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**COLLEGE OF ENGINEERING and APPLIED SCIENCE**  
*"Working for Wyoming and the World"*

**Department of Computer Science Plan  
2009-2014**

[Final Draft: April 29, 2009]

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**Mission**

The Department of Computer Science at the University of Wyoming provides instruction and research in computer and computational science theory and practice for the following groups : undergraduate and graduate students of the University, faculty and staff of the University and partner institutions, as well as industry and government partners in the northern Rocky Mountain region and beyond. These activities provide support for immediate computational needs as well as a foundation for lifelong learning in computational sciences.

**Aspirations**

Our faculty strive to create and maintain expertise in their selected areas of computer and computational sciences, effectively supporting the groups described above while also forwarding research efforts which impact developments in the field at national and international levels. Specific targets which we focus upon for the 2009-2014 planning projection are as follows, categorized by the fundamental themes of UW's Creation of the Future III:

- Access
  - Increasing the enrollment and diversity of undergraduates in our program of study and minor.
  - Increasing the enrollment of graduates in our MS and PhD programs.
  - Enhancing undergraduate and graduate course offerings to include additional campus divisions and groups.
- Excellence
  - Continued improvement and accreditation of our undergraduate program of study.
  - Increasing the levels of external funding for faculty directed research.
- Leadership
  - Increasing our participation in interdisciplinary education and research programs across our College and University.
  - Increasing our contacts and participation with education, industry and government partners in the State and region.
- Strategic Prominence
  - Increase our faculty expertise in areas of strategic prominence to the State of Wyoming, including energy sciences, numerical modeling, health technologies and environmental sciences.

**Previous Planning Accomplishments**

The action items described in the 2004-2009 Department Academic Plan are summarized, with accomplishments to-date, in Appendix A of this plan.

**Relevant Institutional Issues**

The State of Wyoming and the University are embarking on several paths which depend upon a solid physical and human infrastructure in the computational sciences. The NCAR facility proposed for Cheyenne offers substantial opportunities for partnering. The cutting edge of many commercial, healthcare, scientific, and engineering fields of specialty demonstrate an increasing dependence upon reliable and efficient databases, intelligent computational systems, and electronic communications. Also, the need for incorporating computational literacy and algorithmic problem solving into the K-12 classroom through articulated curriculum and standards clearly signifies one of the many critical roles that our Department is being called to take on in the immediate future.

**Action Items**

The Department will pursue the following specific actions in the 2009-2014 timeframe:

1. Receiving continued accreditation for our undergraduate degree program through CAC/ABET: preparation 2008-2010, review in AY 2010-2011.
2. Hiring at least two new faculty members in the systems area to support undergraduate as well as graduate coursework, extramural research, and partnerships: AY 2008-2009 and subsequent.
3. Partnering with faculty from other campus departments to identify opportunities to develop coursework to support undergraduate and graduate programs of excellence in computer and computational sciences: AY 2010-2011 and subsequent.
4. Entering into full partnership with colleagues in the College of Education, the Science and Math Teaching Center, and Wyoming community colleges to support efforts for integrating computational sciences into the K-12 curricula and standards of the State: AY 2010-2011 and subsequent.
5. Working with colleagues in the College of Education and the State Professional Teaching Standards Board to define a Computer Science Education Endorsement program for K-12: AY 2009-2010 and subsequent.
6. Identification and design of next-generation teaching and research facilities for inclusion in College core facility expansion: AY 2009-2010 and subsequent.

**Discussion and Implementation**

The rough first-cut timeline for implementation accompanies each action item identified above. The Department will be guided by the following arguments and refined timelines in order to carry out the actions as delineated:

1. ABET preparation, which is currently underway, includes authoring the program self-study and collecting supporting materials for assessment and review. Each faculty member teaching undergraduate coursework shares in the responsibility for collecting supporting course documentation, while a faculty committee of at least three members is tasked with undertaking the self-study construction. The requisite time commitment is significant and may require release from other activities as appropriate.
  - a. Self-study draft due Summer 2009.
  - b. Preparation of all materials for early review due mid Fall 2009.
  - c. Adjustments and final preparation for official review due early Fall 2010.
  - d. On-site review, Fall 2010.
  - e. Respond to reviewer comments, Spring 2011.
2. Hiring of new faculty members involves multiple resources: (a) availability of faculty lines, and (b) concentrated faculty and staff time to conduct effective searches. With the resignation of two tenured faculty members in the Spring 2008, one faculty line has returned to the Department. A faculty committee is proceeding with finalizing the qualifications to be advertised for the open position and will conduct initial evaluation of applications.
  - a. Advertisement and receipt of first set of applications early Spring 2009.
  - b. Evaluation of applications, on-campus interviews and selection of candidate mid Spring 2009.
  - c. Hiring and placement of new faculty member in time for Fall 2009 semester. Will include resource needs for start-up budget and on-site office and laboratory facilities as necessary.

The Department will continue to pursue a variety of avenues for additional faculty lines, including the CPM process, collaboration with Wyoming NSF EPSCoR, School of Energy Resources, and NCAR programs which identify faculty needs in computer and computational sciences.

3. First steps toward reformulation of undergraduate and graduate coursework have been initiated with review of the six model curricula described by the Association for Computing Machinery (ACM) Computing Curricula 2001 report. Particular interest has arisen with the options including the "functional first" model. The viability of these options will depend upon collaborative agreements with partner programs and community colleges. Curricula which have a track-record of strong support in K-12 environments, and are perceived as highly desirable from a standpoint of "best practices in instruction" as well as appealing to a broad, diverse audience of prospective students, will be given particular attention.
  - a. Preparation of re-design documents for the core computer science coursework, AY 2009-2010.
  - b. Pilot presentation of first three core courses in computer science, AY 2010-2011 and 2011-2012.
  - c. Evaluation and future plans for retrenchment or further roll-out, AY 2012-2013 and subsequent.
4. Long-term institution goals for scientific literacy include computational science literacy, which must be integrated into the math and science curricula of K-12 schools. Partners in mathematics and education will be principle in carrying out the development of standards revisions to include computational theory and theory as appropriate. This effort should result in the expansion of the audience of prospective students in computational sciences and allied fields of study.
  - a. Identification of and articulation with partners to evaluate viability of standards revisions, AY 2010-2011.
  - b. Initial draft of proposed standards revisions, AY 2011-2012.
  - c. Subsequent drafts and adoption, AY 2012-2013 and subsequent.
5. With the adoption of highly qualified preparation standards for secondary education majors, undergraduate programs of study for Wyoming teachers must include certification in the course areas which they will support in the classroom. In conjunction with action item 4, steps must be taken to provide the pre-service teacher preparation and certification in computer science.
  - a. Identification of coursework program of study to provide certification, AY 2009-2010.
  - b. Introduction of certification program, first group of prospective pre-service teachers enrolled, AY 2010-2011.
6. The future core facilities of the College will provide engineering and applied science programs with the next-generation of undergraduate and graduate teaching and research infrastructure. These facilities must be carefully conceived in order to provide for contemporary needs as well as for future growth and adapted utilization.
  - a. Inventory of contemporary classroom and laboratory needs, including technology for collaborative undertakings with campus and region partners, including NCAR: AY 2009-2010.
  - b. Design of multi-use spaces to satisfy contemporary needs and address projected needs for subsequent two decades: AY 2010-2011.
  - c. Detailing and final adjustments for space specifications: AY 2011-2012.

#### **Appendix A: Action Items and Accomplishments from 2004-2009 Department Academic Plan**

The action items and accomplishments are summarized as follows:

- I. Discontinue our role in the eBusiness program. Participate in a dialog with the College of Business (CoB) to determine how to combine resources that are currently devoted to our Management Information Systems (MIS) program and the CoB Information Management sequence to improve those programs and reincarnate the eBusiness program in some form.
  - a. The Computer Science MIS program is effectively phasing out, with less than 10 undergraduates remaining in the pipeline as of Fall 2008. In place is a Computer Science baccalaureate degree, with a Business Option, to capture both the rigor of a CAC/ABET accredited degree and the specialization in business systems which is demonstrated as highly desirable by employers and prospective students.

- II. Discontinue support of a senior-level faculty member dedicated full-time to programs in the College of Health Sciences. Re-distribute the teaching and research resource within home department needs.
  - a. The faculty line has moved to the College of Health Sciences for administrative purposes. Participation of computer science graduate students in appropriate projects has continued with an adjunct faculty appointment.
- III. Expand and reorganize our course offerings in the undergraduate computer science program including new electives. Add new tracks culminating in a separate capstone design course.
  - a. Additions to software design and engineering include the required COSC 3011 *Introduction to Software Design*, which serves as preparation for the COSC 4950 and COSC 4955 *Senior Design I and II* sequence. This sequence allows students to develop interest and expertise in elective coursework while gaining experience with contemporary software specification and design practice, culminating in a year-long capstone design sequence.
- IV. Reorganize and update our course offerings in MIS and increase our interaction with the CoB in delivering this program (as per item I above).
  - a. As described above, the MIS program is phasing out and is being directly subsumed by the Computer Science BS with Business Option. COSC 4210 and 4220 now effectively replace the COSC 2210 and 2220 Business Data Processing course sequence, providing a more rigorous systems design and performance evaluation core.
- V. Eliminate the Professional Masters program but expand our graduate-level course offerings by two courses per year.
  - a. The Professional Masters program has been eliminated, however attrition of faculty resources has limited the ability to offer additional graduate-level courses.
- VI. Increase our efforts to obtain external funding for research.
  - a. Research efforts and grant procurement, both within the Department and collaboratively across the College, University and nation, have included the follow success stories:
    - i. Four NSF grants, including a collaboration with colleagues in the Department of Mathematics, a collaboration with colleagues in Physics, and a multi-institution collaboration focused on computational theory.
    - ii. Contracts with the Department of Defense Joint Robotics Group, in collaboration with Electrical and Computer Engineering colleagues, to support swarm robotics research.
    - iii. Contracts with Lockheed-Martin and Harbor Branch Oceanographic, in collaboration with colleagues in Statistics and Electrical and Computer Engineering.
- VII. Continue to assess undergraduate course sequences, including performance with respect to outcomes objectives, in order to improve undergraduate programs.
  - a. Assessment and curriculum modification continues with ABET self-study and preparation of course materials for review in the next cycle of accreditation.