A Community College Perspective of the Development of Engineering Transfer Model Curricula under the California Student Transfer Achievement Reform Act (SB 1440): An Update on Work in Progress

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Abstract

California Senate Bill 1440, The Student Transfer Achievement Reform Act, requires California Community Colleges (CCCs) to develop associate degrees for transfer to the California State University (CSU) system. Engineering faculty representatives from both systems have worked together to develop preliminary transfer model curricula and associated course descriptors. Both the model curricula and the course descriptors are currently undergoing statewide vetting at the writing of this paper. The results of the vetting process and up-to-date documents will be presented.

Legislation

California Senate Bill 1440, The Student Transfer Achievement Reform Act[1], requires California Community Colleges (CCCs) to develop associate degrees for transfer to the California State University (CSU) system. The CSUs are required to prepare to accept students who complete these AA-T or AS-T degrees. The intent is to develop a more uniform and streamlined transfer process from the CCC to the CSU.

Under SB1440, an associate degree for transfer must include 60 transferable semester units (90 quarter units), including lower division general education and at least 18 semester units in a major or area of emphasis. Students completing an AA-T or AS-T and accepted at a CSU campus are to be admitted with "junior status" and shall not be required to complete more than an additional 60 semester units (90 quarter units) for majors requiring 120 or 180 units, respectively. High-unit majors, such as engineering, are exempt from this CSU-level requirement. The unit requirements pose a challenge in creating an engineering AS-T degree. It should be noted that that CSU engineering programs are currently under pressure to bring their bachelor's degree programs down to a maximum of 120 semester or 180 quarter units. This requirement may significantly affect the transfer curriculum process.

Curriculum Development

CCC and CSU engineering faculty representatives have been meeting to develop transfer model curricula (TMC) and course descriptors for engineering (see Course Identification Numbering System website[2]). It was decided early in the process that preparation for the major is the priority of any transfer curriculum and the 60-unit cap on lower division units could not be met if both major preparation and lower division general education (GE) were to be completed prior to transfer. Therefore, in the spirit of SB1440, two model curricula and the associated course descriptors (C-IDs) were developed – one for Electrical/Computer Engineering (EE/CompE) and one for Mechanical, Civil, Aerospace, and Manufacturing Engineering (ME/CE) to maximize the overlap of course requirements in those disciplines, respectively. Additional model curricula, such as Chemical or Biomedical Engineering, may be developed in the future.

The two model curricula that were developed take two different routes. Both curricula include the typical support courses of calculus, physics, and chemistry. The EE/CompE model curriculum (Table 1) emphasizes the completion of as much lower division GE as possible with just a few engineering courses in the lower division. There was much discussion among the committee members regarding this, but a consensus to add additional engineering courses was not reached.

Table 1
Draft Model Curriculum
Electrical and Computer Engineering
11/9/2012 Version

Course Title	Semester Units (minimum)
Required Engineering Core Courses	7
Introduction to Engineering	1
Circuit Analysis	3
Introduction to Programming Concepts and Methodologies for Engineers	3
Required Science Courses	13
Calculus-based Physics A (Mechanics)	4
Calculus-based Physics B (E & M)	4
General Chemistry with Lab	5
Required Math Courses	15
Calculus I	4
Calculus II	4
Multivariable Calculus	4
Ordinary Differential Equations	3
Total Units (minimum)	35

The ME/CE model curriculum (Table 2) emphasizes the completion of as many lower division engineering courses as possible. The difference between these two approaches is in most part due to the more standardized curriculum in ME/CE programs compared to EE/CompE programs. CSU EE/CompE programs have a greater variety of specialized lower division courses from campus to campus, which makes it difficult to duplicate in a community college engineering program.

Table 1
Draft Model Curriculum
Mechanical, Civil, Aeronautical, or Manufacturing Engineering
11/9/2012 Version

Course Title	Semester Units (minimum)
Required Engineering Core Courses	23
Introduction to Engineering	1
Engineering Graphics	3
Statics	3
Materials Science and Engineering	4
Introduction to Programming Concepts and Methodologies for Engineers	3
Circuit Analysis	3
Strength of Materials	3
Dynamics	3
Surveying (recommended for CE if available)	3
Note: Two of the above courses must contain a lab.	
Required Science Courses	13
Calculus-based Physics A (Mechanics)	4
Calculus-based Physics B (E & M)	4
General Chemistry with Lab	5
Required Math Courses	15
Calculus I	4
Calculus II	4
Multivariable Calculus	4
Ordinary Differential Equations	3
Total Units (minimum)	51

With the addition of lower division GE to either pattern, the total units upon transfer would be greater than the 60 units specified in SB 1440. Hence, these are being called "Model

Curriculum" rather than the official "Transfer Model Curriculum" (or TMC). Approval of these model curricula will require a waiver of the 60-unit lower division requirement.

The two model curricula which were developed and are summarized in the above tables are currently in the statewide vetting process[3]. The vetting process allows for review and comment by any interested parties. The results of that process and any progress in developing the curricula subsequent to the vetting will be presented.

Conclusion

The purpose of SB 1440 is to streamline and simplify the transfer of students from California community colleges to the California State University system. Creating an engineering transfer curriculum to meet the requirements of the law is difficult due to the high-unit nature of the engineering major, which requires a great many lower division preparation and support courses. In the spirit of SB 1440, two model engineering curricula have been drafted by a committee composed of both CCC and CSU faculty, and are being reviewed statewide at this time. With constructive input, serious discussions and compromise from both institutions, a workable transfer pattern may eventually result from this process, benefitting both institutions and the engineering students that transfer between them.

Bibliography

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