

CEAMS – Canadian Engineering Accreditation Management System

A vision document – November 2018.

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Goal:

Build a software system that facilitate the management, measurement, and visualization of the outcomes-based assessment and continuous program improvement for the Canadian Engineering Universities.

Objectives:

The following list describes the objectives that support the above goal.

1. Develop a Web-based application to be used by the Faculties, Instructors, and Administration Staff that helps generate the program/department reports required by the Canadian Engineering Accreditation Board CEAB.
2. Support the process of defining what the student should be able to do at the end of a course or a program that is aligned with the developed curriculum, learning experiences, and environments.
3. Support the process of defining the learning indicators which would demonstrate that students possess the recommended CEAB Graduate Attributes upon graduation.
4. Provide a dynamic and traceable curriculum mapping engine that would link the defined learning objectives, indicators, and student performance.
5. Manage (create, modify, remove) assessment tools per course or per program and automate the data collection process.
6. Provide shared central and local repositories that maintain the results of graduate attribute assessments and enable the process for continuous improvement.
7. Create and manage stakeholder groups, who are involved in decision making for the program improvement, with the ability to document and archive all program-level actions recommended by them.
8. Provide data interpretation and visualization facilities to make meaning and gain insight on students' performance.
9. Manage user profiles and accounts to facilitate the online interactions and encourage the participations among colleagues.
10. Provide secure authentication system to protect the privacy of the students and to guarantee the confidentiality of their data.

System Features:

FEAT1: The system should be available and accessible by the common web browsers running in any computer showing in its main page a welcome message, brief description of the available operations, and an informative dashboard including the semester/year due dates.

- FEAT2:** The system shall provide the ability to define and create programs. One or more online interactive forms should be used to define the program director, program history, and to get answers to the following questions; What does the program do? For whom, and For what benefit?
- FEAT3:** The answers to the previous questions will help document and articulate the purpose of the created program in a form of Program Statement.
- FEAT4:** The system should maintain and manage the CEAB Graduate Attributes. This include:
- GA code
 - GA name
 - GA description
- FEAT5:** The system shall provide the ability to define, develop, and review learning Indicators for each of a pre-defined Graduate Attributes. This include:
- GA code
 - Indicator code (many)
 - Indicator name (many)
- FEAT6:** The system should maintain basic personal information for the program instructors. This includes:
- Instructor number
 - family name
 - first name
 - email address
 - CC member status (Yes/No)
 - Hire date
 - Estimated retirement date
 - L. status (Peng, EIT, ing, ingJr, LL, None)
 - Highest degree
 - Academic rank
- FEAT7:** The system shall provide the ability to define and create undergraduate courses to maintain the detail information about the courses within the program. This should include the following:
- Course number
 - Course title
 - Calendar web link
 - Notes /*to provide explanatory notes on inconsistencies with calendar information (if applicable) */
 - course type (Compulsory, Elective group)
 - K-factor (yes, no)
 - Engineering science AU percentage
 - Engineering design AU percentage
 - Math type (DiffCalc, DiffEq, Discrete, IntCalc, LinAlg, NMeths, Prob, Stats)
 - Math AU percentage
 - Natural science type (Chem, Earth, Life, Phys)
 - Natural science AU percentage

- Complementary studies type (EngEcon, EnvSust, H&S, HumSS, Impacts, OWComm, PEthics)
- Complementary studies AU percentage
- CEAB GA(many)
- GA(many) content level (Introductory I, Intermediate D, Advanced A)
- Academic Credit
- Lectures hours per week
- Lab hours per week
- Tutorial hours per week
- Number of lecture sections
- Number of lab sections
- Number of tutorial sections
- Instructor number (many)
- Is instructor the course contact (yes/no)
- Course learning outcomes (many)
- Lab type (Hands-on, Simulation, Problem, Project, Demo, Other) --This specifies the predominant laboratory experience type for this course/learning activity
- Number of labs -- Specify the total number laboratory experiences for the course/learning activity
- Laboratory safety taught (yes/no) -- Are students instructed in safety issues associated with the laboratory space and the specific learning experience?
- Laboratory safety examined (yes/no) -- Is there verification, testing or checking that students have both received and understood safety issues?
- Required textbook (many and includes author, title, publisher, year) -- required texts only not a reading list
- Course pre-requisites (many)
- Course co-requisites (many)

FEAT8: The system shall provide the Instructor an easy to use form to record the content and skills taught in his/her course and to determine the course learning outcomes indicating which week of the semester these contents are covered. Mainly these learning outcomes are defined in the course outlines.

FEAT9: In determining the course learning outcomes instructors should, in consultation with the program director, indicate the following for each indicator: (this is called a GA curriculum mapping)

- whether indicators are:
 - taught and assessed
 - taught but not assessed
 - not taught and not assessed
 - not taught but assessed
- the level of complexity expected (Introductory, Intermediate, Advanced)

FEAT10: The system shall be exporting the GA curriculum maps to MS Excel file format and/or a print-ready PDF. See table 3.1.1 and 3.1.1a.

- FEAT11:** The system shall be exporting the GA learning level maps to MS Excel file format and/or a print-ready PDF. See table 3.1.1b.
- FEAT12:** The system shall be generating MS Excel file and/or a print-ready PDF for a list of the indicators associated with each attribute together with the learning activities where the indicator has been used to assess performance of students. See table 3.1.2.
- FEAT13:** The system shall be generating the Course Information Sheets (CIS) for the courses created above in MS Excel file format and/or PDF file type.
- FEAT14:** The system shall provide the Instructor the ability to create a set of questions that act as a questions' bank to generate test/exam and as an assessment tools for the specified indicators. These questions can also be imported from MS Excel files. Each question should include the following:
- Question code
 - Question types (single choice, Multiple Choice, True/False, Fill in the blanks, Matching, Ordering, Open Question, Essay)
 - Question text
 - Question options
 - Course number
 - Skill level (introductory, intermediate, or advanced)
 - Question Related images/figures
 - Question frequency -- to set question frequency in exams
 - Question order – added manually or let the system assign it randomly
- FEAT15:** The system shall provide the Instructor an easy to use form to develop the indicator-to-questions mapping, i.e., to determine how the course content with the associated indicators are assessed during the course activities. The following should be recorded in this mapping process:
- Course code
 - Indicator code (many)
 - Question code (many per indicator)
 - Question issue date (many per indicator)
 - Who does answer the question (many students numbers per question)
 - Question grade (many students grade per question) these values will be entered as mentioned in FEAT 17.
- FEAT16:** The system shall provide the Instructor the ability to generate test, exams, quizzes, surveys, etc. and exports them to a print-ready PDF with the course standard exam format, in one or multiple versions.
- FEAT17:** The system shall import the questions results (students grades) from MS excel and/or enter them directly through the system forms. According to the indicator-to-questions mapping made in FEAT 15, the score of course indicators should be determined and scaled onto an integer value from 1 to 4, 1= Unacceptable, 2= Below Expectations, 3= Meets Expectations, 4= Exceeds Expectations. These scores are scaled based on pre-defined course rubrics (see FEAT 18).

- FEAT18:** The system shall provide the Instructor the ability to define grading rubric for indicator associated to his/her course. The system will show a pre-installed rubric template so that the instructor can tone it to fit the specific course contents.
- FEAT19:** The system shall provide statistical reports and/or graphs to help programs committee finding answers to the following questions and be able to know to what extent does the design of the curriculum accomplished what it was intended to be accomplished:
- On which Graduate Attributes is the program focused? i.e., which Attributes/indicators are most often cited as being supported programming? This should be comparable with the program objectives.
 - Where are the focus attributes being best supported? In which courses? In which years? By what instructional methods? Assessed by what means? This should be comparable with the courses learning objectives.
 - Which Graduate Attributes are reported as getting the least attention?
- FEAT20:** The system shall provide statistical reports and/or graphs to help programs committee finding answers to the following questions to know how the students are doing:
- What are the performance distribution of a particular course under a particular indicator, with respect to four different expectation levels of each academic years?
 - How to compare the weighted average performance distribution under a particular indicator for 2nd-year, 3rd-year and 4th-year courses, with respect to four different expectation levels in the same academic year?
 - How to score of the weighted average in a specific academic year?
 - What are the weighted average students performance per year?
 - What are the weighted average students performance per program?
 - How to score of the weighted average percentage per year for the entire program?
 - What percentage of students is reaching target levels of performance?
 - What percentage of students is reaching threshold levels?
 - How congruent are the results of indirect methods (students' self reports, surveys reports, etc.) and direct methods (results on tests, assignments and projects) of assessment?
 - What are the trends?
- FEAT21:** The system shall be able to manage (create and maintain) GA task force or GA committee for the department or the faculty level.
- FEAT22:** The system shall be able to record the GA task force decisions to provide documentary evidence of the ongoing improvement in performance, commitment, strategy, and process that have been recommended, approved, and /or implemented.
- FEAT23:** The system should be able to provide a performance road map or a traceability links that allows the GA task force to follow the students' performance data both forward and backward, from the student's mark in one question to the presentation of the program outcome performance and vice-versa. This capability provides an accurate understanding

of the implications of a proposed change, which help the GA task force make informed curriculum decisions about which proposals to approve.

- FEAT24:** The system should provide an automatic audit trail that records all user level transactions.
- FEAT25:** The system should be able to provide system usages statistics and be able to generate user ranking points based on a dynamic rating points formula, taking into accounts the number of user logins, activity duration, number of courses to manage, number of students per course, etc.
- FEAT26:** The system user must be allowed to change his/her password or ask the system administrator to reset the forgotten password.
- FEAT27:** The system must rely on UWO certified security certificate as a part of enabling HTTPS for its operations.
- FEAT28:** The system is shipped with an administrator account, that is responsible to create custom user roles, defines authorities, assigns permissions, and manage user profiles and accounts. In addition, the system shall provide a customizable reference data module, this includes the lookup tables/code tables data that is used in the application, such as faculty codes, department codes, program codes, gender codes, etc.
- FEAT29:** Although the system presents general information in its landing page that open for public, all information related to students' identities and their performance are protected and controlled by a strong authentication and authorization mechanism.
- FEAT30:** The system administrator must be allowed to reset user passwords and disable or enable the existing user accounts.