April 22, 2011

TO:    THOMAS H. PAYNE  
       COMPUTER SCIENCE & ENGINEERING

FM:    MORRIS MADURO, CHAIR  
       GRADUATE COUNCIL

Re:    Proposal to Establish a Self-Supporting, College-Wide, Online Master-of-Science in Engineering Degree Program within the Bourns College of Engineering

At its meeting of April 20, 2011, the Graduate Council approved the proposal to establish A Self-Supporting, College-Wide, Online Master-of-Science in Engineering Degree Program within the Bourns College of Engineering.

From here, the proposal will have to be approved at the next meeting of the Divisional Senate before being sent to the system-wide CCGA.
• Title
Proposal to Establish a Self-Supporting, College-Wide, Online Master-of-Science in Engineering Degree Program within the Bourns College of Engineering

• Date of Preparation
January 3, 2011

• Contact Information Sheet (with the lead proponent clearly identified)
  – Dean: Reza Abbaschian, Bourns College of Engineering (reza.abaschian@ucr.edu)
  – Associate Dean: Mark Matsumoto, Bourns College of Engineering (mark.matsumoto@ucr.edu)
  – Lead Proponent: Thomas Payne, Computer Science and Engineering (thomas.payne@ucr.edu)
1 Introduction

1. Aims and objectives of the program. Any distinctive features of the program should also be noted.

The primary purpose of BCOE’s proposed Online Master-of-Science in Engineering Program is to enable fully employed engineers, including computer scientists, to advance their professional education, enhancing their value to their employers. The proposed program will be of benefit to engineers, their employers, this state, and the nation. It is at the Master’s level that engineers have the opportunity to learn a specialization in depth, and to renew and update their knowledge of technological advances.

This program is being developed for highly-qualified employed engineers who, for various reasons, do not or cannot attend traditional full-time M.S. programs and who are keenly interested in maintaining up-to-date knowledge of engineering and technology.

There are several reasons for the proposed online MS-degree program in Engineering:

- It furthers the mission of the University.
- It provides UCR in general and BCOE in particular with an entrance to online education, which is certain to become a major mode of delivery for higher education in the 21st Century. A recent survey found that almost a third of UC and UC-eligible students had already taken at least one online course. The number for UCR is not available, but it is very likely to be below that number.
- It serves the needs of working professionals and serves the needs of the industrial community.
- It provides industrial contacts for faculty members to establish research collaborations.
- It provides support funds for PhD students.

The Size and Shape Working group of the University of California Commission on the Future states that:

The terminal Masters is slightly anomalous at UC, where graduate students who are not pursuing professional degrees are usually pursuing doctorates. Self-supporting Master’s programs are beneficial both to the UC mission and to state economic needs. [Emphasis added.]

Also, per President Yudof’s May 14, 2010 letter to the Regents:

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1http://sloanconsortium.org/publications/survey/class_differences
2http://ucfuture.universityofcalifornia.edu/sizeofuc.html
The University’s self-supporting programs extend the University’s degree programs to academically qualified working adults who cannot be full-time students, as well as to foreign-trained students, students located off campus, and students seeking instruction in niche fields.

The distinctive features of the proposed program are that:

(a) The Program will be self supporting.

(b) The Program will be college-wide. This structure enables efficient management at the college level and will facilitate the development of multi-disciplinary specializations.

(c) The Program will be delivered over the Internet. Students of the Program will receive all course materials, including lectures, in an “online” manner. The current mode of delivering many courses within the Bourns College of Engineering (BCOE) relies heavily upon information technology, using learning-management systems. That is, currently, BCOE students receive course lecture notes, assignments, announcements, and other items via WEB interfaces, and they participate in online forums for questions and answers with instructors and TAs. In addition, prepared lectures will be available online for the students of the online M.S. in Engineering Program. The full description of what is meant by “online lecture” is contained in Subsection 2.6.

(d) The Program’s requirements include a significant design experience, incorporating additional readings and the knowledge of the courses undertaken. The Program includes an online 296A course, Preparation for the Comprehensive Examination, which will address this engineering design experience — see Section 2.6.

(e) Program profits will mainly be used to support Ph.D. students within the BCOE.

(f) The design experience, the mode of delivery of the courses of instruction, the availability of this online M.S. in Engineering Program for employed engineers, and the ability to easily implement multidisciplinary programs of study are what distinguish this new program from the M.S. programs that BCOE departments currently offer.

2. Historical development of the field and historical development of departmental strength in the field.

This college-wide program will be based on existing areas of study and combinations thereof to establish relevant and attractive (possibly multidisciplinary) “specializations.” The material for each 100/200-level course

\footnote{Engineering 296A is a yet-to-be-proposed course similar to UCLA’s 597A, which is offered by each engineering department.}
of the online M.S. in Engineering Program will be equivalent to the material delivered under the traditional MS/PhD program; the difference is the mode of delivery. Courses will be taught and administered by ladder-rank faculty and, at times, by selected adjunct faculty, emeriti, and lecturers. Program details are provided in Section 2.

Not all areas of study within the College will be candidates for this program and, as discussed in Section 2, the initial stage (the first year) will begin with Bioengineering as the initial specialization. At the beginning of the second year, the first year for the second cohort, the goal is to have in place at least one additional specialization. Generally, any set of approved courses that can effectively be delivered by online instruction is a candidate to be included in the online M.S. in Engineering Program. However, during the “initialization stage,” and the subsequent year 2 and/or year 3, it is most likely that only a few specializations will be offered. Further specializations will be chosen according to faculty availability and advice from our industry advisers, their employees, and our alumni.

3. Timetable for development of the program, including enrollment projections. Consistency of these projections with the campus enrollment plan. If the campus has enrollment quotas for its programs, state which program(s) will have their enrollments reduced in order to accommodate the proposed program.

We hope to implement an initial offering by Fall 2011 or as soon feasible after approval. Before implementation, a number of tasks will need to be done including:

- Development of initial specialization curriculum.
- Approval of new graduate courses for the professional component of this degree program.
- Development of appropriate versions of these newly developed courses as well as the technical courses that will make up the initial specialization areas for online delivery.
- Sufficient potential enrollments in the initial specializations (~5 students).

As stated above, we plan to start the online M.S. in Engineering Program by offering a specialization in Bioengineering. Upon imminent approval of the online M.S. in Engineering Program by the Graduate Council and CCGA, we will solicit further advice from our industry partners and alumni with respect to specializations in the other BCOE departments and programs.

We will solicit the opinions of our alumni with respect to appropriate specializations, including suggested multidisciplinary areas. This will be

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4 Instructor compensation is discussed on page 22
an on-going effort of BCOE. We will be in frequent contact with our industry partners for their opinions on appropriate specializations, with emphasis on emerging and future areas.

4. Relation of the proposed program to existing programs on campus and to the Campus Academic Plan. If the program is not in the Campus Academic Plan, why is it important that it be begun now? Evidence of high campus priority. Effect of the proposed program on undergraduate programs offered by the sponsoring department(s).

The online M.S. in Engineering Program will emphasize specializations. As an example, our initial specialization will be drawn from Bioengineering courses of the Bioengineering Department. As described in Section 2, the online M.S. in Engineering Program will consist of nine courses, including Engineering 296A to provide the appropriate instruction mechanism and course credit for the major design project. It is important to note that each 100/200 level course’s material in the online M.S. in Engineering Program is equivalent to the material delivered in the traditional MS/PhD program; the difference is the mode of delivery.

There will be no operational relationship between the online M.S. in Engineering Program and the traditional M.S. programs. In particular, the offerings of a given course will be distinct. Each course of the online M.S. in Engineering Program will be constituted as a separate section of the traditional course (e.g., CS235, Section 2). Only students of the online M.S. in Engineering Program will be allowed to enroll in this latter section, and similarly students of the online M.S. in Engineering Program will not be allowed to enroll in the traditional offering (e.g., CS235, Section 1). Additionally, while many traditional graduate courses are offered once per year, their online counterparts may be offered more often.

5. Interrelationship of the program with other University of California institutions, if applicable. The possibility of cooperation or competition with other programs within the University should be discussed. Proponents should send copies of their proposal to all departments on other campuses offering similar degrees. Review letters should be obtained from chairs of such departments and these letters should be attached to the proposal.

UCLA has an established self-supporting online “Master of Science in Engineering” program that is intended for employed engineers as well. Other UC campuses such as UCSD are also considering the establishment of similar programs.

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\(^5\)This course, described in subsection 2.4, is yet to be submitted for approval to the Committee on Courses and the Graduate Council.
Another local competitor for the proposed program is the Distance Education Network of USC, which offers M.S. degrees in the many engineering disciplines.

The Stanford Center for Professional Development (SCPD) offers online M.S. degrees, for employees of member companies, in several engineering disciplines (including Electrical Engineering, Mechanical Engineering, and Computer Science).

On the East Coast, the Georgia Institute of Technology offers online M.S. degrees in several engineering disciplines (including Electrical Engineering, Mechanical Engineering, and Civil Engineering).

We believe the strength of the faculty and the specializations that we will include in the online M.S. in Engineering program will lead to considerable demand for the education and training that BCOE has to offer.

As this program is to be a self-supporting, no resources, teaching or otherwise, will be withdrawn from the BCOE’s undergraduate or graduate programs.

**Precedents.** Within the UC System:

- UCLA proposed their Online MS in Engineering in 2004. It was established in 2007 and now has 450 students. Currently, UCLA’s is the UC System’s only online MS in Engineering.
- UCSD has proposed a Master of Advanced Studies in Systems Engineering, and that proposal has gone forward to the CCGA.
- UCB is proposing a one year, Master of Engineering program that is not online.

US News has published a list of 60 well respected universities that offer online degrees in engineering, both graduate and/or undergraduate. Here are further examples of online M.S. degree programs in engineering offered by top-fifty engineering schools — specifically, US News ranks the University of Illinois–Urbana-Champaign as fifth, USC as seventh, UCLA as 14th, the University of Florida as 25th, Arizona State as 45th:

- USC’s Viterbi School of Engineering offers 66 M.S. degree programs in engineering of which 46 are available online.
- The EDGE (Electronic Delivery of Graduate Engineering) Program of the University of Florida offers 20 different MS degree programs within seven majors.
  - Civil and Coastal Engineering

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8 [http://mapp.usc.edu/mastersprograms/degreeprograms/index.html](http://mapp.usc.edu/mastersprograms/degreeprograms/index.html)
9 [http://www.ufedge.ufl.edu/](http://www.ufedge.ufl.edu/)
- Computer and Information Science and Engineering
- Electrical and Computer Engineering
- Environmental Engineering Sciences
- Industrial & Systems Engineering
- Materials Science and Engineering
- Mechanical and Aerospace Engineering

Their most popular degree is in Environmental Engineering.

UF has been offering distance education since 1964. For 2009-2010, EDGE had approximately 1200 graduate course enrollments. Half of these students came from Florida, with the remainder distributed all over the U.S. and internationally.

- The University of Illinois–Urbana-Champaign offers an online M.S. degree in Mechanical Engineering.[10]
- Arizona State University offers an online M.S. degree in Software Engineering.[11]

6. Plan for evaluation of the program within the offering departments(s) and campus wide.

(a) At the end of each quarter, students will be asked, via online questionnaires, for their opinions of the effectiveness of the teaching medium, approach, and content. Since these graduate students are employed engineers, a good deal of valuable feedback is expected, and improvements will be made accordingly.

(b) During the initialization stage and the second year, the Dean and the Associate Dean will meet periodically with the faculty of the specializations. The head administrator of the computing facilities involved will also attend so that any problems associated with the physical resources needed for the delivery of online lectures may be discussed and resolved. Specifically sought will be the faculty opinion of the success of the online students relative to the traditional students.

(c) At the end of each two-year period, the Dean will request that the Faculty Executive Committee review the program and provide its recommendations to the Dean, who will forward those recommendation, as well as the Dean’s recommendations, to the Graduate Council to implement recommended changes.

(d) As with all graduate programs, the Graduate Council executes its reviews according to its schedule.

Academic standards. The assurance of academic standards for the proposed program is the track record of the proposing unit. In the 20 years of its existence, BCOE has established six graduate programs including the two largest PhD programs on the UCR campus. In addition:

- The students entering the program will meet the same admission standards as those entering the standard graduate programs.
- The courses for this program will be approved via UCR’s standard process.
- The program will be reviewed via UCR’s standard graduate-review process on the standard review cycle.
- The courses will be taught by UCR faculty who are reviewed via the standard processes.
- Some of the courses will be taught to live audiences of resident students and simultaneously recorded for online students. This technique has been successfully employed by other top universities, such as the University of Florida.\footnote{http://www.ufedge.ufl.edu/programs/degree.php}
- The program committee will monitor the annual BCOE alumni surveys to determine whether the program’s objectives are being met.
- There will be UCR’s standard course evaluations.
- All students’ exams will be proctored.
- Each student must either take a comprehensive examination prepared by a committee of BCOE faculty or complete an MS project under the supervision of a BCOE faculty member. In either case, there will be faculty feedback regarding the educational outcomes.
- Each course is taught under the auspices of an existing UCR department, which will have oversight responsibility for that course.

In addition, the proposed program has been modeled after a successful program at UCLA, and there are precedents for such programs at many other top universities throughout the country.

According to a 3/1/2010 report from UCOP, “Current state of online education in the US: Opportunities and challenges”\footnote{http://groups.ischool.berkeley.edu/onlineeducation/docs/currentstate}:

A systematic analysis conducted by the U.S. Department of Education of the research literature from 1996 through July 2008 identified more than a thousand empirical studies of online learning in K-12, post-secondary, and professional education. An analysis of the studies that:

- contrasted an online to a face-to-face condition,
• measured student learning outcomes,
• employed rigorous research design, and
• provided adequate information to calculate an effect size,
produced 51 independent effects (44 of which were based on research with students beyond K-12) that could be subjected to meta-analysis.
The meta-analysis found that, on average, students in online learning conditions performed better than those receiving face-to-face instruction.

Online education will not dilute the integrity and quality of the host institution’s academic offerings whether delivered in person or online. And online courses need not require more faculty time than face-to-face instruction.

2 Program

A detailed statement of the requirements for the program including the following:

1. Undergraduate preparation for admission.

In addition to the requirements of the University, each applicant must possess the equivalent of a Bachelor’s degree in engineering, computer science, physical science, or mathematics, and have sufficient background, courses or experience, to satisfy the prerequisites for the courses of the corresponding specialization.

2. Foreign language. “The CCGA recognizes that foreign language competence may be an important element of graduate education of doctoral programs. It is the responsibility of the Divisional Graduate Councils to insure that the proponents of new doctoral programs have carefully considered the value of a foreign language requirement. We shall assume that when a proposal for a new doctoral degree has been forwarded to CCGA, this issue has been addressed and resolved to the satisfaction of the Division. Divisional Graduate Councils should apply the same standard adopted for new programs in reviewing existing doctoral programs” (CCGA Minutes, 5/14/85, p.6)

Not applicable.

3. Program of study:

(a) Specific fields of emphasis
Each area of study within each of BCOE’s traditional graduate programs is a candidate for a corresponding specialization of the online M.S. in Engineering Program, provided that the courses can be effectively delivered in an online fashion. Combinations of such areas will be actively sought in order to enhance multidisciplinary education. A distinct advantage of the College-wide M.S. in Engineering Program will be the ability to provide multidisciplinary education.

We will initiate the Program by offering the Bioengineering specialization. At the beginning of the second year, we intend to introduce at least one more new area of study, to be selected early in the first year upon the advice of faculty, industry, and alumni. Two likely possibilities include Water-Quality Control Systems and Computer Networks.

As a result of our on-going advice from our industry partners, as well as from our alumni, new specializations will be added to the Program.

(b) **Plan(s): Masters I and/or II; Doctors A or B**

The online M.S. in Engineering Program will be structured in a manner that will allow employed engineers to complete the requirements in two academic years plus one additional summer quarter. All students will complete their requirements through Plan II (project or comprehensive exam). The project will involve a literature review of a specialization topic, a substantial engineering-design project, and a report based on those readings as well as upon course work.

(c) **Unit requirements**

The program will consist of nine courses (36 units), six of which must be at the 200 level. Each student’s program will contain at least four core courses from the professional engineering series, four more from the student’s chosen specialization, plus ENGR 296A (Preparation for M.S. Comprehensive Examination). The latter provides the opportunity for adequate study and instruction for the major design project, a key component of the online M.S. in Engineering Program.

(d) **Required and recommended courses, including teaching requirement**

See the sample program below (item # 11) for the course requirements for the initial specialization, Bioengineering.

(e) **When a degree program must have licensing or certification, the requirements of the agency or agencies involved should be listed in the proposal, especially the courses needed to satisfy such requirements (CCGA Minutes, 1/17/78, p.5)**

Not applicable.

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14See Subsection 4 for more details.
4. Field examinations — written and/or oral.
   Not applicable.

5. Qualifying examinations — written and/or oral.
   Not applicable.

   Not applicable.

7. Final examination.
   Not applicable.

8. Explanation of special requirements over and above Graduate Division minimum requirements.
   Not applicable.

9. Relationship of master’s and doctor’s programs.
   An on-going student of a traditional M.S. program may not switch to the online M.S. in Engineering program. Students who have completed the online M.S. in Engineering program may apply to the Ph.D. program. Students who have completed a traditional M.S. or Ph.D. programs may be admitted to the online M.S. in Engineering program; however, courses taken in completion of those programs’ requirements may not be used for the online M.S. in Engineering program.

10. Special preparation for careers in teaching.
    Not applicable, since the students will be practicing engineers.

11. Sample program.
    A specialization associated with the online M.S. in Engineering Program will be constructed from areas of study associated with the traditional M.S. programs. As an example, we consider the Bioengineering specialization.

   **Specializations**
   
   **Bioengineering**
   Principles and applications of Bioengineering based on a solid fundamental foundation in biological science and engineering to equip the students with diverse communication skills and training in the most advanced quantitative bioengineering research so that they can become leaders in their respective fields. The result is a rigorous, but exceptionally interactive and welcoming educational training for Bioengineering graduate students.
Prerequisite. B.S. degree in engineering or equivalent.

Minimum Course Requirements. Nine four-unit courses, of which at least six must be graduate courses, i.e., at the 200 level.

Plan II. Engineering 296A; four courses from the professional engineering core; plus four courses from the following list, subject to the approval of the student’s adviser:

- BIEN 223 – Engineering Analysis of Physiological Systems
- BIEN 224 – Cellular and Molecular Engineering
- BIEN 249 – Integration of Computational and Experimental Biology
- BIEN 264 – Dynamics of Biological Systems

Selection of courses for the professional engineering core will include courses such as the following:

- MGT 201 Quantitative Analysis
- MGT 221 Decision Making Under Uncertainty
- MGT 236 Decision Making Under Certainty
- MGT 230 Databases for Management
- MGT 243 Product Development
- MGT 266 Project Management
- MGT 281 Systems Analysis and Design
- XRC 463.1 Systems Requirements Definition and Analysis Egr.
- XRC 463.2 Systems Concepts Development and Selection Egr.
- XRC 463.3 Systems Design and Integration Egr.
- XRC 463.4 Systems Verification Egr.
- XRC 470.37 New Product Development
- XRC 470.41 Project Management Essentials (an online course)

A sample specialization, drawn from Bioengineering follows.\textsuperscript{15}

- BIEN 223
- BIEN 224
- BIEN 249
- BIEN 264

\textsuperscript{15}Online versions of these courses have been neither developed nor proposed for Academic Senate approval. Nor have the X 463 series and X 470 series been proposed for XRC status. Online version will be developed as needed, except that X 470.41 is already an online course that has been delivered multiple times by UNEX.
The comprehensive-examination requirement will be met by a literature review, a major design project, plus a report; one enrollment in Engineering 296A\textsuperscript{16} will provide the appropriate course credit and instruction vehicle for this requirement.

ENGR 296A. Preparation for M.S. Comprehensive Examination. (4 units) Tutorial, to be arranged. \textbf{Limited to graduate engineering students in the online M.S. program.} Reading and preparation for M.S. comprehensive examination. S/U grading.

We believe that ENGR 296A requirement will benefit employed engineers far more than only lectures, the mode of operation of other online engineering programs. We believe that the design project and the concomitant satisfaction upon its completion will attract online M.S. in Engineering students to our Ph.D. programs.

\textbf{12. Normative time from matriculation to degree. (Assume student has no deficiencies and is full-time.) Also specify the normative lengths of time for pre-candidacy and for candidacy periods. (If normative time is subsequently lengthened to more than six years, prior approval of CCGA is required.) Other incentives to support expeditious times-to-degree: what policies or other incentives will assure that students make timely progress toward degree completion in the proposed program?}

The normative time for completion will be two calendar years.

\textbf{3 Projected need}

A statement setting forth the following:

\textbf{1. Student demand for the program.}

The demand for such a program is high. UCLA’s program started in 2007 and last year had 450 students.

Working engineers, even those with years of experience, need to frequently renew and update their knowledge to deal with technology advances that occur, and have been occurring, at a rapid rate. There are likely few professions for which the need to renew and update is so critical.

\textbf{2. Opportunities for placement of graduates. UC anticipates that CPEC in particular will expect detailed and convincing evidence of job market needs. This will be especially true for programs in graduate fields now well represented among UC campuses and}

\textsuperscript{16}Engineering 296A is a yet-to-be-proposed course similar to UCLA’s 597A, which is offered by each engineering department.
California independent universities, as well as programs in the same field proposed by more than one campus. If UC already offers programs in the field, what are their placement records in recent years? What recent job listings, employer surveys, assessments of future job growth, etc. can be provided to demonstrate a strong market for graduates of this program, or for graduates of specialty areas that will be the focus of the program?

Since this program is aimed toward fully employed engineers, most of them will already be placed.

BCOE has numerous alumni employed throughout the U.S. and other countries. Not only are many of them candidates for our program, but many are also in positions to influence others to take advantage of what BCOE at UCR has to offer. We have no doubt that there is a considerable potential base of knowledgeable engineers who will appreciate BCOE’s efforts and enroll in the online M.S. in Engineering Program.

3. Importance to the discipline.

Because of rapid advances in technology and rapid changes in the needs of the nation, there is a significant need for continuing education and updating of skills in the engineering profession.

4. Ways in which the program will meet the needs of society.

It will give fully employed engineers an opportunity to update and/or shift the focus of their engineering skills. This program will make it convenient for working engineers to renew their education, while continuing their professional careers, and to have the benefit of instruction by and access to research-active UCR faculty members.

Society needs technological advances in medicine, energy, and sustainability. The faculty and administration of the BCOE wish to provide a critical educational service for California’s and the nation’s engineers and for the organizations that employ them and make those advances.

5. Relationship of the program to research and/or professional interests of the faculty.

This program will be based on existing areas of study within BCOE, and therefore should mesh well with the skills and interests of the faculty.

6. Program Differentiation. How will the proposed program distinguish itself from existing UC and California independent university programs, from similar programs proposed by other UC campuses? Statistics or other detailed documentation of need should be provided.

As mentioned above, the distinctive features of the proposed program are that:
(a) The Program will be self supporting.

(b) The Program will be college-wide. This structure enables efficient management at the college level and will facilitate the development of multi-disciplinary specializations.

(c) The Program will be delivered over the Internet. Students of the Program will receive all course materials, including lectures, in an “online” manner. The current mode of delivering many courses within the Bourns College of Engineering (BCOE) relies heavily upon information technology, using learning-management systems. That is, currently, BCOE students receive course lecture notes, assignments, announcements, and other items via WEB interfaces, and they participate in online forums for questions and answers with instructors and TAs. In addition, prepared lectures will be available online for the students of the online M.S. in Engineering Program. The full description of what is meant by “online lecture” is contained in Subsection 2.6.

(d) The Program’s requirements include a significant design experience, incorporating additional readings and the knowledge of the courses undertaken. The Program includes an online 296A course, Preparation for the Comprehensive Examination, which will address this engineering design experience — see Section 2.17.

(e) Program profits will mainly be used to support Ph.D. students.

(f) The design experience, the mode of delivery of the courses of instruction, the availability of this online M.S. in Engineering Program for employed engineers, and the ability to easily implement multidisciplinary programs of study are what distinguish this new program from the M.S. programs that BCOE departments currently offer.

4 Faculty

A statement on current faculty and immediately pending appointments. This should include a list of faculty members, their ranks, their highest degree and other professional qualifications, and a citation of relevant publications; data concerning faculty should be limited to only that information pertinent to the Committee’s evaluation of faculty qualifications. (For group programs only, one copy of letters from participating faculty indicating their interest in the program should be included. In addition, comments from chairmen of departments with graduate programs closely related to or affected by the proposed program should be included.)

17Engineering 296A is a yet-to-be-proposed course similar to UCLA’s 597A, which is offered by each engineering department.
As discussed in Subsection 2.2, we will initiate the online M.S. in Engineering Program with the Bioengineering specialization. We expect that as the Program develops, more specializations and associated faculty will become active participants.

All online courses are to be taught by the ladder faculty generally associated with the corresponding specialization. Occasionally, adjuncts, emeriti, and lecturers may also be instructors of online courses.

5 Courses

A list of present and proposed courses including instructors and supporting courses in related fields. The catalog description of all proposed courses should be appended. The relationship of these courses to specific fields of emphasis and future plans. How will the courses be staffed given existing course loads?

As previously noted, the proposed program is based on existing courses that are yet-to-be approved for online delivery. We, therefore, request that this proposal be approved contingent upon Committee on Courses approval of the online delivery of those courses.

The graduate courses of the BCOE are candidates, along with appropriate undergraduate prerequisite courses, for inclusion in the online M.S. in Engineering Program. Courses are added to the program as a result of the addition of specializations.

5.1 The Online Courses for the Program

An online course involves the following four components:

- A course management system, e.g., UCR’s iLearn (BlackBoard) system, which UCR has been using for many years and with which most UCR faculty are already familiar.
- For online consultation with TAs and faculty, a web-based meeting system that includes shared desktop, audio, and possibly video communication.
- Remotely available online video recordings of classroom lectures (e.g., Flash 7.0+) with accompanying presentation graphics (e.g., PowerPoint slides).
- Remotely proctored exams, for which we will initially follow UCLA’s policies and protocols.

The links available on UCLA’s current-students web page give a reasonably good idea of how their program works.

Unfortunately, their class-demo website is currently being updated.
5.1.1 The Course Management System

UCR has deployed an online, full-service website, iLearn (based on BlackBoard), that provides student and faculty access to courses and associated materials. Assignments, answer sheets, announcements, lecture slides, lecture notes, etc., may be uploaded by the faculty and easily accessed and downloaded by the student. It also provides threaded forums by which student questions are addressed by the instructor or TA, as well as, possibly, by other students. An e-mail tool is built in that allows the instructor to easily send information to the students of the class.

5.1.2 The Online Lectures for the Program

There are, of course, several technologies for producing online lectures. We have decided that it is best to have the instructor visible and speaking directly to the remote audience. We have decided upon producing video-audio synchronized PowerPoint lectures. Many faculty members of BCOE have a good deal of experience with the production of such lectures. Considerable effort is required of the instructor to create such video-synchronized PowerPoint lectures for an entire course.

When the lecture has been constructed, various files are published (uploaded) to two servers, for the purpose of streaming the lecture material. Each of these servers acts as a backup for the other.

This technology enables the student to have complete control of the streamed lecture material. The student may stop (pause) the flow of the presentation to carefully view a particular slide, the student may easily move from the present slide to any other slide and its concomitant video explanation, and, of course, the student may repeat a lecture or portions of a lecture as often as desired. When the student “clicks” on the appropriate hyperlink, the lecture is streamed to that student’s machine and displayed in the machine’s browser.

5.1.3 Online Consultation

We are currently exploring various collaborative-software technologies (e.g., Skype plus VNC) that will enhance office hours, beyond the usage of online forums, allowing audio and visual contact between the instructor and several students of the class, even if such students are geographically dispersed.

5.1.4 Examinations

Examinations need not be online examinations. During the initialization stage, we expect to mainly enroll those applicants who are employed in organizations with which we are familiar and for which we are able to “localize” the examination. As an example, if we have employees of Company X in Boston enrolled in the program, an examination (e.g., midterm, final) can be posted at a given time and downloaded to a Company X facility at which we have arranged for
a trusted proctor (e.g., a member of the office of the “VP of University Relations”). We would also have an “open link” with the proctor to be able to answer the typical clarification questions that arise during an examination. The students’ examinations would then be scanned and sent back to the instructor via e-mail or by FTP to a protected site.

A design project (in lieu of comprehensive-examination) would be handled as a course (296A) in which the instructor will be in contact with the students, and with portions of the projects being sent to the instructor throughout the duration of the course. In addition to online lecture material (e.g., to clarify the design project), and in addition to the communication ability built into BCOE’s online learning-management system, we may also initiate a “net meeting” implementation to enhance our visual and audio communication with the students of this program.

If there are students of the program who are within a reasonable distance from the UCR Campus, those students may be asked to come to the campus for their examinations, to be synchronously taken along with their remote student colleagues.

As the program develops beyond the initialization stage, we will develop arrangements with organizations, including other schools, at which examinations may take place in a trusted, proctored environment.

5.1.5 Intellectual Property

UC policy is that “[T]he University owns the copyright to recordings of classroom lectures, but faculty own the copyright to their own lecture notes and teaching aids.” It is the College’s position that studio-based pre-recorded lectures are teaching aids and, therefore, the property of the faculty member who created those lectures. No other faculty member may use them without the explicit approval of the creator. Neither the College nor its representatives will distribute those lectures to others without the explicit approval of the creator of those materials.

5.1.6 Summary

In summary, the physical resources of BCOE, the availability of an online learning-management system, and our hardware and software facilities for recording and editing online lectures enable BCOE to provide this program. An outside vendor is unnecessary.

UCLA has a sample, demonstration course posted on its web site — unfortunately, it is currently being updated. Also, USC has an extensive web site detailing how they run their online programs. Regarding academic standards they note that

\[\text{21See http://www.ucop.edu/irc/wp/wpDocs/wpd002.html} \]
\[\text{22http://msengrol.seas.ucla.edu/prospective-students/demo} \]
\[\text{23http://mapp.usc.edu/distanceeducation/index.html} \]
\[\text{24http://www.ufedge.ufl.edu/programs/degree.php} \]
“[S]ince the classes you are completing are the exact same courses our on-campus graduate students take, your degree earned is the exact same degree as our on-campus students, with absolutely no mention of ‘distance learning’ on your diploma or transcript.”

They also describe their process for appointing a proctor and processing exams. And, they have posted a cover sheet for exam proctors certification.

6 Resource requirements

Estimated for the first 5 years the additional cost of the program, by year, for each of the following categories:

1. FTE faculty

   This is covered under “instructor compensation” in the projection chart below.

2. Library acquisition

   None.

3. Computing costs

   This will be covered by the instructional-services fee given in the projection chart below.

4. Equipment

   This will be covered by the instructional-services fee given in the projection chart below.

5. Space and other capital facilities

   This will be covered by the instructional-services fee given in the projection chart below.

6. Other operating costs

   This will be covered by the instructional-services fee given in the projection chart below.

Indicate the intended method of funding these additional costs.

This program will be self supporting. Per the attached projections (below), after a brief start-up period, its expenses will be covered by student fees.

---

25 http://www.ufedge.ufl.edu/partners/proctors.php
26 http://www.ufedge.ufl.edu/pdf/ExamCoverSheet_2010.pdf
If applicable, state that no new resources will be required and explain how the program will be funded. If it is to be funded by internal reallocation, explain how internal resources will be generated.

This program will be self supporting. Per the attached projections (below), after a brief start-up period, its expenses will be covered by student fees.

State Resources to Support New Programs. The resource plan to support the proposed program should be clearly related to campus enrollment plans and resource plans. Campuses should provide detailed information on how resources will be provided to support the proposed program: from resources for approved graduate enrollment growth, reallocation, and other sources. What will the effects of reallocation be on existing programs? For interdisciplinary programs and programs growing out of tracks within existing graduate programs: What will the impact of the new program be on the contributing program(s)? When the proposed program is fully implemented, how will faculty FTE be distributed among contributing and new programs?

Our intention is to initiate this online M.S. in Engineering Program modestly. As stated above, we intend initially to offer a single specialization, Bioengineering. In each of the subsequent years, we intend to add an additional specialization (and possibly more), while continuing with the previous areas as well. At this point, a likely specialization to be included at the beginning of the second year is Water-Quality Control Systems and/or Computer Networks. The following table illustrates this conservative course offering plan by specialization: five incoming students per area per year with four of the five continuing through the second year.

<table>
<thead>
<tr>
<th>Year</th>
<th>Specialization</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Spec 1</td>
<td>5</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Spec 2</td>
<td>5</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Spec 1</td>
<td>5</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Spec 1</td>
<td></td>
<td></td>
<td>5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Spec 2</td>
<td></td>
<td></td>
<td>5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Spec 3</td>
<td></td>
<td></td>
<td>5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Spec 4</td>
<td></td>
<td></td>
<td>5</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Online M.S. in Engineering Program Course Offerings.

We propose that the basic fee for the online M.S. in Engineering Program be $15,000 per year for the two-year program, i.e., $30,000 per student for the two-year program. Revenue will be used for faculty compensation, Special Reader support for Ph.D. students, fee remissions, administrative and computer support. A faculty member’s compensation covers the instructor’s workload, comprising construction of new assignments, changes in the original lectures, online
office hours, instructing and monitoring the special readers, and general grading responsibilities — payments to the faculty may be used for additional student support, travel, and summer salary. Programmer and Student Affairs (Administrative Analyst) assistance will also be needed, in addition to computer server equipment additions that will be needed as enrollment grows and the physical demands of lecture “streaming” increase. We will also allocate one Special Reader for each class. The nature of online lectures necessitates, certainly at the beginning of the Program, adequate consultation resources for the students of the Program. These positions also contribute to needed Ph.D. student support.

The following table describes the revenue and costs for a single specialization of the online M.S. in Engineering Program — the expectation is to introduce one new specialization per year. Profits will be used for unpredicted costs and for graduate fellowships for BCOE’s Ph.D. students.

It is expected that the technical courses will be delivered by tenure-track faculty, who will be both the developer of the course and its instructor. For offerings of that course, the faculty member will receive $400 per student per offering, and will have the assistance of a .25-FTE Special Reader, who will receive $4500 in salary plus $400 in benefits. Other courses, commonly the core engineering methodology courses, will be delivered by adjunct faculty or lecturers, who will work without a TA or Reader and will receive a $400/student/offering instructor fee in addition to $4500 in salary and $400 in benefits for each offering.

27 These on-line courses will not be in lieu of or replacement for a faculty member’s normal teaching, research, or service duties.

28 It is expected that .25-FTE Special Readers will be responsible for an average of five students and a maximum of eight — at that level the load would be split over two .25-FTE Special Readers or given to a .50-FTE Special Reader.
M.S. in Engineering (online)

Nine-course, two-year program with a new cohort each fall

<table>
<thead>
<tr>
<th>Cost Type</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average number of courses/year/student</td>
<td>4.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuition ($15,000/student/year)</td>
<td>$15,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application fee (one time per student)</td>
<td>$70</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Online-Course Develop/Mgmt Fees**

<table>
<thead>
<tr>
<th>Cost Description</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost to develop 1st offering of online course</td>
<td>$5,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost to update for each subsequent offering</td>
<td>$1,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instructional Services Fee (per student/offering)</td>
<td>$500</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Instructional Support**

<table>
<thead>
<tr>
<th>Cost Description</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructor compensation (per student/offering)</td>
<td>$400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.25-FTE TA/Reader costs/offering (salary + fees)</td>
<td>$2,772</td>
<td>$3,255</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost Type</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 new students annually</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Courses Offered</td>
<td>5</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Enrollments</td>
<td>5</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Average enrollment per offering</td>
<td>5</td>
<td>4.5</td>
<td>4.5</td>
</tr>
<tr>
<td>Total Annual Revenue</td>
<td>$75,000</td>
<td>$135,000</td>
<td>$135,000</td>
</tr>
</tbody>
</table>

**Course Development (one-time costs)**

<table>
<thead>
<tr>
<th>Cost Description</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online course conversion ($5000 for 1st offering)</td>
<td>$25,000</td>
<td>$20,000</td>
<td>$0</td>
</tr>
<tr>
<td>Total One-Time Costs</td>
<td>$25,000</td>
<td>$20,000</td>
<td>$0</td>
</tr>
</tbody>
</table>

**Direct Instructional Costs**

<table>
<thead>
<tr>
<th>Cost Description</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketing</td>
<td>$15,000</td>
<td>$15,000</td>
<td>$15,000</td>
</tr>
<tr>
<td>Instructor compensation ($400/student/offering)</td>
<td>$10,000</td>
<td>$16,200</td>
<td>$16,200</td>
</tr>
<tr>
<td>TA/Reader salary and benefits</td>
<td>$30,135</td>
<td>$54,243</td>
<td>$54,243</td>
</tr>
<tr>
<td>Instructional Services Fee ($500/student/offering)</td>
<td>$12,500</td>
<td>$20,250</td>
<td>$20,250</td>
</tr>
<tr>
<td>Course update/revision fee ($1,000/offering)</td>
<td>$5,000</td>
<td>$9,000</td>
<td></td>
</tr>
<tr>
<td>Ongoing Instructional Costs</td>
<td>$67,635</td>
<td>$110,693</td>
<td>$114,693</td>
</tr>
<tr>
<td>Total Annual costs</td>
<td>$92,635</td>
<td>$130,693</td>
<td>$114,693</td>
</tr>
</tbody>
</table>

**Three-Year Net Revenue**

<table>
<thead>
<tr>
<th>Year</th>
<th>First Year</th>
<th>Second Year</th>
<th>Third Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>$75,000</td>
<td>$135,000</td>
<td>$135,000</td>
</tr>
</tbody>
</table>

Table 2. Budget for the online M.S. in Engineering Program.

11 This fee covers such things as student-affairs and technical services.
12 Any net-positive Revenue will be used to support BCOE Graduate Students.
7 Graduate Student Support

It is recommended that all new proposals include detailed plans for providing sufficient graduate student support. In fields that have depended on federal research grants, these plans should also discuss current availability of faculty grants that can support graduate students and funding trends in agencies expected to provide future research or training grants. Are other extramural resources likely to provide graduate student support, or will internal fellowship and other institutional support be made available to the program? Describe any campus fund-raising initiatives that will contribute to support of graduate students in the proposed program.

Since the online M.S. in Engineering Program is for employed engineers, the issue of support of graduate students of the program is not relevant. However, an important reason for the introduction of the online M.S. in Engineering Program is to generate funds to support Ph.D. students, and the profit by this program will be used primarily to do so.

How many teaching assistantships will be available to the program? Will resources for them be provided through approved enrollment growth, reallocation, or a combination? How will reallocation affect support in existing programs?

This program will be self-supporting. Its TAs and Readers will be supported from fees generated by the program.

8 Governance

If the new program is being offered by a unit that does not/has not offer(ed) graduate degrees, then a setting forth of the Department or Group that will administer the program is required, and the proposal should include bylaws associated with the new program. Bylaws should also be included in with all proposals submitted by interdepartmental programs (IDPs). IDPs are graduate degree granting programs that are not offered by a single department, but administered by a group of faculty who are constituted for that purpose, and whose governance lies outside that of any single department.

Oversight committee. The proposed program will have an oversight committee appointed by BCOE’s dean and consisting of representatives from the various BCOE departments and programs. This committee will be chaired by the program’s director. Its current members are:

- Reza Abbaschian, Dean BCOE and former chair of Material Science and Engineering at the University of Florida (ex officio)
Instructors for the online courses will be selected and assigned via the same methods and criteria as for BCOE’s existing programs. Mostly, they will be ladder-rank UCR faculty. And, the fact that the program is online does not affect their credentials.

Applications to the online M.S. in Engineering Program are to be made to the Bourns College of Engineering and to the Graduate Division. The standards for admission are the same as those for BCOE’s traditional M.S. degrees, including GRE requirements and compliance with all Graduate Council regulations for admission. Each year, and for each specialization currently active in the online M.S. in Engineering Program, the Program’s Director will appoint at least two faculty members, associated with the corresponding specialization, to act as an admissions committee. Each committee will make its recommendations to the Director, who will forward them to the Graduate Division. This recommendation process is virtually equivalent to what is now in place for the current M.S. and Ph.D. programs.

The applicant shall have completed the substantial equivalent of the basic requirements for the degree of Bachelor of Science in Engineering, Computer Science, Physical Science, or Mathematics. The adequacy of the applicant’s preparation will be determined by the faculty admission committee.

Petitions, disqualification, and the legion of miscellaneous issues that arise are to be handled in the same manner as they are for the M.S. and Ph.D. programs.

Each student’s course work and comprehensive examination (major design experience and project) will be supervised as follows. For each specialization
that is active in the online M.S. in Engineering Program, the Director will appoint two faculty members, associated with that specialization, to oversee the students’ programs. The Director will recommend to the Graduate Division a committee of three faculty members, associated with the specialization, to constitute the comprehensive examination committee for the students of that specialization.

9 Changes in Senate regulations

The proposal should state clearly whether or not any changes in Senate Regulations at the Divisional level or in the Academic Assembly will be required. If changes are necessary (e.g., for all proposals for new degrees), the complete text of the proposed amendments or new regulations should be provided.

The following subsections discuss several related issues: (1) the reason for the requested degree designation, (2) the issue of differential fees, and (3) SR 694.

9.1 Master of Science in Engineering (M.S.)

It is well-understood in the engineering/computer-science community that the M.S. degree is the degree that leads to the specialized advanced education that is of importance to the student, to industry, and to the students entering the Ph.D. program. Engineers seek the M.S. degree to expand their engineering education to attain a level of technical competence that is generally not achieved at the baccalaureate level, and to enhance their opportunities and be of greater use to their employers. Indeed, the attainment of the M.S. generally leads to increases in pay.

The M.S. program provides the education by which engineers improve their educational and professional status; that is, the M.S. degree in engineering/computer-science areas is the de facto “professional” degree. To use any other designation would inappropriately diminish the dedication of the faculty and the value to be accrued by the students of the program. Our proposed degree program is educationally equivalent to the traditional M.S. program and so should be its degree designation. It is the position of the College’s administration and faculty that to call the degree anything other than M.S. would be inappropriate, misleading, and would contradict the Program’s content and would defeat the Program’s purpose. UCLA, Stanford, USC, Georgia Tech, and a host of other engineering schools use M.S. and in no way distinguish the online program’s degree from the traditional degree.

9.2 Differential Fees

The proposed online Master-of-Engineering program is educationally comparable to the traditional M.S. programs offered by the College. However, consider-
able extra effort and time are required of the participating faculty who will not receive “teaching credit” for the courses of this program. Additionally, there will be considerable infrastructure, special reader, programmer analyst, and student affairs officer costs.

9.3 SR 694

In 1956, in a “Report of the Graduate Council, Northern Section,” (1956/05/24, Academic Senate, Northern Section: Notice of Special Meeting of the Representative Assembly (Vol. II, No. 11)), the following opening sentence occurs:

“At its meeting on April 23, 1956, the Graduate Council gave consideration to a report of its sub-committee appointed to study a proposal presented by Dr. B. M. Woods, Vice-Chairman–University Extension, that off-campus instruction be offered for the master’s degree, and to study also the entire conception of off-campus instruction directed toward higher degrees.”

The resulting legislation, SR 883, was renumbered in 1964 to SR 694. The main request by the Vice-Chairman of University Extension, in 1956, was to allow University Extension to have a wider role in Master’s programs. It is our opinion, upon reading the referenced report, that “off-campus instruction” refers to off-campus centers generally operated by Extension. Parts C and D also reveal the Council’s concern with faculty, courses, and programs at such centers. It is our opinion that SR 694(B) is essentially a restriction on Extension with respect to the M.A. and M.S. degrees and certainly should not be considered to be a restriction on ladder faculty presenting courses and programs approved by the Graduate Council, the Committee on Courses, and the Committee on Educational Policy. In any event, SR 694 is so thoroughly intertwined with Extension and its centers (indeed, the opening sentence of SR 694 requires the cooperation of Extension) that we strongly believe that SR 694 is irrelevant with respect to BCOE’s proposal.

Moreover, today’s technology could not have been envisioned by the legislators of 1956.
April 22, 2011

TO: MARY GAUVAIN  
CHAIR, UCR ACADEMIC SENATE

FM: MORRIS MADURO, CHAIR  
GRADUATE COUNCIL

Re: Proposed self-supporting MS program in Engineering

Dear Dr. Gauvain:

The Graduate Council has approved of the proposed self-supporting MS program in Engineering. The most contentious issue related to the online modality in instructional delivery. After meeting with Drs. Payne and Matsumoto, the Graduate Council was satisfied that all its concerns had been addressed. UCLA has had a similar program for some five years now, and it is to BCOE’s credit that they are trying to move into this area at UCR. The funds generated by the program will be used to support PhD students in academic programs.

The system wide Coordinating Committee on Graduate Affairs (CCGA), for which I have been the UCR representative for almost two years, has been approving similar programs. My sense is that this program is very likely to be approved.

Sincerely,

Morris Maduro  
Chair, Graduate Council
December 1, 2009

TO:  ALAN WILLIAMS, CHAIR
     GRADUATE COUNCIL

FM:  ANTHONY W. NORMAN, CHAIR
     RIVERSIDE DIVISION

RE:  BCOE PROPOSAL FOR AN ON-LINE ENGINEERING MS PROGRAM

The above proposal has been reviewed by the committee on Educational Policy, Planning and Budget, Courses and Library. Several concerns were raised by the committee members who reviewed the committee. Planning and Budget voted in favor of development of the Online Masters Program contingent on the proposal being approved by other appropriate Senate Committees. Committee on Educational Policy was not convinced that there was enough evidence that this program will deliver quality education required of all UCR programs and they would like this issue to be addressed prior to it being approved by the Committee. The Committee on Library questioned whether the College has adequately addressed issues related to the delivery of the courses and they would like to have a formal response to this question prior to receiving their full endorsement. The Committee on Courses had a number of questions which they would also wish to have addressed prior to the proposal being approved.

I am enclosing all the 4 committee responses for your review and further action. From my perspective, it is clear (4.5 out of 5.0) Senate Committees did not provide approval of the proposed On-Line Engineering Program.

Thanks.

Enclosure
November 4, 2009

TO: ANTHONY NORMAN, CHAIR
RIVERSIDE DIVISION

FR: JOSE WUDKA, CHAIR
COMMITTEE ON EDUCATIONAL POLICY

RE: PROPOSAL FOR AN ON-LINE M.S. PROGRAM IN ENGINEERING

The Committee on Educational Policy reviewed the proposal for an on-line M.S. Engineering program at its October 30 meeting. Though the CEP accepts the possibility that the proposed program might serve UCR well, it was generally felt that, as presented, this proposal was incomplete and too vague in several key aspects to warrant approval.

Among the issues raised during the discussion were the following:

- The proposed program is based on a series of online courses, none of which have been approved. This makes it difficult assess many of the fundamental aspects of the program, such as its educational impact and its viability.
- The CEP believes that the development of effective online courses can proceed only with a significant investment of time and funds, and that this issue must be thoroughly addressed in order for the program to be considered viable.
- Given the existence of competing programs, the Committee was seriously concerned about the impact this program would have. No supporting letters from other UC campuses or institutions were provided to indicate that this would not be a serious problem.
- As described, the assessment methods were considered unsatisfactory. It is unclear whether virtual homework assignments would satisfy the educational need of the students, especially with a potential lack of hands-on experience. It is also unclear whether the assessments process will be adequately protected against dishonesty.
- Given the costs associated with course development and assessment management, and the lack of evidence that this program can successfully attract students, the CEP was concerned about the financial viability of the program.

In summary, the CEP feels that there is no convincing evidence that this program can effectively deliver quality education required of all UCR programs; the proposal must be revised to address this and all related issues before it can be approved by the Committee. This decision should not be interpreted as a rejection of the concept of online instruction: the CEP looks forward to a revised proposal from the BCOE.

cc: Allan Williams, Chair, Graduate Council
October 14, 2009

TO: Anthony Norman, Chair
    Academic Senate

FROM: Carol Lovatt, Chair
      Planning and Budget

RE: Online Engineering Master's Program in the Bourns College of Engineering

UCR Planning and Budget Committee (P&B) reviewed the "Proposal to Establish a Self-supporting, College-wide, Online Master-of-Engineering Degree Program within the Bourns College of Engineering (BCOE)" on October 2, 2009. A resulting set of questions for clarification of information in the proposal was sent to Akula Venkatram, the BCOE member on P&B (Appendix I). At P&B's October 9th meeting, Professors Mark Matsumoto and Thomas Payne provided a set of written responses to P&B's questions (Appendix II) and went over the responses with the committee and answered additional questions.

Planning and Budget voted in favor of the development of the Online Master's Program in the Bourns College of Engineering contingent on approval of the program and proposed courses by the other appropriate Academic Senate Committees.

The financial plan proposed is conservative, requiring an enrollment of only five students per year. Even with an annual student attrition rate of one student at the end of year 1, the Online Engineering Master's is projected to recoup most of its expenses in year 2 and generate net revenue by year 3.

Student enrollment in the campus-based Engineering Master's Program should not be impacted by the online program due to the significantly higher fees charged for the online Engineering Master's Program. Further, the online Engineering Master's at UCR is designed to avoid competition with similar programs at other universities, such as UCLA.

Growth of BCOE's program will have a financial impact on the Graduate Division related to processing applications and maintaining student records. The issue of how to identify non-residents and collect non-resident tuition or limit the course to residents only will have to be resolved.

Overall, there appears minimal cost to the campus and little financial risk to BCOE.
October 3, 2009

TO: Akula Venkatram - Mechanical Engineering

FROM: Carol Lovatt, Chair Planning & Budget

RE: Proposal for the On-line Engineering MS Program

For our meeting on October 9, 2009, could you please assist with the following items and provide answers to the following questions.

1) Walk us through the budget in Table 2, page 15.

2) The budget in Table 2 does not seem to cover development of the significant number of course listed on page 8 as part of the MS program.

3) What is the proposed source of funds to develop the first set of on-line courses for year 1 of the program?

4) Will the required additional staff (Programmer, Student Affairs AA) be funded from the revenue generated from the program? Please see the last sentence on page 16.

5) Likewise, will the additional computer server equipment be purchased from the proceeds of the program?

6) The justification for establishing the On-line Engineering MS program is student demand. No supporting documentation is provided. What is the estimated number of students who would enroll in UCR's program? How will the UCR program compete with the UCLA on-line Engineering MS Program? Please provide information about the UCLA on-line Engineering MS Program. How successful is it? Is its enrollment capped, creating a need for a program at UCR? Will there be overlap in specializations offered or will UCR's offerings be distinct from those of UCLA?

7) Have BCOE faculty agreed to teach on-line courses for which they will not receive teaching credit? Is the proposed $400/student/course payment to the faculty teaching on-line courses within University policies and approved by the appropriate committees?

8) How can the inclusion of such a large number of UNEX courses in a UCR program awarding an advanced degree be justified? Please address the issue of reducing the quality of an UCR advanced degree.
APPENDIX II

October 3, 2009

TO: Akula Venkatram - Mechanical Engineering

FROM: Carol Lovatt, Chair Planning & Budget

RE: Proposal for the On-line Engineering MS Program

For our meeting on October 9, 2009, could you please assist with the following items and provide answers to the following questions.

1) Walk us through the budget in Table 2, page 15.

Here is a top-down prose version of Table 2, which is a model of the expected revenue and expenses associated with a single specialization within the online MS in Engineering.

We will add specializations as supply and demand dictate, but hope to add on the order of one new specialization per year.

The total fee for the nine-course program is $30,000 or $3,333.33 per course. Each student is expected to take an average of 4.5 courses per year ($15,000 per year) plus a one-time application fee of $70.

Each course is expected, on average, to incur $5,000 in one-time development costs for converting it to an online format, plus another $1,000 per offering in maintenance costs, plus another $500 cost per student per offering in delivery costs. Those costs are exclusive of instructor and TA/reader compensation, which we estimate to be $400 per student per offering in instructor compensation and TA/reader costs per offering of $2,772 in salary plus $3,255 in grad student fees. The following table lays out the cost/revenue breakdown for a course.

<table>
<thead>
<tr>
<th># of students</th>
<th>Course Cost (1st offering)</th>
<th>Course Cost (&gt;1st offering)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development cost</td>
<td>$5,000</td>
<td>$0</td>
</tr>
<tr>
<td>Maintenance cost</td>
<td>$0</td>
<td>$1,000</td>
</tr>
<tr>
<td>Delivery cost</td>
<td>5 $2,500</td>
<td>2,500</td>
</tr>
<tr>
<td>Marketing</td>
<td>5 $3,000</td>
<td>3,000</td>
</tr>
<tr>
<td>Inst Comp</td>
<td>$2,000</td>
<td>$2,000</td>
</tr>
<tr>
<td>TA cost</td>
<td>$6,027</td>
<td>$6,027</td>
</tr>
<tr>
<td>Total cost</td>
<td>$18,527</td>
<td>$14,527</td>
</tr>
<tr>
<td>Revenue</td>
<td>5 $16,667</td>
<td>16,667</td>
</tr>
</tbody>
</table>

We expect to recruit an average of five students per year into a specialization and that on average one of them will drop out after the first year. The program will involve a total of nine courses, implying that on average a student will enroll in 4.5 courses per year, most likely five the first year and four the second. So, the first year we expect five students each taking five courses, for an average enrollment of five per course. In subsequent
years, we expect five new students plus four continuing students for a total of nine students. And we expect to offer roughly nine courses with an average per-course enrollment of 4.5. The revenue implied by this enrollment projection is $75,000 for the first year and $135,000 for each subsequent year.

In terms of one-time costs to convert courses to an online format, it would cost $25,000 to convert five courses the first year, $20,000 to convert four more the second year, and no further conversion costs would be necessary in subsequent years. Those would include at most five of the MGT and XRC courses from the list of course examples on page 9. In terms of annual on-going costs there would be a $15,000 per year marketing cost in addition to the costs, discussed above, associated with the delivery of the online courses.

The bottom line is that, for a single specialization, there would be a modest loss in the first year followed by a modest gain in the second. But the overall investment is fully recouped in the third year. Thereafter, annual cash flow is projected to be positive by about $20,000, which can be used to fund the development of additional courses for that specialization and/or the development of additional specializations. In general, the proceeds of this program go to support the program and to fund Ph.D. students through TAships, readerships, and faculty internal-allocation accounts.

2) The budget in Table 2 does not seem to cover development of the significant number of course listed on page 8 as part of the MS program.

All of the courses listed on page 9 -- there are none on page 8 -- are existing courses. So, what needs to be done in terms of development is translating the current course content to an online format. Specifically, the BIEN and MGT courses are Senate-approved UCR graduate courses. The XRC courses are existing UNEX courses that are possible candidates for cross-listing, which would require course-by-course Academic Senate approval. In Table 2, initial costs for such development of each course are projected as $5,000 per course and another $1,000 for updating the course each subsequent year. As mentioned above, in terms of one-time costs to convert courses to an online format, it would cost $25,000 to convert five courses the first year, $20,000 to convert four more the second year, and no further conversion costs would be necessary in subsequent years. Those courses would include at most five of the MGT and XRC courses from the list of course examples on page 9.

3) What is the proposed source of funds to develop the first set of on-line courses for year 1 of the program?

As mentioned above, development is projected to cost $25,000 much of which will come from the $75,000 first-year revenue. Overall, we are projecting a first-year deficit of roughly $18,000, which we will seek to cover by donations or contracts from local employers such as the Naval Surface Warfare Center at Norco. Otherwise, it will be covered by BCoE discretionary funds.

4) Will the required additional staff (Programmer, Student Affairs AA) be funded from the revenue generated from the program? Please see the last sentence on page 16.
Yes, specifically they would be funded via the “instructional services fee” mentioned in Table 2.

5) Likewise, will the additional computer server equipment be purchased from the proceeds of the program?

Yes, that is the intention. Initially, this server load can be serviced from spare capacity on existing BCoE servers. Also, last year BCoE established an Instructional Media Development Studio that will be used in developing the online version of these and other BCoE courses.

6) The justification for establishing the On-line Engineering MS program is student demand. No supporting documentation is provided. What is the estimated number of students who would enroll in UCR's program? How will the UCR program compete with the UCLA on-line Engineering MS Program? Please provide information about the UCLA on-line Engineering MS Program. How successful is it? Is its enrollment capped, creating a need for a program at UCR? Will there be overlap in specializations offered or will UCR's offerings be distinct from those of UCLA?

UCLA’s program, which was initiated in 2006, has had an average of 86 new enrollees per year. We estimate that the UCR program enrollment will reach about 80 students in various specializations in about 5 years. We believe this is a reasonable estimate based on the results of the attached survey of 751 “Southern California Engineering Firms”, conducted by UCR Survey Research Center. However, it should be noted that the program should be self-supporting even at low enrollment of 5 new enrollees per year. Because of its distinctive features, the UCR program will be as good if not better than the UCLA program. The UCR program includes a combination of in-depth specialization that is geared to specific industries and cohorts, and professional engineering components. In contrast, the UCLA program has more technical coverage and no professional engineering components. Specifically, the UCR program includes engineering management and professional development courses, which UCLA’s program does not (see attachment). As such, the UCR program will be distinctive from that of UCLA. Therefore, not much difficulty is envisioned in the competition provided that the program is marketed appropriately. Appropriate marketing allocation of $15k per year has been made for each specialization. Obviously, the marketing cost per specialization will decrease as the program matures and more specializations are established. From the program-profile web site for UCLA's program, which is to be found at http://www.gdn.uncla.edu/asis/progprofile/result.asp?selectmajor=00A5, it appears that their program has been quite successful in a short period. It has acceptance rate of 72%, and enrolls 21% women and 17% underrepresented minorities, and with only 4% international students. These numbers are very good for an MS program in engineering. The UCR program will not overlap or duplicate the UCLA program. Moreover, each specialization will be established only after detailed market and demand analysis. The industries surveyed indicated that a relevant curriculum will increase the likelihood of enrollment by their employees.
7) Have BCOE faculty agreed to teach on-line courses for which they will not receive teaching credit? Is the proposed $400/student/course payment to the faculty teaching on-line courses within University policies and approved by the appropriate committees?

UCLA charges the same $15,000 per year per student and about 10% of that goes to the faculty who serve as instructors for their courses. We plan to give the faculty $400 per enrollee for an average of 4.5 courses per student per year, which works out to 12%, which is in the same range. It should be noted that, depending on the faculty’s choice, parts or all of the online lectures may be recorded during regularly scheduled lecture classes, or recorded separately from regular classes. However, the online courses will have different section numbers. That money goes to the faculty member's BCOE Internal-Allocation Account, which are funds that can be carried forward and have the usual strings attached. Mostly these funds will be spent in support of graduate research assistants. We have not yet recruited individual faculty to cover specific courses. However, the Bioengineering faculty and Chair of the department have conceptually approved the proposed specialization in Bioengineering. Future specializations will similarly require faculty and departmental approvals.

8) How can the inclusion of such a large number of UNEX courses in a UCR program awarding an advanced degree be justified? Please address the issue of reducing the quality of an UCR advanced degree.

The seven MGT courses are already on-the-books AGSM courses, and there are a sufficient number of them to run the program. The seven XRC courses would not and could not be included until and unless they are approved for UCR credit (via cross-listing) by the relevant Academic Senate committees: the Committee on Courses and the Graduate Council. It should be noted, however, that such cross-listing is common practice at other UC campuses.

Attachments:
Appendix I: Memo to Akula Venkatram
Appendix II: Responses from BCOE
October 22, 2009

TO: ANTHONY NORMAN, CHAIR
ACADEMIC SENATE

FR: JOHN BAEZ, CHAIR
COMMITTEE ON LIBRARY & SCHOLARLY COMMUNICATION

RE: Online Master of Science in Engineering Program

The University Committee on Library and Scholarly Communication has just a few concerns with the proposal for an Online Master-of-Science in Engineering:

1) First, this proposal does not address how distance learning students will obtain access to library materials. Students in the program will need access to the electronic library resources on campus. Thus, they will need to be granted access through WebVPN and Client VPN systems for accessing library materials from off-campus. However, even with this access, library resources may be restricted for distance learning students unless the university pays additional licensing fees or document delivery costs. These resources are already available to all current students. Therefore, it is crucial that the online students be given the same privileges in this respect, even if additional expenditures are required. Our question is whether the College has adequately addressed these issues. We would like to have a formal response to this question prior to our full endorsement.

2) It is assumed that the online students will need some instruction in how to use the library, particularly its electronic resources. (This is also not considered in the proposal.)

3) As the online program develops, its focus on new specializations such as Bioengineering may require new library materials. Paying for these will require a new funding source provided to the Libraries by the University or the College. Even without the current budget reduction, the library budget is insufficient to absorb the costs of these new materials.
November 5, 2009

TO: ANTHONY NORMAN, CHAIR
RIVERSIDE DIVISION

FROM: THEDA SHAPIRO, CHAIR
COMMITTEE ON COURSES

RE: BCOE proposal for an on-line M.S. program in Engineering

At its two most recent meetings on October 12 and 26, 2009, the Committee on Courses discussed the proposal from the Bourns College of Engineering for a new, self-supporting on-line Master of Science in Engineering program. While we are not unfriendly to such a proposal, we wish to comment on what we see as a number of lacunae in the proposal and possible questions and problems raised by the current draft of the proposal.

Rationale for the program at UCR:

1. Since such on-line graduate Engineering programs already exist at UCLA, USC, and perhaps many other prestigious schools of Engineering nationwide, what makes the proposed program distinctive, so that it would attract an additional student body not already "housed" in an existing program? Has the BCOE studied the capacity and current enrollments at the highest-ranking on-line programs and determined need for an additional program? What will UCR's program add that may attract a different clientele?

2. Will international students be a part of the desired clientele for this program, and if so, how will their qualifications, entrance examinations, etc., be certified as authentic? We can imagine the program attracting numerous highly-qualified international students with the ability to pay the fees, so this question should be considered carefully before the request for applications is launched.

Curricular issues:

1. Although the design of the program presupposes that the students to be admitted will be working engineers with ample funding to cover the costs of the program, there may also be highly qualified candidates who live at a distance from UCR, are not currently employed, and will be able to enroll in the program only with the help of financial aid. The federal government has established guidelines for awarding financial aid based on faculty-student contact hours. These guidelines should be studied and the program designed accordingly.
2. How will advising, tutoring, and other services that are usually delivered one-on-one in person be provided?

3. The current proposal does not make clear how examinations and research work for the program will be handled. Will there be periods of in-residence contact between instructors and students? How will the students complete laboratory work under faculty supervision, as is essential for an Engineering degree? Will the ENGR 296A be some sort of a lab, residency, or workshop (perhaps during Summer Session) which will bring students together and/or give them hands-on research experience? Based on a recently-developed UCR on-line graduate program, the MFA in Creative Writing administered by the Palm Desert campus, we recommend that the BCOE faculty consider establishing some period(s) of intensive, short-term residency as an integral part of the program.

4. How will the on-line courses be calendared? Will the program conform at all to UCR's regular academic terms?

5. On-line courses and programs present many issues concerning authentication of students' identities and the honesty of the work they present (homework, exams, research results, etc.). The proposal states that arrangements with trustworthy testing centers will be made to deliver large examinations, but how will periodic homework and other work to be handed in by the students be handled to ensure honesty? The BCOE should contact schools which already have functioning on-line programs to learn how these issues are handled. If international students are to be welcomed into the program, this may compound the possible problems.

6. With respect to the courses for the program, the proposal assumes (1.4, page 5) that the current courses can be offered with simply a separate section for the students in the on-line program. We cannot accept this method, because the activities and assessment methods for the on-line courses will necessarily be different from the in-person versions of the courses. The on-line courses will have to go through the approval process with a specific accounting for the activities required of the students in the new format. Moreover, we strongly recommend to BCOE that a different rubric (for example, ENOL rather than ENGR) be used for the on-line program's courses. This will immediately identify the on-line versions of the courses, and it will facilitate records-keeping and future assessments and reviews of the on-line students' progress, easily differentiated from that of resident students.

Costs and profits:

1. No clear mention of administrative support for this program (clerical handling of applications, clerical correspondence, responses to questions concerning administrative or technical matters, enrollment, etc.), or its cost, is made in the proposal, and, based on our own (admittedly hearsay) knowledge of the design of successful on-line courses, we suspect that the amounts budgeted for production costs are considerably understated. Since the projected net revenue for the first three-year period is very modest, we do not have confidence in the projection of fees compared to costs, at least for the start-up
period of the program. We recommend that these issues, and particularly the question of the real costs of producing successful on-line courses, be examined in greater detail with reference to the experience of other institutions, such as UCLA.