External Evaluation Report

Form 2D

The External Evaluation Report is an important component of a new academic program proposal. The external evaluator's task is to examine the program proposal and related materials, visit the campus to discuss the proposal with faculty and review related instructional resources and facilities, respond to the questions in this Report form, and submit to the institution a signed report that speaks to the quality of, and need for, the proposed program. The report should aim for completeness, accuracy and objectivity.

The institution is expected to review each External Evaluation Report it receives, prepare a single institutional response to all reports, and, as appropriate, make changes to its program proposal and plan. Each separate External Evaluation Report and the Institutional Response become part of the full program proposal that the institution submits to SUNY for approval. If an external evaluation of the proposed program is required by the State Education Department (SED), SUNY includes the External Evaluation Reports and Institutional Response in the full proposal that it submits to SED for registration.

Institution: *University at Albany*

Evaluator Name (Please print.): *Joanne Bechta Dugan*

Evaluator Title and Institution: *Professor of Electrical and Computer Engineering; Director of Computer Engineering Programs*

Evaluator Signature:

Proposed Program Title: *Computer Engineering*

Degree: *BS*

Date of evaluation: *November 19, 2014*

I. Program

1. Assess the program's **purpose, structure, and requirements** as well as formal mechanisms for program **administration and evaluation.** Address the program's academic rigor and intellectual coherence.

The proposed program in computer engineering, leading to a BS degree, is well designed to meet accreditation standards and industry needs. Because it is an engineering program, its structure is fairly standard, with a full year of math and basic sciences, 1.5 years of engineering topics, significant design experiences, depth and breadth across the curriculum. Its requirements are well defined.

The proposed program will be administered by the new Computer Engineering Department within the College of Computing and Informatics, which appears to be an excellent plan for establishing and maintaining the integrity of the program. The proposal calls for the hiring of a department chair followed by hiring 3-4 faculty. If the program succeeds in hiring a department chair with experience in building a computer engineering program and with the accreditation review process, the program has excellent potential.

Student learning outcomes and educational objectives have been defined. Student learning outcomes, which are generic to all accredited engineering programs and are prescribed by the accreditation agency, have been refined to specific aspects of required courses, which makes it clear how each course fits into the program and contributes to learning. The learning outcomes are also clearly linked to program objectives.

In addition to the normal 7-year program review process apparently in place at the University at Albany, the program will undergo an extensive accreditation review at least every 6 years by the external accreditation agency, the EAC of ABET, Inc.

2. Comment on the **special focus** of this program, if any, as it relates to the discipline.

The program will emphasize issues at the hardware/software interface, as is fitting for a program of this sort. An eclectic mix of electives will allow a student to focus study in software, hardware or embedded systems areas.

3. Comment on the plans and expectations for **self-assessment and continuous improvement**.

The proposal defines appropriate educational objectives and student learning outcome, refining the student learning outcomes to constituent parts. The student learning outcomes are mapped to required courses and thus it appears that the educational plan strongly supports the defined outcomes. However, a specific plan for measuring and evaluating the extent to which these student outcomes are achieved is not defined in the proposal. The proposal would be strengthened considerably by the definition of specific measures that can be used to demonstrate achievement of learning outcomes, including achievement targets. The definition of measures and targets will facilitate an effective process for self-assessment and continuous improvement. This reviewer recommends a schedule that calls for evaluation of several (but not all) outcomes each year, so that the burden of assessment is not onerous. Further, the current assessment matrix calls could be streamlined so that the assessment process is sustainable. As currently defined, the process runs the risk of producing too much data, making the evaluation more difficult than necessary.

4. Discuss **the relationship** of this program to other programs of the institution and collaboration with other institutions, and assess available support from related programs.

The proposed program appears to enjoy the strong support of its related programs in the College of Computing and Information, and the new program complements the other programs in the college. Math, Physics and Chemistry also appear to strongly support the proposed computer engineering program. This support is vital to the success of the new program.

5. What is the evidence of **need** and **demand** for the program locally, in the State, and in the field at large? What is the extent of occupational demand for graduates? What is the evidence that demand will continue?

The need for STEM (specifically engineering) graduates is well documented nationally. The Bureau of Labor Statistics report of May 2013 (latest data available) reports substantial need for computer hardware engineers in New York State, and reports that wages in this field are relatively high in New York State. Further, there is no public institution in the region offering an engineering degree, so the proposed program clearly fills a need.

II. Faculty

6. **Evaluate the faculty**, individually and collectively, with regard to training, experience, research and publication, professional service, and recognition in the field.

Faculty in the program are well qualified to support the proposed program. New faculty with specific experience in computer engineering will benefit the development of the program and ensure high-quality engineering design content in the curriculum.

7. **Assess the faculty in terms of number and qualifications** and **plans for future staffing**. Evaluate **faculty responsibilities** for the proposed program, taking into account their other institutional and programmatic commitments. Evaluate faculty **activity in generating funds** for research, training, facilities, equipment, etc. Discuss any **critical gaps and plans for addressing them**.

The number of faculty in the program (when all available lines have been filled, including a new department chair) appear to provide adequate support for the proposed program. An experienced department chair and faculty with expertise specific to engineering are crucial to the development of a successful program. Plans for additional faculty, when fulfilled, should achieve coverage of all curricular areas, and are expected to provide adequate numbers to administer the program, advise and counsel students on curricular and career matters, contribute to university service activities, achieve professional development, and interact with industrial and professional practitioners. If the program enrollment grows beyond the projected numbers, however, more faculty will likely be needed.

Development of curricular materials, labs and design activities may provide a significant burden on new faculty and such contributions must be considered in the promotion and tenure review. The new faculty, because of their specific computer engineering expertise, will need to shoulder the responsibility for the engineering and design content of the new program, including curricular materials, lab experiences, design activities and physical lab space and materials. Further, processes and documentation that support accreditation activities will also require significant service contributions as well. It is important that these service and curricular activities are supported and recognized, and that research expectations are realistic during the development of the new program.

8. Evaluate credentials and involvement of **adjunct faculty** and **support personnel**.

No part-time or adjunct faculty appear to be associated with the program. However involvement of appropriate local practitioners from industry could benefit the program by teaching special topics courses or advising student teams on projects or mentoring students in the program. The program could also be well served by an instructional laboratory technician who can develop prototype designs, maintain and develop lab equipment, establish and maintain inventory of necessary parts and equipment.

III. Students

9. Comment on the **student population the program seeks to serve**, and assess plans and projections for student recruitment and enrollment.

Students will need a strong secondary-school preparation in math and science for this program but there is no reason to expect that such well-prepared students are scarce. Ties with local community colleges are strong and it's expected that the community colleges could provide an excellent pool of transfer students to the program.

10. What are the prospects that recruitment efforts and admissions criteria will supply **a sufficient pool of highly**

qualified applicants and enrollees?

The projected enrollments are modest and appear to be reasonable. There may be more demand than anticipated, and if so, the program resources will need to expand to meet the demand.

11. Comment on provisions for encouraging participation of **persons from underrepresented groups**. Is there adequate attention to the needs of part-time, minority, or disadvantaged students?

Computer engineering as a field has the capability to attract and retain persons from underrepresented groups. However, the faculty must reflect the diversity of the desired student population. Role models are critically important to enhancing diversity. The institution and program appear well-poised to attract and retain qualified students from underrepresented groups.

12. Assess the system for monitoring **students' progress and performance** and for **advising students** regarding academic and career matters.

The Advisement Services Center will advise pre-major students and appears well-suited to this task. Once students declare the major, academic and career advising will be handled within the program. This is a standard approach to advising, monitoring and tracking students' progress. Engineering faculty can work with the career development personnel (who appear to be well suited to support engineering students) to provide necessary career and graduate school guidance. Local engineering practitioners could provide excellent opportunities for mentoring, internships and other guidance.

13. Discuss prospects for graduates' post-completion success, whether **employment, job advancement, future study, or other outcomes related to the program's goals.**

The prospects for graduates' success in employment and in graduate study are excellent. Graduates of a computer engineering program are highly valued and are in high demand throughout the nation as well as in the local area.

IV. Resources

14. Comment on the adequacy of physical **resources** and **facilities**, e.g., library, computer, and laboratory facilities; practica and internship sites or other experiential learning opportunities, such as co-ops or service learning; and support services for the program, including use of resources outside the institution.

Library resources and plans are excellent. Computer facilities are good; however it is strongly recommended that students in the engineering program be required to purchase a laptop computer for use in class and for assignments. Software licenses for engineering software will require continued financial and infrastructure support. Proposed instructional laboratory and classroom facilities should be carefully designed to allow flexibility and reconfigurability. Most engineering instructional lab spaces suffer from inadequate numbers of electrical outlets for laptops, scopes, instrumentation and other equipment. High bandwidth wireless access should be assured for classrooms and lab spaces. Faculty research labs must also allow for easy reconfigurability as space and equipment needs change frequently with emerging technologies.

15. What is the **institution's commitment** to the program as demonstrated by the operating budget, faculty salaries, the number of faculty lines relative to student numbers and workload, and discussions about administrative support with faculty and administrators?

The institution appears to be strongly committed to the proposed program and appears ready to provide the necessary support to ensure its success.

IV. Summary Comments and Additional Observations

16. Summarize the **major strengths and weaknesses** of the program as proposed with particular attention to feasibility of implementation and appropriateness of objectives for the degree offered.

The program is well conceived, well supported, meets a demonstrated need. The faculty and administration are supportive and enthusiastic. Faculty from several allied disciplines have been working and planning for this new program and their cooperative approach is likely to result in a successful program. Support from the administration, in terms of resources, space, faculty lines as well as enthusiasm is strong. The program will meet a need for students and graduates. Students need an affordable path to an engineering career in the region. Local, regional and national demand for graduates of computer engineering programs is high. The potential for collaborations with industry and with local private and community college institutions is excellent. The probability of success is high.

Notwithstanding the probability of success, there are some risks to address. Engineering faculty with experience in engineering education and engineering practice will ensure the rigor of the engineering and design content of the program. Faculty without authentic engineering design experience can provide and ensure a strong theoretical foundation, but engineering faculty with experience can carry that foundation forward into engineering practice.

Lab facilities for engineering programs require significant continual resources to ensure that they remain relevant. Equipment needs continual upgrading and new materials, parts and equipment become obsolete remarkably quickly.

Accreditation needs impose a significant service burden that must be recognized and supported.

17. If applicable, particularly for graduate programs, comment on the ways that this program will make a **unique contribution** to the field, and its likelihood of achieving State, regional and/or national **prominence**.

The proposed program, under excellent leadership, has the potential for national prominence.

18. Include any **further observations** important to the evaluation of this program proposal and provide any **recommendations** for the proposed program.

Version 2013-10-15

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Institution: University of Albany, NY

Evaluator Name (Please print.):   Mani SOMA

Evaluator Title and Institution: Professor, University of Washington, Seattle

Evaluator Signature:

Proposed Program Title: Computer Engineering

Degree: Bachelor of Science (BS)

Date of evaluation: November 18-19, 2014

I. Program

1. Assess the program's **purpose, structure, and requirements** as well as formal mechanisms for program **administration and evaluation.** Address the program's academic rigor and intellectual coherence.

The program's purpose is to educate students in high-demand high-skill areas within the Computer Engineering discipline. This education will also serve the growth of the University based on its strategic plan and provide a high-quality workforce to meet the demands of local, regional, and state industry. This purpose is appropriate since it fits the University overall strategy and satisfies the needs of the students, community, and industry. The program also seeks to attract international students, which will bring resources into the University and enhance its reputation.

The structure of the program is standard for a bachelor of science offering in engineering disciplines. The topics to be taught are the foundation of Computer Engineering, augmented by emphasis on embedded systems, networking and emerging technologies. Given the fast pace of computer technology development and applications, the structure does provide opportunities for students to learn the fundamentals as well as to acquire skills necessary to adapt to the ever-changing technical landscape.

The program requirements are reasonable and expected of Computer Engineering programs in the US.

Program administration: The program is administered by the College of Computing and Information. The Department Chair for Computer Engineering, who is the responsible administrator, is being recruited (see Appendix 6 for the recruiting information). This is the regular administrative mechanism in many UW universities and colleges.

Program evaluation: the proposal includes section 2.7 (details in Appendix 3) on program assessment and improvement. The program mentions the required assessment mechanism every seven years as standard in the University, but on-site discussions indicate that a program undergoing external accreditation such as computer engineering to be evaluated by ABET does not use the University regular 7-year mechanism. The University Faculty Senate also has a formal Guide for the Evaluation of Undergraduate Programs. The program will apply for ABET accreditation, which requires assessment of program educational objectives, student learning outcomes, faculty, etc. every six years, beginning in 2017. The evaluation and assessment plan conforms to both university and national / international requirements. The assessment plan currently specifies which outcomes to be assessed in which courses but has not described the assessment tools to do so. While it is desirable to use many courses to assess one outcome, the workload due to the subsequent data analysis and information extraction to provide feedback for continuous improvements is significant. The balance between sufficient assessment and reasonable workload for the faculty (and associated assessment units and staff) needs to be carefully considered.

Since no students have been admitted, the program academic rigor is difficult to address. The intellectual coherence is supported by the proposed curriculum, developed based on the IEEE/ACM model. Note that the curriculum could be modified based on the expertise of the computer engineering faculty still to be recruited.

2. Comment on the **special focus** of this program, if any, as it relates to the discipline.

The program has a strong foundation provided by the current Computer Science department and associated departments of Physics and Informatics. The program's special focus evolves from the current software emphasis in Computer Science and moves on to complement it with hardware courses and projects as appropriate for computer engineering. Other computer engineering programs in the Capital Region (Rensseelaer Polytechnic Institute and Union College) have stronger relationships with electrical engineering, while the University of Albany computer engineering program has a stronger relationship with computer science.

3. Comment on the plans and expectations for **self-assessment and continuous improvement**.

The plan for self-assessment and continuous improvement is guided by the ABET accreditation requirements. The program plans to apply for accreditation in 2017. The assessment plan in Appendix 3 has been commented upon in the answer to question 1 above. The course descriptions in Appendix 5 have a section "Assessment and Policies" in the syllabus of each new course but this section has only minimal information, probably since these are new courses and will depend on the computer engineering faculty to be recruited.

The continuous implement plan, also required by ABET, has not been described.

4. Discuss **the relationship** of this program to other programs of the institution and collaboration with other institutions, and assess available support from related programs.

This program is the first response to President Jones' call for engineering programs as one of his four stakes for advancing the University. The University has a 25-year Master Plan, which likely is an impetus for the creation of the computer engineering program. The program has a strategic plan to bring access to public high school students pursuing engineering degrees in the Capital Region. Hudson Valley Community College is one example of a strong 2-year program that can provide transfer students to University of Albany to complete the computer engineering degree. These transfer students, together with existing University students in the related disciplines who want to change major to computer engineering, will be the first graduates in 2017.

The program will enhance statewide offerings in engineering. There are two accredited computer engineering programs in the Capital Region from private institutions (Union College and Rensselaer Polytechnic Institute [RPI]) thus there are opportunities for collaboration. Within the State of New York, there are other institutions with accredited computer engineering programs as well. The proposal did describe consultation with some of

these institutions as part of the creation of the computer engineering program at the University of Albany. The program also had extensive input from consultants at other universities and ABET expert.

Within the University, the program will receive significant assistance in teaching and collaborative research from Computer Science, Informatics, Mathematics, and Physics.

5. What is the evidence of **need** and **demand** for the program locally, in the State, and in the field at large? What is the extent of occupational demand for graduates? What is the evidence that demand will continue?

The proposal includes two letters from local industry supporting the creation of the computer engineering program. Other industry, e.g. Global Foundries and IBM, are active in the state and certainly will consider employment of computer engineering graduates. Discussions during the on-site visit also indicated needs other local companies such as General Electric (Schenectady, NY). Nationwide and worldwide, the demand for graduates in high-skilled areas such as computer engineering continues to be strong. Computer engineers can work in both hardware and software areas, and while software has received much attention recently, note that networking, communication, embedded systems (e.g. tablets), medical devices and systems are just as important to technological developments and to social applications. The existence of many computer engineering programs in the state attests to this demand in computer system skills to design and manufacture these systems.

II. Faculty

6. Evaluate the faculty, individually and collectively, with regard to training, experience, research and publication, professional service, and recognition in the field.

The existing faculty listed in the table in section 4c Part 1 hold PhD degrees in appropriate areas in mathematics, physics, computer science and engineering. Thus the training and experience are appropriate to their roles in the program, especially with regard to teaching the courses listed in this table.

The program plans to recruit a new department chair and three faculty at the assistant professor rank. Since this recruiting effort just gets started, it is too early to assess their training, experience, research, publication, professional service and recognition in the field. The sooner the new faculty join the program, the better.

7. Assess the faculty in terms of number and qualifications and **plans for future staffing**. Evaluate **faculty responsibilities** for the proposed program, taking into account their other institutional and programmatic commitments. Evaluate faculty **activity in generating funds** for research, training, facilities, equipment, etc. Discuss any **critical gaps and plans for addressing them**.

The current number of faculty will need to increase to serve the anticipated enrollment (36 in Year 1 to 99 in Year 5). The proposal includes a plan to hire a department chair and three full-time faculty with degrees in computer engineering. These faculty, together with the existing faculty, should satisfy the program requirements in education, career advising, interactions with industry, etc. Since these faculty are to be hired and several of the existing faculty are visiting or holding part-time appointment, it is too early to comment on faculty activity in generating funds for research, facilities, equipment, etc.

The existing faculty in Computer Science, Informatics, Mathematics and Physics are sufficient in number and in staffing courses in their disciplines as part of the proposed computer engineering program.

Numerous interactions between faculty and industry were cited in preparing this proposal to create the program. These interactions and the consultation with partners will help in future relationships with regard to soliciting support, equipment grants, joint projects with industry, and internship opportunities for students.

The program expects to apply for ABET accreditation in 2017. With three new assistant professors focusing on accomplishments leading to tenure (whose criteria tend to emphasize research and teaching), the program must be cognizant that other existing and senior faculty must contribute more toward accreditation preparations.

8. Evaluate credentials and involvement of **adjunct faculty** and **support personnel**.

The proposal currently does not list adjunct faculty and support personnel (e.g. assistant to the chair, laboratory manager, etc.). The proposal does describe the responsibilities of a computer engineering academic advisor (staff associate) to be hired. The University also provides many support services in advising, student transitioning into college with higher academic expectations, advising during the first year, tutoring, and career fairs. These support services have been proven at the university level.

Teaching Assistants will likely be needed to assist in laboratory operations. On-site discussions indicate that these TAs will initially be provided by Computer Science. Since computer engineering laboratories do require hardware skills, especially in design courses at the junior and senior levels, computer engineering TA resources should be incorporated into the plan in a timely manner when these design courses are offered.

III. Students

9. Comment on the **student population the program seeks to serve**, and assess plans and projections for student recruitment and enrollment.

The students to be served include students in the high schools and community colleges in the Capital Region, students in the state and from other states, and international students. On-site discussions indicate that for the University as a whole, transfer students comprise about 30% of the student population; between 85% to 90% of the students come from within the State. For computer engineering, the enrollment in the first year likely comprises transfer students from either the community colleges (e.g. Hudson Valley) or within the University.

The projection of enrollment from 36 in Year 1 to 99 in Year 5 is realistic considering the current enrollment data

from Union College and RPI, co-located with the University in the Capital Region. Given these pools of students, it seems that recruitment should not pose particular challenges. International undergraduate enrollment is being considered.

10. What are the prospects that recruitment efforts and admissions criteria will supply **a sufficient pool of highly qualified applicants and enrollees**?

Students are admitted to the program using the same criteria as admission to the University, so there is no differentiation at this level (unrestricted major). With the anticipated enrollment numbers, it is likely that the program will need to have a plan to screen for qualified applicants since the number of applicants likely exceeds the available space in the program. Admission to computer engineering at many other institutions tends to be competitive, thus ensuring the pool will have highly qualified applicants. The same situation should apply to this program at Albany.

11. Comment on provisions for encouraging participation of **persons from underrepresented groups**. Is there adequate attention to the needs of part-time, minority, or disadvantaged students?

The program seeks to reflect the diverse demographics of the University. Students from the College of Computing and Information have attended the Grace Hopper conference. The program seeks to enhance the current environment and create role models, both are crucial in attracting under-represented, minority, and first-generation students. The program mentions in the proposal that it will establish connections with the Society for Women Engineers, the NYS Society of Professional Engineers, the University at Albany College of Computing Women In Technology program, and the Two Year Engineering Science Association. Joint events with these societies will help recruit under-represented students with diverse background. It is important that these mechanisms serve to create a recruiting pipeline for women and minority students.

The program is intended to serve only full-time students, at least initially, which is the norm in other national programs.

12. Assess the system for monitoring **students' progress and performance** and for **advising students** regarding academic and career matters.

The proposal presents a plan to use both the University Advisement Services Center and a to-be-hired Computer Engineering academic advisor to monitor students' progress and performance. The central Career Services will help provide information regarding career matters (including the organization of Career Fairs, teaching job search skills, and providing job search tools), and there are various other venues (IEEE Student Branch, interactions with industry, community engagement) for students to learn more about career options. The University already has existing systems and services to assist first-year students and transfer students in adjusting to the college environment. Internship opportunities are offered by academic departments, and the program currently requests a position for internship coordinator.

It is also important that Computer Engineering faculty, not just staff, also provide career and academic advice to students. This advising role should be expected of all Computer Engineering faculty in the programs, especially those teaching courses leading to the BS degree.

13. Discuss prospects for graduates' post-completion success, whether **employment, job advancement, future study, or other outcomes related to the program's goals.**

Computer engineering is a growing and changing discipline, with ever increasing applications. Graduates should be able to find jobs easily: some could be in state and some could be out of state or even in other countries. Future study and advancement will require lifelong learning, which is one requirement of ABET accreditation. Graduates who desire to continue to graduate study should also be able to find opportunities at many institutions.

IV. Resources

14. Comment on the adequacy of physical **resources** and **facilities**, e.g., library, computer, and laboratory facilities; practica and internship sites or other experiential learning opportunities, such as co-ops or service learning; and support services for the program, including use of resources outside the institution.

The proposal includes an extensive description of the library system with both regular and electronic subscriptions. Electronic subscriptions (e.g. IEEE, ACM, and related professional publications) are especially important for computer engineering students.

The faculty resources appear adequate with the recruiting of a new department chair and three new faculty in computer engineering, together with the existing faculty in supporting disciplines such as Computer Science, Informatics, Physics, and Mathematics. Space has been reserved for these new faculty offices.

Existing tutoring and mentoring service, and the current Advising PLUS counseling system may be extended to cover computer engineering students.

The remodel for laboratory facilities just gets started. While some space has been identified, significant work remains to acquire equipment, instrumentation, and associated tools to support computer engineering experiments. A stockroom for frequently used components, likely staffed by part-time students, will be necessary and should be built into the existing space. Note that support from national and local industry, in terms of equipment and instrumentation donation, should be solicited to reduce cost of and enhance the laboratories.

Space has been identified to create new laboratories to accommodate the program. Costs associated with the library improvement and the laboratory creation have been incorporated in the program budget.

15. What is the **institution's commitment** to the program as demonstrated by the operating budget, faculty salaries, the number of faculty lines relative to student numbers and workload, and discussions about administrative support with faculty and administrators?

The institutional commitment has been demonstrated by the grants to develop the program. In addition, resources are being committed for the planned recruitment of a department chair, three tenure-track new faculty, another visiting faculty, staff support, and the various costs associated with the start-up of a new academic program. The faculty lines should be sufficient to deliver the program to the planned enrollments in the first few years but will likely need to increase should student demand exceed the planned allocation. Together with the possible increase in faculty lines is the increase in resources, both administrative and technical, to support the additional students and faculty. On-site discussions indicate that the program has been spared of a recent budget cut, which is necessary for program creation and development.

IV. Summary Comments and Additional Observations

16. Summarize the **major strengths and weaknesses** of the program as proposed with particular attention to feasibility of implementation and appropriateness of objectives for the degree offered.

Strengths: building on the new curriculum model created by IEEE and ACM, with a close relationship to the existing Department of Computer Science. An emphasis on software, complemented by hardware, will distinguish the program from other regional offerings by Union College and RPI, which emphasize electrical engineering aspects.

Possible issues to be considered:

a. Since the core faculty for computer engineering are still being recruited, the current course descriptions and proposed curriculum (including the design courses at the senior level) will likely need to be adapted to the expertise and interest of these faculty.

b. Industry input to the senior-level design lab courses and offerings of internships should be strengthened. Internships in particular could lengthen the length of the degree program beyond 4 years if some internship lasts for more than one summer semester. This extended internship is beneficial to students but needs to be taken into account in academic / career advising and in communication to students and industry stakeholders.

17. If applicable, particularly for graduate programs, comment on the ways that this program will make a **unique contribution** to the field, and its likelihood of achieving State, regional and/or national **prominence**.

This is an undergraduate program, so undergraduate research, if planned, could be a component leading to unique contributions. The creation and continuing management of an undergraduate research program is a major undertaking for faculty, students, industry, and administration from department up to college level. This effort and resources to maintain and improve it should not be under-estimated.

18. Include any **further observations** important to the evaluation of this program proposal and provide any **recommendations** for the proposed program.

a. The establishment of an Industry Advisory Board (IAB) would be helpful to the program (relationship building, possible sponsorship of projects, frequent engagement, advice to the program for possible improvements, possible scholarships), and to the students (direct contacts with high-level industry leaders, early job opportunities, developing communication skills in talking to industry members). If the University plans to create additional engineering programs, such an IAB would be very beneficial as a formal mechanism for planning and for interacting with external and internal stakeholders.

b. Given the current aggressive plan to apply for accreditation in 2017, it is recommended that the recruitment of the department chair move at a faster pace, and that faculty recruiting be started soon.

c. A more comprehensive and efficient assessment plan, together with specific assessment tools and methods, should be completed. The creation of a continuous improvement plan based on assessment results should be initiated.

Version 2013-10-15

INSTITUTIONAL RESPONSE TO COMPUTER ENGINEERING PROGRAM REVIEW

DATED: December 2, 2014

The External Evaluation Reports have been reviewed by members of the Computer Engineering Working Group. While the reviewers, both seasoned ABET accreditors, were asked to evaluate the program for SUNY System administration review and subsequent registration by the NYS Education Department, they also offered valuable direction for embedding ABET standards as the program is developed.   We are pleased with the substantive comments and the positive prognosis they provided for the program. This report responds to recommendations and comments made by each reviewer.

REVIEWER: Joanne Dugan

Comment (Q3): This reviewer recommends a schedule that calls for evaluation of several (but not all) outcomes each year, so that the burden of assessment is not onerous. Further, the current assessment matrix cells could be streamlined so that the assessment process is sustainable.

Response: The faculty currently participating on the Working Group understand what is required to complete the assessment plan for the program based on ABET requirements and will use the recommendation to distribute assessment of learning outcomes over the six-year time frame between assessments. The assessment framework we have in place will assist new faculty in identifying specific indicators based on exams, lab assignments, presentations, etc. that will be designed by faculty as they deliver and assess the courses.

Comment (Q6): New faculty with specific experience in computer engineering will benefit the development of the program and ensure high-quality engineering design content in the curriculum. An experienced department chair and faculty with expertise specific to engineering are crucial to the development of a successful program.

Response: We recognize the benefit of this recommendation and have included information in the description for the open positions that addresses this recommendation. The search for the department chair is currently underway, and searches for the faculty will begin before the end of the fall semester. The advertised job description for the Department Chair indicates:

> "Applicants must have a Ph.D. in Computer Engineering or Electrical Engineering or a closely related discipline from a college or university accredited by the U.S. Department of Education or an internationally recognized accrediting organization.   Additionally, applicants must address in their applications their ability to work with a culturally diverse population. Applicants must demonstrate expertise in one or more of the following areas: computer engineering, electrical engineering,

embedded systems, mobile applications, networking, operating systems, and software engineering. Applicants must have a strong record of funded research and demonstrated expertise in academic administrative and leadership skills. Applicants must be willing to teach at the undergraduate and graduate levels. Applicants should demonstrate active participation in professional engineering organizations. Applicants should be committed to teaching, research, and service in an interdisciplinary environment."

The Chair will begin as soon as possible and faculty will begin prior to the Fall 2015 semester. To ensure high-quality engineering design content in the curriculum, advertisements for the faculty positions will state "Applicants must demonstrate expertise in one or more of the following areas: computer engineering, electrical engineering, embedded systems, mobile applications, networking, operating systems, and software engineering."

Comment (Q7): Development of curricular materials, labs and design activities may provide a significant burden on new faculty and such contributions must be considered in the promotion and tenure review… It is important that these service and curricular activities are supported and recognized, and that research expectations are realistic during the development of the new program.

Response: The University is committed to mentoring its junior faculty. (http://www.albany.edu/academics/mentoring.best.practices.toc.shtml). The Department Chair and College Dean work closely with faculty throughout the first few years of the program to determine the appropriate balance among the three categories of scholarship, teaching and service upon which new faculty will be evaluated. The University at Albany's "Procedures for Promotion and Tenure Review" (http://www.albany.edu/academics/promotion_tenure/introduction.shtml) indicate that recommendations for promotion and tenure shall be based primarily upon a careful deliberation concerning the effectiveness of the candidate within each of the three categories of scholarship, teaching and service "as appropriate to the position of the candidate within the University." This allows the Department Chair and College Dean to recognize that as we establish the new program, the position of new faculty may focus more heavily on their curricular and service contributions than is normally expected, while recognizing that faculty will still be expected to have a trajectory that would be appropriate for a STEM department at a research university. Thus, it is expected that (1) candidates will receive appropriate mentoring during their pre-tenure years and (2) the Department Chair and College Dean will provide appropriate background material to the university-level promotion and tenure committee (University Senate Council on Promotion and Continuing Appointment) to ensure that candidates will be appropriately evaluated through the tenure and promotion process.

Comment (Q8): …involvement of appropriate local practitioners from industry could benefit the program by teaching special topics courses or advising student teams on projects or mentoring students in the program.

Response: We agree with this recommendation. During the development of the program we have recognized the need to develop strong partnerships and have connected with leaders from several local business organizations who have expressed a willingness to act as guest speakers in the introductory engineering courses, serve as mentors for students, provide

internships to upper division students, and work with us on connecting to industry-relevant problems for design projects. We anticipate that several of our industry partners will also be willing to teach in an adjunct capacity.

Comment (Q8): The program could also be well served by an instructional laboratory technician who can develop prototype designs, maintain and develop lab equipment, establish and maintain inventory of necessary parts and equipment.

Response: We agree with this recommendation and have included a technical assistant in the budget to oversee the laboratories, provide faculty with assistance for set up, order supplies, and oversee the storage and inventory of parts and work to create a process to dispense consumables and equipment.

Comment (Q11):   The faculty must reflect the diversity of the desired student population. The institution and program appear well-poised to attract and retain qualified students from underrepresented groups.

Response: The mission of the program is to offer a student-centered engineering curriculum, to engage a diverse community of students in solving real-world engineering problems, to instill a commitment to professional and ethical engineering standards, and to promote a devotion to life-long learning. As part of the search process our Office of Diversity and Inclusion (ODI) has reviewed and approved our advertisement and marketing plan that includes publications that can reach under-represented groups. We will continue to work with ODI to increase the diversity in the applicant pools for all computer engineering positions.

Comment (Q12): Local engineering practitioners could provide excellent opportunities for mentoring, internships and other guidance.

Response: We agree with the recommendation and have reached out to industry partners and professional engineering organizations to secure guidance on the curriculum and to request their participation in potential mentoring programs. Attached is a letter from the Capital District Society of Women Engineers who have agreed to have their members serve as mentors for our students.

Comment (Q14): It is strongly recommended that students in the engineering program be required to purchase a laptop computer for use in class and for assignments.

Response: We recognize the benefit that a personal laptop will provide students. Students will be required to purchase a laptop computer based on UAlbany policy/practice/protocol.

Comment (Q14): Software licenses for engineering software will require continued financial and infrastructure support.

Response: Our industry partners recommend the use of Open Source software. This will allow us to secure access to the software at no cost. Open Source provides students the opportunity to work in this environment as preparation for industry employment where Open Source is used extensively. It is not expected that this approach will eliminate the need to budget for proprietary software but will reduce costs.

Comment (Q14): Most engineering instructional lab spaces suffer from inadequate numbers of electrical outlets for laptops, scopes, instrumentation and other equipment. High bandwidth wireless access should be assured for classrooms and lab spaces. Faculty research labs must also allow for easy reconfigurability as space and equipment needs change frequently with emerging technologies.

Response: During the tour of the lab facilities it was clear that adequate electrical outlets would be required along with access to high bandwidth wireless. Representatives from the University's Office of Campus Planning were made aware of these needs and have incorporated them into their plans for renovating the spaces.

Comment (Q16): Notwithstanding the probability of success, there are some risks to address. Engineering faculty with experience in engineering education and engineering practice, will ensure the rigor of the engineering and design content of the program. Faculty without authentic engineering design experience can provide and ensure a strong theoretical foundation, but engineering faculty with experience can carry that foundation forward into engineering practice.

Response: We will consider this during the hiring process. The search will seek faculty with expertise in computer engineering that focuses on particular areas pertinent to the program. Design experience will be evidenced by research initiatives, funded projects, and industry work experience and collaboration.

Comment (Q16): Lab facilities for engineering programs require significant continual resources to ensure that they remain relevant. Equipment needs continual upgrading and new materials, parts and equipment become obsolete remarkably quickly.

Response: The computer engineering labs require several small pieces of electronics, a soldering station and components to create a small, functional system. Students will be required to provide their own low-cost kits and oscilloscopes. The development budget allows for the initial equipment and start-up parts.

Comment (Q16): Accreditation needs impose a significant service burden that must be recognized and supported.

Response: We recognize the ongoing need for actions that will allow the program to achieve and maintain accreditation. To structure and support the necessary level of assessment, the Staff Associate will be charged with collecting student work to demonstrate accomplishment of student performance on each student learning outcome. In addition we expect that an assessment coordinator will be required once the program is up and running. This position can be handled by a faculty member with assistance from the staff associate.

REVIEWER Mani Soma:

Comment (Q1): The assessment plan currently specifies which outcomes to be assessed in which courses but has not described the assessment tools to do so.

Response: Although the assessment framework we have in place ties performance criteria to specific student learning outcomes, source of assessment and course activities, it does not include the specific assessment tools in order to allow the newly hired computer engineering faculty to use their discipline expertise to establish the assessment tools and determine the performance measures. Once we have hired the faculty, they should have the freedom to develop measures they determine to be appropriate to address ABET accreditation requirements.

Comment (Q3): The continuous implement (sic) plan, also required by ABET, has not been described.

Response: At present, the process for continuous improvement is in place and a plan has been added to the proposal. Annually, a review of the outcomes data collected by the faculty will be reviewed at a departmental retreat to be held each spring.   The retreat will provide faculty an opportunity to reassess performance measures, assessment tools and student performance in order to make changes for the next assessment round.

Comment (Q7): With three new assistant professors focusing on accomplishments leading to tenure …the program must be cognizant that other existing and senior faculty must contribute more towards accreditation preparations.

Response: The College is aware of the workload on new faculty and will work to support their accreditation efforts. The accreditation process will be shared by a staff associate in the computer engineering department and the Department Chair in addition to the newly hired computer engineering faculty.

Comment (Q8): The proposal currently does not list adjunct faculty and support personnel (e.g. assistant to the chair, laboratory manager, etc.).

Response: In addition to the staff associate, the budget does include hiring a clerical assistant to the chair and a technical lab assistant to support the faculty in the delivery of the program. Enrollment in the initial years can be handled by existing and newly hired faculty. Once enrollment grows, adjunct faculty will be hired to meet the demand.

Comment (Q8): Since computer engineering laboratories do require hardware skills, especially in design courses at the junior and senior levels, computer engineering TA resources should be incorporated into the plan in a timely manner when these design courses are offered.

Response: We will work with the new Department Chair and faculty to determine their needs for TAs given the initial enrollment projections. As the program progresses and a graduate program is introduced, we will be in a position to seek funding to support additional support for instruction and research.

Comment (Q10): With the anticipated enrollment numbers, it is likely that the program will need to have a plan to screen for qualified applicants since the number of applicants likely exceeds the available space in the program.

Response: As a public institution, we will work to accommodate student enrollments in this program. Note that the first two years of the curriculum consists mainly of existing computer science courses and College of Arts and Sciences mathematics and science courses. CAS has identified the cost of increased enrollment based on the enrollment projections for computer engineering. These costs have been included in the computer engineering budget.

Comment (Q12): It is also important that Computer Engineering faculty, not just staff, also provide career and academic advice to students. This advising role should be expected of all Computer Engineering faculty in the programs, especially those teaching courses leading to the BS degree.

Response: We recognize the opportunity faculty have to support students in curricular and career choices and will adhere to University advisement practices. The relationship between computer engineering faculty and students begins with the introductory courses in design and analysis during the first year. Faculty will be encouraged to act as mentors to students to advise them on career options, course selection and research opportunities. Faculty and staff have been investigating grant funding to support a formal mentoring program. In addition the staff associate will work with the Advisement Services Center and Career Services to create events that bring faculty and students together in informal settings to increase interaction.

Comment (Q14): The remodel for laboratory facilities just gets started. While some space has been identified, significant work remains to acquire equipment, instrumentation, and associated tools to support computer engineering experiments. A stockroom for frequently used components, likely staffed by part-time students, will be necessary and should be built into the existing space. Note that support from national and local industry, in terms of equipment and instrumentation donation, should be solicited to reduce cost of and enhance the laboratories.

Response: We will approach industry to secure donations of equipment and consumable items. The Working Group will be hosting a visit from the University of Virginia Director of Lab Instruction to discuss engineering education, design lab needs, best practices in lab security and purchase, storage and distribution of consumable lab supplies.

Comment (Q16): Since the core faculty for computer engineering are still being recruited, the current course descriptions and proposed curriculum (including the design courses at the senior level) will likely need to be adapted to the expertise and interest of these faculty.

Response: Because of the changing nature of computer engineering and emerging technologies, we have built flexibility into the curriculum through the electives and also within the design courses. We expect that the new faculty hires will demonstrate expertise in mobile, networking and embedded systems.

Comment (Q16): Industry input to the senior-level design lab courses and offerings of internships should be strengthened. Internships in particular could lengthen the length of the degree program beyond 4 years if some internship lasts for more than one summer semester. This extended internship is beneficial to students but needs to be taken into account in academic / career advising and in communication to students and industry stakeholders.

Response: We agree and have been working with multiple industries to identify internship opportunities for computer engineering students. Students are encouraged to enter into internship arrangements prior to the junior year to gain industry experience, though primary internships take place after the junior year. This allows the internships to inform the senior design experience without extending the 4-year program.

Comment (Q17): The creation and continuing management of an undergraduate research program is a major undertaking for faculty, students, industry, and administration from department up to college level. This effort and resources to maintain and improve it should not be under-estimated.

Response: It is our intention to build a graduate program in computer engineering as soon as possible. This will provide research opportunities for undergraduates and teaching assistants for faculty. We recognize the resources that will be required and will work collaboratively with the administration and external stakeholders to meet the demands.

Comment (Q18): The establishment of an Industry Advisory Board (IAB) would be helpful to the program (relationship building, possible sponsorship of projects, frequent engagement, advice to the program for possible improvements, possible scholarships), and to the students (direct contacts with high-level industry leaders, early job opportunities, developing communication skills in talking to industry members).

Response: It is the intent of the College of Computing and Information to add several engineering advisors to the existing College Advisory Board. The President of the University will be convening an Executive Advisory Committee to oversee the University's engineering profile.

Comment (Q18): Given the current aggressive plan to apply for accreditation in 2017, it is recommended that the recruitment of the department chair move at a faster pace, and that faculty recruiting be started soon.

Response: The Chair search has been posted and applications are being collected. However, the response is not sufficient at this time to interview the candidates. We continue to connect with engineering professionals and organizations to locate viable candidates. The paperwork for the faculty searches is being submitted to Human Resources and the Office of Diversity and Inclusion for approval so that the marketing of the positions can take place as soon as possible.

Comment (Q18): A more comprehensive and efficient assessment plan, together with specific assessment tools and methods, should be completed. The creation of a continuous improvement plan based on assessment results should be initiated.

Response: The plan is incomplete by design so the computer engineering faculty can identify exams, lab assignments, presentations, etc. that will provide opportunities for assessing the student learning outcomes. The continuous improvement plan will be formalized once the faculty are in place. Our goal at this point is to move towards program approval and to embed ABET specifications during the first year of program delivery. Once we have hired the faculty, they should have the freedom to develop measures as they see appropriate to address ABET accreditation requirements.

November 20, 2014

Mr. Neil Murray
Chair of Computer Science
University at Albany
1400 Washington Avenue
Albany, NY 12222

Dear Mr. Murray,

On behalf of the Society of Women Engineers (SWE) NYS Capital District section, I would like to express our support of a mentoring program for female students at the University at Albany. One of SWE's core values is to provide an organization that fosters mentoring, to promote the development of professional and personal networks. We support the University's effort to increase gender equality in engineering through a mentoring program. Our organization reaches out to over 200 engineering professionals in the Capital District area, and we will use our network to help connect the students with mentors.

We look forward to working with the University at Albany in support of the mentoring program.

Sincerely,

Anne Roberts

President, NYS Capital District SWE
www.nyscdswe.org

Email: anne.roberts@swe.org
Cell: 518-312-0456