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Ensuring Curriculum Integrity for Engineering Technology Programs during Calendar Conversion

Introduction

Calendar conversion, for the purposes of this paper, is defined as the process of converting from a calendar based on periods of instruction referred to as academic quarters to academic semesters. In calendars based on quarters, each period of instruction lasts 10 weeks and students attend three quarters during a normal academic year. In calendars based on semesters, each period of instruction lasts approximately 15 weeks and students attend two semesters during a normal academic year. In both quarters and semesters, attendance during summers may be desirable, but such attendance is considered optional.

A quick snapshot of the calendar selections of institutions throughout the United States (U.S.) reveals that approximately 90% of institutions are on a semester-based calendar leaving approximately 10% of U.S.-based institutions on a quarter-based calendar. A quick snapshot however, taken by itself, does not indicate trending that may be occurring over time, and such trending exists with respect to calendar conversion. Over the past several years there has been a trend wherein U.S.-based institutions on quarters are increasingly converting to semestersⁱ. This trend appears to be localized within U.S.-based institutions as semesters appears to be the predominant calendar utilized on a global basis.

While is it beyond the scope of this paper to conduct a meta-analysis of institutions who have converted from quarters to semesters, it may be helpful to note institutions that have most recently converted calendars – those institutions include, but are not limited to, the followingⁱⁱ:

- Alabama system (converted in 1998)
- University System of Georgia (1998)
- Utah State System (1998)
- University of Minnesota system (1999)
- Auburn University (2000)
- Northeastern University (2003)
- Shawnee State University (2007)
- Northwood University (2010)

Of additional interest may be a list of institutions with Engineering Technology programs that have converted calendars – those institutions include, but are not limited to, the following:

- Michigan School of Technology (2000)
- Youngstown State (2000)

Additionally, several schools are currently in the process of converting from quarter to semester calendars with expected completion as shown:

- Principia College (2011)
- Ohio University (2011)

- Ohio State University (2012)
- Wright State University (2012)
- University of Cincinnati (2012)
- California State at Los Angeles (2012)

Both the Ohio University System and the University of Cincinnati have programs in engineering technology.

Having defined calendar conversion, the topic will be further explored throughout the remainder of this paper. Topics to be discussed include providing a context for calendar conversion at the Rochester Institute of Technology (RIT), discussing Engineering Technology (ET) curricular needs relative to conversion, examining opportunities and risks, investigating points of concern for ET curricula, and providing detailed examples of course conversion. A conclusion with a high-level review of procedural steps and timing related to the conversion is provided.

Context

Discussions of calendar conversion have occurred at RIT several times during the past decade. These discussions have been spirited and have engaged literally every constituent group throughout the campus. Each time a discussion of calendar conversion has occurred the topic has eventually been tabled due to:

1. a rationalization of the financial and human resources required to complete the conversion
2. disagreement regarding the attractiveness of semesters vs. quarters, and
3. reluctance to depart from what has become to be a readily identifiable component of an RIT education – academic quarters.

It is fair to say, however, that each time a conversation of calendar conversion has been raised at RIT, such conversations have concluded with an articulation of several reasons why remaining on quarters would be increasingly difficult to sustain.

Reasons precipitating a calendar conversion at RIT include the following:

- Difficulty in facilitating student transfers,
- Misalignment of calendars with the majority of other academic institutions in the U.S. and abroad,
- Messy and confusing academic credit conversions,
- Barriers to facilitating global education – most particularly in study abroad and exchanges of various types for students and faculty, and
- Obstacles in hiring students for careers and cooperative (coop) educational experiences.

Ultimately, a decision to convert the academic calendar from quarters to semesters at RIT came into the sharpest focus when considering input and requests from employers of our students. At issue with employers is/was that reliance on quarters makes students available for work in either permanent or coop positions nearly three weeks after students on semesters become available for employment. This misalignment in availability for students on quarters vs. semesters represents

substantial costs and inefficiencies for employers who are required to run duplicative employee orientation processes and who wish to match new employees with certain skill sets in different assignments and cross-functional work teams. Accordingly, the decision was made in the fall 2010 quarter to convert to semester in the fall of 2013.

With a decision made to convert the calendar, an analysis was conducted to identify additional changes within the institution that would be required to effect the conversion. While discussion of these additional changes is beyond the scope of this paper it is noteworthy to identify these additional changes as they too represent significant undertakings on par with calendar conversion. The additional changes are as follows:

- General education reform – from a distributed/menu-based system to a theme-based model, and
- Replacement of the “Student Information System” (SIS) – from legacy systems to PeopleSoft.

Having committed to calendar conversion, general education reform, and replacement of the SIS it was clear a set of principles would be necessary to guide the conversions efforts. Other institutions undergoing this transformation have provided a context to ensure no harm is done to students during the conversion process. The guiding principles governing conversion processes at RIT included the following:

- No delay in time to graduation for students,
- No additional costs to students as a result of the conversion, and
- Common academic components/characteristics would be included in all degree programs.

It is this consideration of common academic components/characteristics that would be included in all degree programs that enables us to orient the remainder of this paper to ET-specific curricula. In particular, the common components/characteristics most pertinent to ET curricula are as follows:

- All programs would retain a career focus,
- All programs would continue to emphasize or require cooperative educational experiences,
- All programs would include educational experiences intended to engage students in the design or application of innovation within their disciplines,
- All programs would include educational opportunities for student research, and
- All programs would include an opportunity for study abroad that does not delay graduation.

Calendar Conversion Relative to ET Curricular Needs

While calendar conversion with guiding principles and common components/characteristics may sound attractive for planning and consistency purposes, such conversion must be set within a context of ET curricular needs. Certainly not unique to ET, but critically important to ET none the less, are curricular needs for the following types of educational experiences:

- “Hands-on” activities vs. demonstrations,

- Laboratory-based course work,
- Pedagogical designs emphasizing activities and assignments organized as discrete projects, and
- Extensive use of teams throughout all aspects of the curricula.

The needs for ET curricula identified above were handled by engaging in curricular design and development holistically from the program or systemic level by teams of faculty serving in the roles of curriculum design and development specialists. Such detail in planning and curricular design was required simply due to the complexity involved with single program conversion wherein each of three ET departments was responsible for converting multiple degree programs simultaneously. Indeed, the only way common components and ET curricular needs could be verified and assured was to create program level maps identifying when and where within the curricula these components have been included and ET-specific needs have been met relative to institutional conversion and accreditation requirements.

Accreditation requirements were mentioned at this point in the discussion as maintenance of accreditation was/is considered to be of critical importance during calendar conversion processes. Of particular importance was/is alignment of curricular design elements with criteria for both regional and professional accreditation. In the case of accreditation agencies involved with academic programming at RIT, the Middle States Association of Colleges and Schools accredits RIT on a regional basis and the Technology Accreditation Commission (TAC) of the Accreditation Board for Engineering and Technology (ABET) is the source of professional accreditation for RIT Engineering Technology programs.

It is interesting to note that adherence to regional and professional accreditation criteria helps provide the potential to realize many opportunities throughout the institution as a result of calendar conversion. However, such adherence to accreditation criteria does not eliminate the potential negative effects of certain risks.

Opportunities & Risks in Calendar Conversion

The opportunities and risks associated with calendar conversion apply to all academic programs at RIT. In making a decision to convert the academic calendar from quarters to semesters, potential opportunities were evaluated relative to potential risks. Leadership within the institution determined that opportunities outweighed risks at this point in history for the institution, given the dynamic and competitive landscape of academia in general. For purposes of a balanced consideration in this paper the top six opportunities were considered relative to the same number and importance of risks.

Opportunities:

A reasonable question to ask might be the following: “What opportunities, taken for all academic programs across a major institution, could justify committing the financial and human resources required to convert the calendar?” A brief identification of the most important opportunities justifying calendar conversion includes:

- The promise and expectation of a revolutionary change in new curriculum (i.e., general education reform as well as content for professional degrees) systemically implemented throughout the institution,
- Thoughtful considerations and curricular designs to integrate and enhance educational experiences common to all students,
- Creation of a context (i.e., calendar conversion) serving as a catalyst and galvanizing agent for sweeping change throughout the institution,
- New approaches to instructional delivery from the perspective of pedagogy as well as multi and inter-disciplinary student projects, and
- Better alignment of student and faculty availability with other academic institutions and industry needs for hiring and cooperative education.
- Better alignment of student and faculty availability with other academic institutions for internal experiences such as study abroad.

Risks:

Equally important in a decision to convert from quarters to semesters is a consideration of the risks that could vary in severity from creating insurmountable difficulties at one extreme to limiting the effectiveness of conversion processes at the other extreme. A brief identification of the most important risks potentially opposing calendar conversion includes:

- Missed opportunities to realize the benefits associated with systemic and thorough curricular enhancement in the event faculty simply repackage existing quarter-based curricular content into a semester equivalent,
- Disruptions or ineffectual student advising during the conversion processes,
- A potential loss in emphasis on cooperative education which remains a hallmark of an RIT education in general,
- Loss satisfaction from those students do not want to change calendars while they are attending RIT and a loss of satisfaction for those students who view college education based on quarters to be a sort of “Badge of Honor,” and
- Negative impact to student progress through the curriculum during transitionⁱⁱⁱ.
- A significant dip in enrollment as has been experienced by some other institutions who have converted calendars.^{iv}

Having considered opportunities and risks associated with all academic programs on an institutional basis, it is time to consider pertinent points relative to ET programs specifically.

Points of Concern Specific to Engineering Technology Curricula

The ET curricula at RIT are rich in theory, practice, and experiential opportunity. Laboratories, projects, and extensive design activities included within a wide variety of course offerings make the programs attractive, and customizable. Maintaining excellence while embracing the opportunity to evaluate and improve programs was the overarching theme of the Engineering Technology semester conversion. Four specific areas of concern come to the forefront:

- Cooperative education is the hallmark of an education in Engineering Technology at RIT. Each student completes five quarters of cooperative educational experiences over the final three years of their five-year academic program. Achieving success in the fast-

paced, high intensity, ten week blocks, interspersing academics and co-op, are perceived a rite of passage within many groups of students. Preserving the integrity of the cooperative education component is perhaps the single most important issue from the student perspective.

- The philosophy of learning by doing through design work, and laboratory experiences is the academic cornerstone of Engineering Technology at RIT. Maintaining extensive opportunities for engineering design and practice is critical to the success of the semester transition.
- The curricula within Engineering Technology at RIT have provided numerous opportunities for long-term projects providing students a vehicle to showcase their achievements. The quarter system affords the opportunity to offer a variety of courses both project-based and more theoretical in nature. Preserving a balance of opportunities, academic rigor, and student choice is an important goal of the transition.
- The Engineering Technology programs have included liberal offerings of night-time courses and laboratories for students to complete a BS degree part-time. Courses are typically offered numerous times per year to accommodate students with rigid work schedules, or students who are out of sequence with the published academic plan.

The Engineering Technology semester conversion teams were dedicated to addressing each of these concerns during the transition process.

Procedural Steps & Timing

The official announcement confirming the transition from quarters to semesters was delivered by RIT's president on February 10, 2010. Immediately, steps were taken to develop and finalize conversion plans and a timeline. A Semester Conversion Director was named, and a budget was established. A steering committee was formed, and appropriate subcommittees were put in place in order to carry out the conversion process. Of significant importance was the creation of the Co-op/Internship/Study Abroad Semester Conversion Committee. This committee was comprised of Academic Chairs, Faculty, the Director of Study Abroad, and the Associate Vice President of Co-op and Career Services. Maintaining the importance of cooperative education, and elevating the importance of study abroad opportunities was clearly paramount in the administrative decision-making process. The Co-op/Internship/Study Abroad Committee created a flexible structure enabling colleges and departments to have significant control over their cooperative education requirements ultimately enhancing student choice^v.

Ultimately, within the organizational structure of the institution, the curricular conversion is owned by the faculty. The colleges, schools, and departments were given guidelines, timelines, and deadlines. Important to note is that in the state of New York, the state Board of Education requires final curriculum review and approval. This time consuming and critical step clearly impacts the overall timeline by approximately one year.

Implementation details of the curricular changes were left to the various academic branches within the institution. In September 2013 RIT would officially be a semester-based institution. An analysis of the entire institutional conversion is beyond the scope of this document. This

section will detail the inner workings of the Engineering Technology conversion process with a focus on the department of Electrical, Computer, and Telecommunications engineering technology (ECTET).

Upon confirmation of the semester conversion decision, the ECTET department formed a semester conversion team consisting of a senior academic advisor and six faculty members including the department chair. All tenure/tenure track faculty ranks were represented on this team. Team composition was critical as enthusiasm, teamwork, and attention to detail were all required in order to meet the strict deadlines of the institution. The charge given to this group was to:

1. Review the existing program curricula and look for improvement opportunities
2. Find and evaluate similar programs at semester-based institutions
3. Create draft semester curriculum plans for the two undergraduate programs
4. Present their findings to the ECTET department

This team began evaluating the system level requirements during the spring of 2010. They evaluated all academic aspects of existing programs, and researched how other semester-based schools throughout the country approached their academic plans. Through diligent and consistent efforts, this group completed the definition of specific curriculum plans for two undergraduate BSET programs during the summer of 2010. They were determined to address each of the most significant concerns as early as possible within the conversion process. Certain risk factors can only be addressed as we get closer to the actual conversion date and fully understand specific student situations. To date, the ECTET semester conversion team has addressed the following:

- Cooperative education will continue to be the cornerstone of the RIT experience. The curriculum plan includes two summers and two semesters of required co-operative educational experiences totaling approximately 50 weeks of work experience. Due to the timing of the student job search, and the large blocks which are appealing to both employers and students, this should be an enhancement over the existing co-op calendar which includes a solitary three-month block.
- Significant hands-on activities through laboratories have been thoroughly maintained in the new semester curriculum plans. A thoughtful combination of stand-alone laboratory courses and lecture/laboratory courses provides a strong blend of the theoretical and practical. In many cases, the laboratory component of courses will be significantly strengthened with the semester transition due to the additional five weeks allocated.
- Within the new curriculum plan, there are extensive opportunities for long-term projects, existing both early in the programs, and as part of capstone sequences. Additionally, a course entitled Design and Innovation has been added in the third year to provide students with a significant long-term project experience prior to their first co-operative educational experience.
- Perhaps the most significant impact of the semester conversion deals with student choice and opportunity. While the overall number of course options for students has

been reduced, the semester conversion team devised a plan to offer students degree options that provide opportunity for extensive depth in core areas. Initially, four-course options in Communications Systems and Audio are planned to be added to the RIT Program Library. Students may choose an option which will be noted on their academic transcript, or elect to choose no specific option, in which case they will have considerable elective choices for additional technical breadth and depth. Additionally, due to the flexibility provided by the Co-op/Internship/Study Abroad subcommittee, students may more easily fit study-abroad or work-abroad opportunities into their experiential education portfolio.

Details of Curricular Conversion

In addition to providing a great opportunity to improve and enhance the curriculum, the process of academic calendar conversion involves significant reworking of course materials and repackaging of course content. At the Rochester Institute of Technology courses were converted from a quarter based model with students typically taking four four-credit courses per quarter (16 credits), to a semester based model with mainly five three-credit courses per semester (15 Credits). In the end, the number of lecture and laboratory contact hours remains remarkably similar between the quarter and semester calendars.

Four categories of courses were established as part of the conversion process: semester equivalent courses, semester replacement courses, new courses, and deleted courses. These classifications assist the registrar in mapping equivalency for students who complete courses under both calendar models. The Electrical Engineering Technology (EET) curriculum is used here as an example to demonstrate the types of courses in each category.

A semester equivalent course, denoted by SE, is defined as a course converted from quarters to semesters without substantial content change. A semester replacement course (SR) is a course that has been modified or repackaged to maintain the majority of content from the original program. This is typically a merger of content from two or more courses.

Table 1 provides examples of several EET courses and how they have been converted as semester replacements or semester equivalents during the conversion process.

Table 1: EET Course Conversion Category Examples

Course Designation	Course Name	QCH	Course Name	SCH
SE	Digital Fundamentals	4	Digital Fundamentals	3
SR	Circuit Theory I and ½ Circuit Theory II	6	DC Circuits	4
SR	½ Circuit Theory II and Circuit Theory III	6	AC Circuits	4
SE	Transmission Lines	4	Transmission Lines	3
N			Design and innovation	3
D	Advanced Electronics	4		

A new course (N) is a newly created course for the semester calendar, and a deleted course (D) is a course that is removed from the curriculum as a result of semester conversion.

The Electrical Engineering Technology curriculum at RIT transitioned from 192 quarter credit hours (QCH) to 128 semester credit hours (SCH). Of the required core courses within the EET program under semesters sixteen were semester equivalents, five semester replacements, one new course, and four deleted courses. Three completely new courses were also created as part of the program options within the EET curriculum.

Of significance is the ratio of laboratory time to lecture time for a given course. In the original quarter-based curriculum, a typical laboratory course consisted of three lecture hours and two laboratory hours accounting for 4 credits over a 10 week period. The result is thirty hours of lecture and twenty hours of laboratory work. A typical course in the new semester model consists of two lecture hours and two laboratory hours over a 15 week period. This results in the same thirty lecture hours, but provides an additional 10 hours of laboratory time. Faculty members view this as a worthwhile opportunity to provide more and more meaningful laboratory exercises and projects to certain areas of the curriculum. Additionally, the addition of five weeks to a given course allows for long-term projects with more scope. Table 2 provides examples of how curriculum content was repackaged in the conversion to semesters.

Table 2: Contact Hours and Credits, Quarters vs. Semesters

Course Name	Quarter			Semester		
	Lecture Hours	Lab Hours	Credits	Lecture Hours	Lab Hours	Credits
Digital Fundamentals	30	20	4	30	30	3
DC Circuits/AC Circuits (multi-course sequence)	120	60	12	90	60	8
Electronics (multi-course sequence)	90	60	12	75	60	7
Signals and Transforms	50	0	4	60	0	4
Communications Electronics	30	20	4	30	30	4

There is somewhat of a content shift inherent in the transition process. This repackaging has enabled the faculty to evaluate specific course content, create new courses, and develop new laboratory exercises. Overall, the quarter technical core content for the EET program under quarters consists of 730 lecture hours and 440 laboratory hours while the proposed semester program consists of 735 lecture hours and 480 laboratory hours.

Summary & Closing Comments

The content of this paper was intended to provide general insights into calendar conversion processes from an institutional perspective, and to provide more specific insights into calendar conversion processes specific to the Engineering Technology community. Discussion began by examining the context by which calendar conversion was undertaken at one academic institution with ET programs, progressed to a consideration of opportunities and risks, addressed points of concern specific to ET programs and curricula, and concluded with a consideration of procedural steps and timing.

As calendar conversion processes continue at RIT with an expected fall 2013 “go live” date, it is clear many more points of interest to the ET community on a national scale will present themselves. These points of interest will come in the form of challenges and difficulties – all of which will require careful thought, planning, and action to effect a successful conversion. Ultimately, time and history will tell the extent to which the conversion was successful and whether or not the conversion produced the desired outcomes. We close this paper with the intent of reporting further to the ET community as details of the conversion processes at RIT become available.

ⁱ Mayberry, K. (2009). *Quarter-to-Semester Calendar Conversion Prepared for President Bill Destler*. Rochester, NY.

ⁱⁱ Mayberry(2009)

ⁱⁱⁱ College of DuPage. (1992). *Academic Calendar Task Force Report to the President*. Glen Ellyn, IL.

^{iv} Mayberry(2009)

^v Co-op/Internship/Study Abroad Committee, RIT (2010). *Recommendations Submitted to Semester Conversion Steering Committee*. Rochester, NY.