Common First-year Engineering Curriculum for the BC Post-Secondary Sector

To implement a common first-year engineering curriculum for all post-secondary institutions in BC.

Such a curriculum could:
• Improve efficiencies at sending institutions.
• Assist smaller institutions in developing an engineering focus, creating opportunities for community engagement and partnerships.
• Improve the student learning environment (e.g. stronger cohort development, student supports).
• Enhance quality reporting for accreditation processes.

Background

The BC Council on Admissions & Transfer (BCCAT) oversees the BC Transfer system, and supports 66 autonomous articulation committees.

Figure 1. Student Mobility in the BC Transfer System*

The BCCAT Engineering Articulation committee consists of:

The Engineers and Geoscientists of BC (EGBC)

6 major research universities in BC

17 public and private sending institutions

A 2016 feasibility study requested by this committee found that, although there exists diversity within the first-year engineering programs offered a different institutions, substantial overlap was found to suggest a sector-wide common first-year curriculum could be developed.

Common Curriculum

<table>
<thead>
<tr>
<th>Common Curriculum Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>CALC I/II</td>
</tr>
<tr>
<td>CHEM I*</td>
</tr>
<tr>
<td>CSCI I</td>
</tr>
<tr>
<td>ENGL I/II</td>
</tr>
<tr>
<td>ENGR I/II</td>
</tr>
<tr>
<td>LALG I</td>
</tr>
<tr>
<td>PHYS I/II</td>
</tr>
</tbody>
</table>

Common First-Year Engineering Curriculum for the BC Post-Secondary Sector

Design Curriculum (ENGR I/II)

Introducing a year-long design curriculum at all post-secondary institutions has been very successful for student learning and community partnerships, while developing the student experience with engineering ethics and the profession. Although packaged as two courses, only the overall learning outcomes are evaluated for this curriculum.

Learning Outcomes:

Engineering Design (ED = 36 hrs)
Engineering Design Process, Stakeholder Engagement, Project Scope, Risks and Hazards, Brainstorming and Creative Tools, Decision Processes, Build/Test Prototypes

Engineering Drawing/CAD (ES = 18 hrs)
Sketching, Isometric/Multi-Dimensional Drawings, CAD (up to and including 3D sketching and exploded views), Producing prototypes with CAD tools

Sustainability (CS = 18 hrs)
Impact of technology on the environment and society, Sustainable vs Traditional Design criteria, Life Cycle Assessment, Case studies

Team Work
Group dynamics theory, models of successful team-building, conflict resolution, giving/receiving feedback

Professionalism/Ethics
CEAB competencies, Code of Ethics, Ethical Conflict Resolution, Case studies

Project Work
Students, working in teams, follow a structured process to design a sophisticated system comprising of multi-disciplinary subsystems. Client-based project

Requirements

1. Instructors for designated engineering courses must have a professional engineering credential
2. Students to complete Workplace Hazardous Materials Information System (WHMIS) training.
3. Encapsulate the first-year engineering curriculum at sending institutions as a recognized credential and aligned to the common engineering curriculum.

AU/Graduate Attributes

In addition to specific skills and knowledge to best prepare students to transfer to second-year and be successful, the proposed common curriculum has a minimum expected delivery of articulation units (AU):

- Math (M) 156
- Natural Science (NS) 201
- Complementary Studies (CS) 96
- Engineering Science (ES) 83
- Engineering Design (ED) 36

And Graduate Attributes #1-10, 12 (all introductory).

These defined minimums are expected to aid receiving institutions during accreditation.

Next Steps

This project describes work undertaken to obtain preliminary agreement by all major receiving institutions in BC on a common, first-year engineering curriculum. Before this curriculum is broadly implemented, steps required include:

- Sign-off by the appropriate governance/administrative bodies at each post secondary institution.
- Curriculum development at primarily sending institutions.
- Improved tracking of student academic success after transition.

Acknowledgement

This work is the result of the active contribution of all BCCAT Engineering Articulation members, past and present, BCCAT, and EGBC.

Specific recognition is due to LillAnne Jackson, Carol Jaeger, and their respective teams at Uvic and UBC-V/0 for their incredible work supporting this project.

Funding has been provided by the BCCAT Transfer Innovation Project (TIP) program.

Project Steering Committee

Brian Dick (VIU) – Project Lead (brian.dick@viu.ca)
Yang Cao (UBC-O) Barbara Rudecki (CNC)
Jennifer Kirkey (Douglas) Elroy Switlishoff (Selkirk)
Margaret Gwyn (UVIC) Tara Todoruk (Columbia)

*Highlights from the Student Transitions Project (Feb-2011)
http://www.bccat.ca/research/tip (Revised: 27 Apr 2018)