Shane N. White
Telephone: (510) 987-9303
Fax: (510) 763-0309
Email: shane.white@ucop.edu

Chair of the Assembly of the Academic Senate
Faculty Representative to the Regents
University of California
1111 Franklin Street, 12th Floor
Oakland, California 94607-5200

April 27, 2018

MICHAEL T. BROWN
PROVOST AND EXECUTIVE VICE PRESIDENT
UNIVERSITY OF CALIFORNIA

Re: Approval of Master of Software Engineering (MSE) at UC Irvine

Dear Michael:

In accordance with the *Universitywide Review Processes for Academic Programs, Units, and Research Units* (the "Compendium"), and on the recommendation of CCGA, the Academic Council has approved UC Irvine's proposal to establish a self-supporting graduate program leading to a Master of Software Engineering (MSE) degree.

Because this is a new degree title, and the Assembly of the Academic Senate is not meeting within 30 days of CCGA's approval, Council must approve the program per Senate Bylaw 125.B.7.

I am enclosing CCGA's report on its review of the new program, and respectfully request that your office complete the process of obtaining the President's approval.

Sincerely,

Shane N. White, Chair
Academic Council

Encl

Cc: Academic Council
        Senate Director Baxter
        Senate Executive Directors

COORDINATING COMMITTEE ON GRADUATE AFFAIRS (CCGA)
Karen Duderstadt, Chair
karen.duderstadt@ucsf.edu

ACADEMIC SENATE
University of California
1111 Franklin Street, 12th Floor
Oakland, California 94607-5200

April 16, 2018

ACADEMIC COUNCIL CHAIR SHANE WHITE

Dear Shane,

At its March 7th 2018 meeting, the Coordinating Committee on Graduate Affairs (CCGA) voted 9-0-1 to approve UC Irvine's proposal for a Master of Software Engineering (MSE). The program will be a new Self-supporting Graduate Professional Degree Program (SSGPDP) in the Donald Bren School of Information and Computer Sciences. The MSE program is the final part of the Department of Informatics restructuring plan to meet the demands of a changing job market.

The MSE program is a practice-oriented degree and is designed as a hybrid program for working professionals or recent graduates seeking a career in software engineering in the software industry. This degree is apart from the research-oriented Master of Science degree programs in Informatics and Software Engineering. The program is designed as four academic quarters and a summer internship which focuses on planning, design, implementation and management of complex large-scale software projects in local industry settings. The MSE program is anticipating an initial enrollment of 40 students with a robust interest from international applicants with undergraduate degrees in computer science. The program is expected to initially enroll 40 students with a target enrollment of 75 to 100 students annually. It hopes to enroll its first cohort of students in fall 2018.

Four qualified Computer Science and Engineering faculty reviewers were solicited by the CCGA lead reviewer for the proposal-two internal (UC) reviewer and two external (non-UC) reviewers. The internal UC reviewers were from UCLA and UC San Diego. The external reviewers were from Columbia University and Carnegie Mellon University. The reviewers were asked to comment on the (1) Quality and academic rigor of the program; (2) Adequacy of the size and expertise of faculty to administer the program; (3) Adequacy of the facilities and budgets; and (4) Applicant pool and placement prospects for the graduates. In addition, UC Planning and Budget (UCPB) reviewed the proposal and provided comments to CCGA.

Overall, the reviewers and UCPB were strongly supportive of the proposal and noted the proposed program was excellent and the academic rigor was of high quality. The reviewers identified outstanding teaching faculty that are available to teach both core and elective courses within the disciplines. However, the reviewers raised some concerns, and also provided some constructive comments on the proposal.
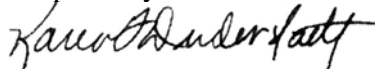
The proposal clearly outlined the distinction between the existing Master of Computer Science Engineering (MCSE) degree and the proposal for the new MSE degree. However, the reviewers were concerned the MSE program would significantly affect the enrollment of the MCSE degree program. The proposers responded that the possibility of financial support for the MCSE students and the interest in the

research-oriented program leading to the PhD would sustain the MCSE as well as the large applicant pool for the various Masters' programs in the School. An additional concern to the reviewers was the lack of focus in the curriculum on big data analytics and data science which are emerging topics in the field. The proposer's response addressed this issue and acknowledged the field of software engineering is an evolving and emerging field and that the faculty would be expected to grow and evolve to match the demands of the applicants and the changing job market. UCPB noted the MSE program campus-level proposed indirects may not be sufficient to cover costs for the classroom space and support for the projected student enrollment. A three-year review of the program is recommended by CCGA to reexamine this issue.

The response from the proposers adequately addressed these concerns and the others raised by the reviewers and CCGA. CCGA believes the proposed UC Irvine MSE Program will provide important career opportunities for graduates with the foundational skills and practical application to meet the demands of the changing software job market. The expert reviewers have confirmed that it meets the criteria for quality and rigor. Other aspects of the proposal also seem to more than satisfy the expectations of reviewers and CCGA members.

As you know, CCGA's approval is usually the last stop of the Academic Senate side of the systemwide review and approval process except when the new degree title must be approved by the President, under delegated authority from the Board of Regents. Given its status as a new graduate program title on the Irvine campus, CCGA submits its approval of the Master of Software Engineering degree program for formal approval by the Assembly of the Academic Senate. For your information, I have included our Lead Reviewer's final report as an enclosure. Please do not hesitate to contact me if questions arise in your final review of the proposal.

Respectfully submitted,

Karen G. Duderstadt PhD, RN, CPNP, PCNS, FAAN
Chair CCGA 2017-2018

cc: Robert May, Academic Council Vice Chair
       CCGA Members
       Hilary Baxter, Academic Senate Executive Director
       Michael LaBriola, Academic Senate Analyst
       Chris Procello, Academic Planning and Research Analyst
       Frances Leslie, Dean UC Irvine
       Enrique Lavernia, UCI Provost and Executive Vice Chancellor
       Natalie Schonfeld, UCI Senate Executive Director
       Thao Nguyen, UCI Senate Analyst

Enclosures (1)

Report for the UC Irvine (UCI) Proposal for a New Self-Supporting Professional Graduate Degree Program (SSPGDP) Leading to a Master of Software Engineering (MSE) at University of California, Irvine

March 25, 2018

This proposal is to establish a new self-supporting professional graduate degree program (SSPGDP) leading to a Master of Software Engineering (MSE) at University of California, Irvine. The MSE is a highly-focused degree program for providing the deep knowledge of software engineering, including the foundational skills and practical applications. It is meant that by the completion of the program, the students will be knowledgeable enough about the underlying principles of software engineering and have acquired enough practical skills to join the professional world of the software industry. The establishment of this program will be the last step in the restructuring of degree programs at the Department of Informatics, where the program will be administered. The MSE program will co-exist alongside the more research oriented Master of Science in Software Engineering. The MSE track is for those who are more interested in building a career as software engineers in the software industry, while the M.S. in Software Engineering will be suited to those who are interested in more theoretical aspects of the field.

The proposal submitted to CCGA was reviewed by four qualified Computer Science and Engineering faculty-two internal (UC) reviewer and two external (non-UC) reviewers. The internal UC reviewers are Professor Jens Palsberg (Reviewer 1, Professor and former Department Chair of Computer Science at University of California, Los Angeles UCLA), and Professor Sorin Lerner (Reviewer 2, Professor and Vice-Chair for Graduate Education, Department of Computer Science & Engineering, UC San Diego) and the external reviewers were Professor Gail E. Kaiser (Reviewer 3, Professor of Computer Science Director, Programming Systems Lab Director of Graduate Studies Associate Chair, Department of Computer Science Columbia University in the City of New York), and Professor David Garlan (Reviewer 4, Professor of Computer Science, Associate Dean for Master's Programs in the School of Computer Science, Carnegie Mellon University).   All reviewers have experience administering programs in the area of software engineering and computer science. The reviewers were asked to comment on specific aspects of the proposal: (1) Quality and academic rigor of the program; (2) Adequacy of the size and expertise of faculty to administer the program; (3) Adequacy of the facilities and budgets; and (4) Applicant pool and placement prospects for the graduates. In addition, UC Planning and Budget (UCPB) reviewed the proposal and provided comments to CCGA.

In general, all reviewers and UCPB were strongly supportive of the proposed program, with such comments as:

- "The proposal is strong and timely" (Reviewer 1)
- "The quality of the program is very high. The program covers many aspects that would be important in the professional setting of software engineering." (Reviewer 2)
- "The academic rigor and quality of the proposed program is excellent overall." (Reviewer 3).

- "This is a well-conceived program with adequate technical and academic rigor." (Reviewer 4)

However, the reviewers raised some concerns and suggestions, and they also provided some constructive comments. The reviews were discussed in a preliminary discussion among CCGA members on the Jan. 3rd meeting, in which a number of concerns were identified to be addressed by the proposers. The reviews were provided to the proposers along with the identified list of CCGA's concerns. I believe the proposers adequately addressed the key concerns raised by the reviewers and UCPB's comments. The proposers' responses were reviewed by the CCGA members on the March 7th, 2018 meeting, and unanimously had a favorable vote in regards to the responses. Below is the list of CCGA concerns and the summary of the proposers' responses:

1) **Emerging topics (specifically Data Science):** Reviewer 1 writes "One chair called for cloud programming, big data analytics, and specification and requirement analysis to be covered; I think those topics could be covered in elective courses. Reviewer 2 noted a weakness as "one glaring whole: software engineering for big-data/machine-learning/data- science", and Reviewer 4 lists "Lack of coverage of certain emerging topics, including data-driven analytics, use of machine learning, continuous deployment, and run-time quality assurance" as one of the weaknesses of the program.

   - The proposers addressed this issue on three points. The following are the summary their reasoning. 1) It is understood that the field of software engineering is an evolving an emerging field and as such the original set of the breath courses is expected to grow and evolve over time to match the needs of the field. 2) Some of the mentioned emerging topics will be covered in the Software Engineering Principles courses. 3) Students will also have the chance to concentrate on such specific emerging topics in their capstone projects.

2) **Specialization and depth achievement:** Reviewer 4 points out that "There appears to be inadequate attention to software architecture and design. Too much emphasis on programming", and that "Students will not have the opportunity to achieve depth in areas of their choosing".

   - The proposers pointed out that a number of courses, such as the "Programming Style" course, cover software architecture and design principals, although the name of the course may not imply as such. The name of one proposed course, "Internet Applications Engineering", which covers software architecture and design principals will be changed to "Distributed Software Architecture" in order to reflect the content more. Proposers will also "seek an arrangement with the Master of Computer Science in which [the MSE] students can take one or two of their courses'', and thus achieve more concentration and desired specialization in these areas.

3) **Relationship between the MSE and Master in Computer Science**: Reviewer 1 points out: the MSE program may "cannibalize the existing M.S. program on software engineering ", Reviewer 2 also points out the "Competition between the existing UCI Master of Computer Science and the new Master of Software Engineering".

- The proposes appreciate the concern of the reviewers, however, they do not think this matter will be a problem. They point out that " in addition to the Ph.D. students we bring in fully funded, the minimum number of MSSE students we need each year is 60% of the current cohort to help staff our existing undergraduate courses with TAs and readers. That means 60% of the current cohort has the chance to come with financial support in future. That's very appealing: we do not expect to 'lose' these students because the new Master program comes online, especially since a funded MSSE gives students the chance to try out research without entirely committing to the Ph.D." The proposers also point out that the various Master programs in the School are considerably different, and serve different purposes and populations. Finally, they point out that the applicant pool for the Computer Science is fairly large (2000+) for just 150 slots.

4) **Program load and grade requirement:** Heavy load of the first quarter and grade requirements: Reviewer 3 has pointed that the minimum B- grade may be too harsh, especially in the light of the heavy first quarter load. Reviewer 3 notes if students with "the C+ or lower grade in any single course of this overloaded first quarter should really be dismissed from the program, and in the case of international students deported, as implied by 5-43." There is no note of what the class average grade would be. Reviewer 3 points out that "if the expected curved class average is A-, my concern is probably unwarranted".

- The proposers pointed out that the "B or better" grade requirement for completion of the courses is the University policy, however, they noted that there is "Students Affairs Office staff built in the program to guide and assist students". The proposers have planned for "strong TA support with low student-TA ratio". They also have an assessment team that operates quarterly, to identify any issues that may arise as soon as possible.

5) **Adequacy of the facilities and budgets** – While most reviewers agreed with the proposal that the facilities of UCI's Department of Informatics and budget detailed in the proposal is adequate, Reviewer 3 points out that "no new computing costs" in section 5-36 may be "wishful thinking" and that "any course projects involving operating system kernel, network stack, and/or distributed systems programming will almost certainly need Linux (or other *nix) hosts, probably running in virtual machines (VM) so students are not actually modifying the underlying machines' operating system or networking capabilities. ….. [needing] a VM cluster, not just the equipment but also professional IT staff to manage the equipment."

- The proposers pointed to (line 47) in the budget for $14,000 which they believe should cover the initial purchase of computer time. The proposers realize that more support may be needed in the years to come that they acknowledge the need to "reassess this point in the first few years of the program." This will be an important issue to consider in the program's initial and subsequent review cycles.

UCPB identified a few potential areas of concern to be monitored as follows:

- "The campus-level indirects do not seem to be sufficient to pay for the space and other support necessary for 40 students on campus.
- "it is not clear if the need for TAs from existing state-supported graduate programs will be a strain on the department's TA pool."

As directed by UCPB, CCGA did not request a response to the UCPB recommendations regarding budget and TA pool issues from the proposers. However, CCGA should monitor the financial status of the program and require a three-year follow-up program report. While the matter of diversity was well addressed in the proposal, CCGA members have also requested that the program pay special attention to be sure that such goals are met successfully. CCGA should monitor future review reports to ascertain and strongly encourage the success of the program in diversity areas.

Summary

In summary, CCGA's review of the Master of Software Engineering (MSE) at University of California, Irvine (UCI) proposal consisted of two external reviewers- Computer Science and Engineering faculty who have experience administering CSE programs at highly respected institutions in the field. In addition, two internal reviewers with considerable administrative experience in the field (one from UCLA and the other from UCSD) submitted their reviews. The proposed program also received an overall favorable review from UCPB with some concerns which do not need to be addressed at this time. This program will satisfy the great need for training of students who are interested in quickly entering the highly dynamic workforce of the software engineering. Such a program needs to be rigorous and comprehensive and I believe the UCI faculty has the expertise and recognition, as well as the facilities, to establish such a program. This proposed program will bring national and international attention to the University and as the lead reviewer for the proposal, I recommend its approval to CCGA members.

Respectfully submitted,

Shahrokh Yadegari
CCGA, Lead Reviewer for UCI' Master of Software Engineering Program.