F or P.	COURSES TAUGHT Include term; course prefix, number and title; & credit hours. (D, UN, UT, G)	ACADEMIC DEGREES AND COURSEWORK List relevant courses taught, including institution and major. List specific graduate coursework, if needed	OTHER QUALIFICATIONS AND COMMENTS Note qualifications and comments as they pertain to course taught.	NEW COURSES Include course prefix, number, and title.
Dakshramoorthy Manivannan F	CS570 Operating Systems G	PhD CS Engineering Ohio State 1997		
Raphael Finkel F	CS541 Compiler Design G	PhD CS Stanford 1976		
James Lumpp F	EE585 Fault Tolerant Computing G EE580 Advanced Embedded Systems G EE588 Realt Time Operating Systems G	PhD EE Purdue 1988		
Himanshu Thapliyal F	EE599 Nanocomputing Circuits G	PhD CS Engineering U of S Florida 2011		
Henry Dietz F	EE599 Cameras as a Computing System G EE599 Cluster Computing G	PhD CS Polytechnic U 1987		
Sen-ching Cheung F	EE599 Cybersecurity G	PhD EE U Cal Berkeley 2002		
Kenneth Calvert F	CS585 Network Security G	PhD CS UT Austin 1991		
Mirek Truszczynski F	CS515 Algorithm Design G	PhD Mathematics Warsaw U 1980		
Nathan Jacobs F	CS460G Machine Learning G CS636 Computer Vision G	PhD CS Washington U 2010		
Lirong Cui F	CS585 Advanced Data Science G	PHD CS Case Western U 2014		
Joseph Elias P	EE584 VLSI Design G EE589 Advanced VLSI G	PhD EE Rice U 1990		
(Other CS and ECE faculty)	(Numerous elective courses)			

FT = full time	D = developmental	UT = undergraduate transferable
PT= part time	UN = undergraduate nontransferable	G = graduate

NEW

From:	Raphael Finkel <raphael@cs.uky.edu>
Sent:	Wednesday, August 1, 2018 2:30 PM
To:	Brandenburg, Barbara
Subject:	[raeanne.pearson@uky.edu: Substantive Change-Computer Engineering, MS]

Barbara,

Here are the mails from RaeAnne.

Raphael

----- Forwarded message from "Pearson, RaeAnne" <raeanne.pearson@uky.edu> -----

Date: Mon, 16 Jul 2018 17:28:24 +0000
From: "Pearson, RaeAnne" <raeanne.pearson@uky.edu>
To: Raphael Finkel <raphael@cs.uky.edu>
Subject: Substantive Change-Computer Engineering, MS

Dear Dr. Finkel,
Thank you for submitting a NOI regarding the proposed program, Computer Engineering, MS (14.0901).

My email will serve 2 purposes: 1.) Next steps for SACSCOC, and 2.) Verification and notification that you have contacted OSPIE-a Senate requirement for proposal approval.

1.   Next steps for SACSCOC: None required
2.   Verification that OSPIE has reviewed the proposal: Based on the proposed documentation presented and the Substantive Change Checklist, the proposed program does not constitute a substantive change as defined by the University or SACSCOC, the university's regional accreditor. Therefore, no additional information is required by the Office of Strategic Planning & Institutional Effectiveness at this time. The proposed program may move forward in accordance with college and university-level approval processes.

Should you have questions or concerns about UK's substantive change policy and its procedures, please do not hesitate contacting me.

RaeAnne Pearson, PhD
Office of Strategic Planning & Institutional Effectiveness University of Kentucky
Phone: 859-218-4009
Fax: 859-323-8688
Visit the Institutional Effectiveness Website:
https://na01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.uky.edu%2Fie&data=02%7C01%7Cbarb
ara.brandenburg%40uky.edu%7Cd56491f67b354541a08208d5f7dcd181%7C2b30530b69b64457b818481cb53d42ae%7C
0%7C0%7C636687450146311034&sdata=T4Ve%2BVOe5g1q6RP2PXoVtsxwUOWPK478YBpxjn%2BenZg%3D&r
eserved=0
[eeblue60_100_286]

From:	Johnson, Michael
Sent:	Thursday, September 13, 2018 1:29 PM
To:	Brandenburg, Barbara
Cc:	Finkel, Raphael
Subject:	ECE approval of MS and PhD Computer Engineering proposal

Hi BJ,

The ECE department voted last Friday to approve the proposal for MS and PhD programs in Computer Engineering. There are a few minor wording changes, but from discussing with Raphael none of these will require re-voting of CS or ECE, so it can be considered approved by both departments. Raphael can get you an updated version.

Mike

==

Dr. Michael T. Johnson
Professor and Chair, Electrical and Computer Engineering
FPAT 453, (859) 257-0717
University of Kentucky
http://johnson.engineering.uky.edu/

1

From:	Brent Seales <seales@netlab.uky.edu>
Sent:	Wednesday, November 7, 2018 1:30 AM
To:	Brandenburg, Barbara
Subject:	Re: MS/PhD Computer Engineering

Barbara,
The faculty voted unanimously on October 18 to approve the proposal with its final changes.
Brent

On Mon, Nov 5, 2018 at 11:23 PM Brandenburg, Barbara <barbara.brandenburg@uky.edu> wrote:

Dr. Seales,

I was getting ready to send these out of the College, but I can't find a date on the form where the CS faculty voted to approve it. Will you please send it to me via email?

Thank you,

BJ

BJ Brandenburg

College of Engineering

Director of Student Records

355-S F. Paul Anderson Tower

University of Kentucky

Lexington, KY 40506-0046

Tel: (859) 257-7978

Fax: (859) 257-5727
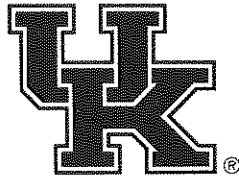
University of Kentucky
College of Engineering
Office of the Dean

351 Ralph G. Anderson Bldg.
Lexington, KY 40506-0503
P: 859-257-1687
F: 859-257-5727
www.engr.uky.edu

November 13, 2018

To Whom It May Concern:

The College of Engineering faculty reviewed the new master's degree program for Computer Engineering via email. There were no concerns or objections raised.

Sincerely,

Kimberly Anderson, Ph.D.
Associate Dean for Administration and Academic Affairs