Advanced Diploma to Degree Engineering Bridge Agreement

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Table of Contents

2. Executive Summary

A pathway has been developed with the University of Windsor, in partnership with St. Clair College, in which a bridging agreement for Engineering Technology Advanced Diploma graduates from any Ontario College are able to continue their studies into a related University of Windsor Degree program through a single transition semester, versus transition through course-by-course credit transfer. The University of Windsor and St. Clair College of Applied Arts and Technology both agree that the development of a better pathway for engineering programs is critical for our community which has been built on innovation in manufacturing and technology.

The main focus of this final project is between St. Clair College's Mechanical Engineering Technology – Automotive Product Design program and the University of Windsor's Bachelor of Applied Science (B.A.Sc.) – Mechanical Engineering program, however, the methodology is currently being implemented towards Civil and Electrical Engineering programs, as well.

A previous transfer agreement, which has been quite popular, existed between St. Clair College's Mechanical Engineering Technology – Automotive Product Design program and the University of Windsor's B.A.Sc. Mechanical Engineering program which was based on a course-by-course credit transfer agreement. While considering the previous transfer students' high success rate during their studies at the University of Windsor, developing a stronger pathway will not only be more appealing for the engineering technology graduates, it will also be plausible. This course-by-course credit transfer agreement was unique to all transfer students and was based on their performance during their studies at St. Clair College. While the latter is still necessary to ensure that the students transferring into the University of Windsor are equipped with necessary skillset to successfully complete their B.A.Sc., a pathway that is equal to each transfer student has been developed. The course-by-course credit transfer system has created scheduling barriers for the transfer students as well as the institution's program coordinators. Furthermore, the course-by-course credit transfer agreement required the students to study at the University of Windsor for the duration of three years before obtaining their B.A.Sc. The new pathway not only eliminates the unique scheduling for each transfer student, it also decreases their study duration from three to two years.

A summer transition semester, as well as a few minor modifications to existing semesters was made to ensure that the gaps between the two neighbouring institutions' programs are eliminated. The two gaps that need to be addressed when mapping courses for an accredited engineering program in Canada are: program learning outcomes as well as Accreditation Units (AU) required by the Canadian Engineering Accreditation Board (CEAB). The program learning outcomes are necessary to address to ensure that the students entering the University of Windsor are equipped with the necessary skills required to successfully complete their B.A.Sc. The Accreditation Units are necessary to address to ensure that, upon completion of their B.A.Sc., the transfer students are designated with a degree that is accredited by the CEAB; which is necessary for them to obtain their Professional Engineering status in Canada. A methodology has been designed to ensure that the two gaps stated above are thoroughly addressed.

In the initial stages of the analysis, a comparison between the program learning outcomes for St. Clair College's Engineering Technologies and the University of Windsor's B.A.Sc. programs has been made.

Due to the very different learning outcomes between the two institutions, further analysis was necessary to address the learning outcomes: direct-course-comparison. For direct-course-comparison, a thorough analysis of course matching between the University of Windsor's Mechanical Engineering courses, which have some relevant topics to courses offered in St. Clair College's Mechanical Engineering Technology program, has been completed. This analysis is essential for addressing any topics that are neglected in similar courses; these neglected topics are then projected to bridge program, if necessary. Not all learning outcomes need to be addressed for each student, thus, when selecting the learning outcomes and topics for bridge semester, it is important to consider the topics necessary for the students to successfully complete their B.A.Sc.

The Canadian Engineering Accreditation Board requires that all students graduating from an accredited engineering program are exposed to a certain amount of Accreditation Unit (AU) hours in the following subsections: Mathematics, Natural Sciences, Complementary Studies, Engineering Science and Engineering Design. Unlike the learning outcomes, the AU hours must be met by all students. To convert the hours from their studies at St. Clair College, a College Unit (CU) has been developed for the same subsections required for the AU hours. To convert the CU hours to AU hours, a multiplication factor, referred to as the J factor, has been developed. The J factors range from 0.25, 0.5, 0.75 and 1 and are unique to every St Clair College course. The selection of the J factors for each course was obtained via relative difficulty and thorough reviews of the course outlines. Once the J factor was obtained for each college course, it was multiplied by that course's CU hours to obtain the AU hours. After the AU hours were obtained, they were summed up according to their subsections. After the summation, the following subsections needed to be addressed: Mathematics, Natural Science and Complementary Studies; with large gaps existing in Natural Science and Complementary Studies. When developing the bridge semester, both the necessary AU hours as well as learning outcomes were considered.

The summer bridge semester consists of six designed-specific courses as well as five existing courses. Of the six designed-specific courses, two of them are taken over the span of a twelve week semester and the remaining four are taken over the span of six weeks. Furthermore, the previous transfer agreement consisted of two third-year, first-semester courses which also exist in the new transfer agreement. The two twelve-week semester courses are taken in the summer semester along with one existing engineering course and two existing math courses which are normally offered during summer semesters. The four six-week courses are grouped in pairs and selected to replace the time slots associated with the two third-year courses existing in the transfer agreement; which are taken in the fall semester. The two remaining existing courses, which exist in the Physics and Chemistry departments, are required to be completed in the winter semester, when they are normally offered, between the two conventional third- year semesters. The presence of the five existing courses, as well as the six design-specific courses, ensures that the required AU hours, as well as the necessary learning outcomes, are met. The first trial of this bridge agreement will begin in the summer of 2019.

3. Project Purpose and Goals

The University of Windsor and St. Clair College of Applied Arts and Technology both agree that developing a better pathway for engineering programs is critical for our community which has been built on innovation in manufacturing and technology. Both institutions are committed to completing this initiative and an investment from ONCAT would assist in accelerating its development and implementation. The goal for this initiative is to develop a better transition pathway with a unique program for students who have completed an Engineering Technology Advanced Diploma Program at any Ontario College to continue their studies in a related Bachelor of Applied Science (B.A.Sc.) Engineering program at the University of Windsor. Through this partnership with St. Clair College, pathways for Mechanical, Civil, and Electrical Engineering will be explored, with the initial analysis focusing on Mechanical. There is an existing transfer agreement between St. Clair College and the University of Windsor, and it has proven to be quite popular, with approximately twelve students exploring transfer each year, on average. However, the current agreement is based on a course-by-course credit transfer arrangement that is often troublesome for incoming transfer students. The course-by-course credit often poses scheduling challenges, resulting in semesters with only partial course loads, or extra semesters required to reach completion, which in turn leads to extended timelines and additional costs. Additionally, this approach poses difficulties in maintenance to the existing agreement when courses in either curriculum are modified or updated at either institution. The objective is to replace the existing transfer method with a more holistic approach, by developing an extensive one semester bridging semester that prepares the students to directly enter the third year of the University Degree program. It is anticipated that this streamlining will further encourage more college students to extend their studies by providing a less resistive pathway to the degree. The intent is to first develop the pathway for the Mechanical Engineering Degree program, by completing the necessary program analytics through comparison with St. Clair College's Mechanical Engineering Technology program. Once confirmed, the results of the mapping, analytics, and curriculum development will be utilized to complete the same process for the Civil and Electrical Engineering degrees, and the related St. Clair College advanced diploma programs. As all colleges follow structured Vocational Learning Outcomes for their Engineering Technology Advanced Diplomas, it is anticipated that the bridging curriculum developed should be applicable to other college students with similar credentials.

4. Pathway Development

a. Methodology

The Canadian Engineering Accreditation Board (CEAB) requires that all engineering graduates graduating from an accredited engineering program in Canada be exposed to a certain amount of Accreditation Unit (AU) hours under the following subsections: Mathematics, Natural Sciences, Complementary Studies, Engineering Sciences and Engineering Design. It is therefore essential for the development of any new engineering degree transfer agreement to abide by these regulations with no exceptions to attain accreditation; a necessary attainment for engineering graduates to obtain a professional engineering status in Canada. Aside from the required AU, it is also important to close the necessary gaps not covered during the studies at the neighbouring institution to ensure that the necessary learning outcomes are met for the students to successfully complete the remaining courses required to obtain a degree in engineering.

Pre-Accreditation Unit Analysis

Since it is intended that the transfer students, post completion of the bridge semester, enter the third year, it is essential to evaluate the Accreditation Units for the first two years of the engineering degree program. The final additions of these AU hours, in accordance with their subsections, are used as a minimum guideline to follow when closing the gaps between the diploma and degree programs.

Evaluation of Transferable Courses Present in Past Transfer Agreement

It is important to evaluate the previous transferable courses from the course-by-course credit transfer system to identify which courses are not transferable which will also help identify some of the gaps that need to be closed. It is also possible to keep the previous transferable courses in place with no further analysis, since their justification is already present.

Curriculum Matching

There are various similarities in the courses offered between the two neighbouring institutions; which is what makes the development of the new articulation agreement plausible. Of the courses with similarities, curriculum matching can be accomplished. In this step, courses from the degree program and their major topics are tabulated and grouped into certain categories (i.e. thermofluids, engineering mechanics etc.). The degree courses' major topics are then matched with the diploma courses on a topic-by-topic manner. This helps identifying gaps in the course topics for courses that do have similarities. For example, both institutions may have courses that consist of engineering mechanics topics, yet, some of the topics covered in the degree program's engineering mechanics courses may not be covered in the advanced diploma program. The missing topics may then be chosen to be topics covered in the bridge semester.

Development of College Units

College Units (CU) are developed in accordance to the same subsections as the AU: Mathematics, Natural Sciences, Complementary Studies, Engineering Science and Engineering Design. During this step, the AU subsections covered at the diploma program are identified. Also, a paragraph justifying the CU for each course has been completed whether it was via direct course comparison or better judgment after evaluating the course outlines. The CU is calculated in the same manner that the AU is calculated.

Development of the Multiplication (J-Factor)

To convert CU to AU, a multiplication factor referred to as the J-Factor was developed. The J-Factor can range from 0.25, 0.5, 0.75 and 1 and is unique to each diploma course. The J-Factor for each course was selected either based off relative difficulty where direct course comparison applies or via the review of each course's Course Outline. Once all courses' CUs are converted to AUs, they are summed up according to their subsections and compared with the first two years of the degree program. This step provides a general understanding of what AU gaps which need to be closed during the bridge semester prior to the finalized Accreditation Requirements.

Development of the Bridging Courses

By now all of the gaps that need to be closed for Accreditation Units and learning outcomes are identified and the development of the bridging semester can be completed. While designing the bridge semester, compliance with the Accreditation Requirements must be considered.

Accreditation Requirements

The following sections and their definitions were obtained from the 2016 Accreditation Criteria Procedures provided by the Canadian Engineering Accreditation Board:

3.4.2: Minimum curriculum components: An engineering program must include the following minima for each of its components.

- Mathematics: Minimum 195 AU
- Natural Sciences: Minimum 195 AU
- Mathematics and Natural Sciences combined: Minimum 420 AU
- Engineering Science: Minimum 225 AU
- Engineering Design: Minimum 225 AU
- Engineering Science and Engineering Design combined: Minimum 900 AU
- Complementary Studies: Minimum 225 AU
- Laboratory experience and safety procedures instruction

3.4.3: A minimum of 420 AU of a combination of mathematics and natural sciences. Within this combination, each of mathematics and natural sciences must not be less than 195 AU.

3.4.4: A minimum of 900 AU of a combination of engineering science and engineering design: Within this combination, each of Engineering Science and Engineering Design must not be less than 225 AU.

3.4.5: A minimum of 225 AU of complementary studies: Complementary studies include humanities, social sciences, arts, management, engineering economics and communications that complement the technical content of the curriculum.

3.4.6: The program must have a minimum of 1,950 Accreditation units that are at a university level.

3.5.5: Professional status of faculty members: Faculty delivering curriculum content that is engineering science and/or engineering design are expected to be licensed to practise engineering in Canada, preferably in the jurisdiction in which the institution is located. In those jurisdictions where the teaching of engineering is the practice of engineering, they are expected to be licensed in that jurisdiction. To evaluate this criterion, the Accreditation Board will rely on the interpretive statement on licensure expectations and requirements, which is attached as an appendix to this document.

Appendix 3:

6. A minimum of 600 Accreditation Units (AU) of a combination of engineering science and engineering design curriculum content in an engineering program shall be delivered by faculty members holding, or progressing toward, professional engineering licensure as specified in points 1 and 4 above. These are referred to as Specific AU.

All of the requirements above need to be satisfied and shown for accreditation purposes.

b. Program comparison and analysis

Pre-Accreditation Unit Analysis

Pre-Accreditation Unit analysis for the first two years of the Bachelors of Applied Science in Mechanical Engineering at the University of Windsor is shown in Table 1 of the Appendices. This will be used as a minimum guideline to follow when developing the degree completion program in regards to Accreditation Units prior to the Accreditation Requirements.

Evaluation of Transferable Courses Present in Past Transfer Agreement

The following is a list of courses that are transferrable in the course-by-course credit transfer system. These transfer courses may be projected to the new degree completion program if necessary without any further justification or analysis.

1. (62-126) - Linear Algebra
2. (62-140) - Differential Calculus
3. (85-111) - Engineering Mechanics I
4. (85-133) - Engineering & Design
5. (62-141) - Integral Calculus
6. (64-141) - Introductory Physics II
7. (85-120) - Engineering Thermo-fluids
8. (85-219) - Introduction to Engineering Materials
9. (85-230) - Advanced Engineering & Design
10. (85-212) - Thermodynamics I (3rd year)
11. (85-233) - Fluid Mechanics I (3rd year)
12. (94-330) - Automotive Engineering Fundamentals (3rd year-auto)
13. Non-technical elective

As shown in the list above, four courses, including the non-technical elective, are third year level courses. Since the main objective is to allow the transfer students to enter into the third year of the degree program after completing the bridging semester, these courses will either be eliminated from the transfer agreement for either AU or learning outcome reasons, or their timeslots can be replaced by design-specific courses through careful scheduling.

Curriculum Matching

Direct course comparisons between St. Clair College's Mechanical Engineering Technology – Automotive Product Design program and The University of Windsor's Mechanical Engineering Program are shown in Tables 2 through 9 of the Appendices. Subsections include: Drafting, Cad and GD&T, Rigid Body Statics and Dynamics, Thermofluids, Deformable Mechanics, Natural Sciences, Material Sciences, Electrical Circuits and Mathematics. This will help identifying topics needed for the bridging semester. Cells highlighted in red are major topics not covered by the advanced diploma program and text in red are topics not covered.

Development of College Units

After reviewing the course outlines from both, St. Clair College's Mechanical Engineering Technology Automotive Product Design (APD) program and the University of Windsor's Mechanical Engineering program, some St. Clair College APD courses can be directly related to the University of Windsor's Mechanical Engineering courses. For those APD courses that cannot be directly related to The University of Windsor's Mechanical Engineering courses, a thorough review of the course outlines in accordance with the CEAB's accreditation units' definitions is used to classify the courses, respectfully. Furthermore, compliance with the CEAB's regulations in regards to the following sections will be addressed in the latter portion of the report: 3.4.2, 3.4.3, 3.4.4, 3.4.5, 3.4.6, 3.5.5 and Appendix 3 of the 2016 Accreditation Criteria and Procedures. A College Unit (CU) is developed under the subsections that agree to CEAB's Accreditation Units (AU): Mathematics, Natural Sciences, Complementary Studies, Engineering Science and Engineering Design. For conservative purposes, any non-integer CU calculations post multiplication factors are rounded down to the lowest integer. The following is a course-by-course justification for the selection of CUs:

MET 137 (Mechanical Drafting)

- Direct comparison with 06-85-133 (Engineering and Design) which grants 25% to Complementary Studies, 25% to Engineering Science and 50% to Engineering Design. With 15 hours of classroom activity and 30 hours of laboratory/ tutorial activity, the CU count is as follows:
  - 7.5 Complementary Studies
  - 7.5 Engineering Science
  - 15 Engineering Design

MET 139 (PC CAD)

- Direct comparison with 06-85-133 (Engineering and Design) which awards 25% to Complementary Studies, 25% to Engineering Science and 50% to Engineering Design. With 15 hours of classroom activity and 30 hours of laboratory/tutorial activity, the CU count is as follows:
  - 7.5 Complementary Studies
  - 7.5 Engineering Science
  - 15 Engineering Design

MET 181 (Inspection Methods – CMM)

- Inspection Methods provides students with hands on experience using measurement tools such as micrometers, dial gages, vernier calipers and CMM. With emphasis on non-destructive precision measurement, students who've completed MET 181 finish the course with knowledge and hands-on experience with quality control. Students are able to compare finished products with engineering drawings to ensure the working piece is within tolerance and acceptable to move forward on assembly, fabrication or releasing to a customer without any negative feedback. These tools are essential in the Engineering Sciences and Design processes. As a result, 75% of the course-load is granted towards Engineering Science and the remaining 25% towards Engineering Design. With 15 hours of classroom activity and 15 hours of laboratory/tutorial activity, the CU count is as follows:

- 16.9 Engineering Science
- 5.6 Engineering Design

MET 202 (PC CAD II – GD & T)

- Comparison with both, 06-8-133 (Engineering and Design) and 06-85-119 (Technical Communications). The 25% of Engineering Design awarded to 06-85-119 is a result of both, GD & T as well as a design project. Since MET 202 focuses solely on CAD and GD & T, CU's are in accordance with the AU's of 06-85-113. With 45 hours of classroom activity and 0 hours of laboratory/tutorial activity, the CU count is as follows:
  - 11.25 Complementary Studies
  - 11.25 Engineering Science
  - 22.5 Engineering Design

MET 227 (Applied Engineering I)

- Direct comparison is made with 85-111 (Engineering Mechanics I), due to their similar course structure as well as the topics in the course curriculums. 85-111 is awarded 25% towards Natural Science and 75% to Engineering Science. With 45 hours of classroom activity and 15 hours of laboratory/tutorial activity, the CU count is as follows:
  - 13 Natural Science
  - 39 Engineering Science

MET 243 (Analysis of Electrical Circuits)

- "This is an introductory course in dc/ac circuits. Topics include voltage, current, resistance, energy and power. Series/parallel circuits using resistors, capacitors and inductors are analyzed, built, and tested. Basic measuring instruments including multimeters will be used for testing and troubleshooting electric circuits" (as per course description). The course is both, classroom and lab based, which provides the students with both, theoretical and practical hands-on experience. All assignments, tests and labs are with the focus of design analysis. Theory in both, natural science and engineering science is necessary for understanding these concepts and to complete both labs and assignments. 25% is granted towards both, Natural Sciences and Engineering Design with the remaining 50% towards Engineering Sciences. With 15 hours of classroom activity and 30 hours of laboratory/tutorial activity, the CU count is as follows:

- 7.5 Natural Science
- 15 Engineering Science
- 7.5 Engineering Design

MET 248 (Manufacturing Processes & Workshop)

- Manufacturing Processes & Workshop provides students with hands-on experience operating precision tool cutting machines such as drills, mills, lathes and other machines. There's an emphasis on shop-safety that students will carry on throughout their careers. Understanding how parts are placed on machines for manufacturing is an essential tool for any engineer who's responsible for overseeing, releasing or even designing blueprints that are to be released for manufacturing. The tools gained by MET 248 will help graduates with project management to aid machinists in manufacturing parts in a more efficient way by reducing setups, using proper tools and even designing fixtures for manufacturing. 25% of the course-load is granted to Complementary Studies due to the emphasis of workshop safety, 50% for Engineering Science due to the knowledge gained towards manufacturing a working piece and the remaining 25% towards Engineering Design for the knowledge gained that can be related to designing manufacturing blueprints and the understanding of designing efficient manufacturing fixtures for various types of working pieces. With 30 hours of classroom activity and 45 hours of laboratory/tutorial activity, the CU count is as follows:
    - 13 Complementary Studies
    - 26 Engineering Science
    - 13 Engineering Design

MET 317 (Metallurgy)

- The course relates to both, Engineering Materials Fundamentals (06-85-219) as well as Materials and their Properties (06-89-330). MET 317 provides a good, hands on laboratory in which heat treatment, hardness tests as well as other material structure related topics; not unlike the laboratory provided in 89-330. Both courses, (06-85-219) and (06-85-330) award 30% of course-load towards Natural Sciences and the remaining 70% towards Engineering Science. Same will be granted to MET 317. With 30 hours of classroom activity and 15 hours of laboratory/tutorial activity, the CU count is as follows:
    - 11 Natural Science
    - 26 Engineering Science

MET 327 (Applied Engineering II)

- This course closely relates to Dynamics (06-210) which is awarded 25% of the course-load towards Natural Science, 50% awarded to Engineering Science and the remaining 25% towards Engineering Design. A major difference between Dynamics and Applied Engineering

II is that Dynamics has a large design project worth a significant portion of the class marks. As a result, 10% of the CU's awarded from Engineering Design will be directed towards Natural Science and the remaining 15% will be awarded to Engineering Science. CU's for Applied Engineering II will be 35% Natural Science and 65% towards Engineering Science. With 45 hours of classroom activity and 15 hours of laboratory/tutorial activity, the CU count is as follows:

  - 18 Natural Science
  - 34 Engineering Science

MET 328 (CATIA I)

- CATIA I resembles both, Engineering and Design (06-85-113) and Advanced Engineering and Design (06-85-230). Both, (06-85-113) and (06-85-230) award 25% towards Complementary Studies, 25% towards Engineering Science and 50% towards Engineering Design. CATIA I will be granted the same, respectfully. With 15 hours of classroom activity and 30 hours of laboratory/tutorial activity, the CU count is as follows:
  - 7.5 Complementary Studies
  - 7.5 Engineering Science
  - 15 Engineering Design

MET 332 (Driveline & Transmission Design)

- Driveline and Transmission Design exposes students to the research, design and testing of various driveline components. Students will not only know what components are present in automotive drivelines and transmissions but will understand how these components work together to transmit power to a vehicle's wheels. The course also discusses trends in vehicle safety and stability. There is a final project worth 20% of the final grade which encourages students to use Engineering Sciences taught in MET 332 as well as other courses which is then presented orally to a large audience. Due to the orally presented final project as well as the discussion of vehicle safety and stability, 25% of the course-load is in the focus of Complementary Studies, 25% is granted towards Engineering Design and the remaining 50% directed towards Engineering Sciences. With 30 hours of classroom activity and 15 hours of laboratory/tutorial activity, the CU count is as follows:
  - 9.4 Complementary Studies
  - 18.8 Engineering Science
  - 9.4 Engineering Design

MET 430 (Computer Aided Design – CATIA II)

- MET 430 (CATIA II) is a more in-depth CAD course with similar content as that of 06-85-230 (Advanced Engineering & Design). Both courses introduce students to wireframe and surfacing design as well as assembly design to add to their skill sets provided in the pre-requisite courses: MET 328 for St. Clair College and 06-85-113 for the University of Windsor. It can be concluded that students entering the Mechanical Engineering program at the University of Windsor from St. Clair College's APD program are subjected to more rigorous CAD courses than the students who directly enter the Mechanical Engineering program out of secondary high school. Both courses subject the students to a final project in which all skill sets learned in previous CAD courses are necessary to use to obtain an adequate mark. 06-85-230 is a 1 hour lecture 3 hour lab course per week. MET 430 is a course that all hours are credited towards lab hours. 06-85-230 grants 25% towards Complementary studies, 25% Engineering Science and 50% Engineering Design. The same will be granted for MET 430. With 0 hours of classroom activity and 60 hours of laboratory/tutorial activity, the CU count is as follows:

  - 7.5 Complementary Studies
  - 7.5 Engineering Science
  - 15 Engineering Design

MET 438 (Fluid Mechanics)

- Engineering Thermofluids (06-85-120) and Fluid Mechanics I (06-85-233) can be used for direct relation due to the similarities in the course subjects as well as structure. Engineering Thermofluids: 40% Natural Sciences, 60% Engineering Sciences. Fluid Mechanics I: 25% Natural Sciences and 75% Engineering Sciences. MET 438 more closely relates to MET 438 where the APD students are introduced to the basics in their Fluid Power course. 25% Natural Science and 75% Engineering Science will be awarded to MET 438. With 45 hours of classroom activity and 0 hours of laboratory/tutorial activity, the CU count is as follows:
  - 11 Natural Science
  - 33.8 Engineering Science

MET 439 (Strength of Materials)

- Relates to Mechanics of Deformable Bodies (06-85-218). 25% Natural Science, 75% Engineering Sciences. With 45 hours of classroom activity and 15 hours of laboratory/tutorial activity, the CU count is as follows:
  - 13 Natural Science
  - 39 Engineering Science

MET 443 (Suspension & Steering Design)

- This automotive based course introduces students to the processes involved in designing features from the steering wheel and vehicle frame to the contact path. Static and dynamic loading, mass-spring-damper models in the form of differential equations is also introduced as well as many other important topics related to suspension and steering design. On top of learning how the suspension and steering systems work, students attending this course are also responsible for a working CAD model of a vehicle's frame, suspension and steering in which a DMU model is encouraged that resembles a working suspension and steering system for a car that properly complies with appropriate codes. Do to the focus of design in this course as well as an introduction to the sciences involved in designing these suspensions and steering systems, 25% of the course is directed towards Engineering Design and the remaining 75% towards Engineering Sciences. With 15 hours of classroom activity and 30 hours of laboratory/tutorial activity, the CU count is as follows:

  - 22.5 Engineering Science
  - 7.5 Engineering Design

MET 448 (Manufacturing Processes II)

- This program focuses on the applications, economics, forming and recycling of polymers. A group project worth 20% that must be presented at the end of the term as well as the focusing on recycling, economics and forming of polymers exposes students to a sense of project management. As a result of the project management as well as the oral presentation at the end of the semester, 30% of this course will be awarded to Complementary Studies. The remaining 70% is towards Engineering Sciences. With 30 hours of classroom activity and zero hours of laboratory/tutorial activity, the CU count is as follows:
  - 9 Complementary Studies
  - 21 Engineering Science

MET 471 (Fluid Power)

- This course exposes the students to the principles of fluid power, the functions of hydraulic and pneumatic circuit components and the design of fluid circuits for the transmission of fluid power and operation of automated systems. 67% of the course is lab work in which students are required to design fluid circuits on engineering software. 25% of the course is lab assignments; the remaining 75% is tests and the final exam. The tests and exams are heavily focused on design questions. 50% of this course is directed towards Engineering Science and the remaining 50% is towards Engineering Design. With 15 hours of classroom activity and 30 hours of laboratory/tutorial activity, the CU count is as follows:
  - 15 Engineering Science
  - 15 Engineering Design

MET 510 (Jig & Fixture Design)

- This design based course requires the students to design a fixture using CATIA. It exposes the students to the economic benefactors in designing fixtures for manufacturing purposes as well as considering ergonomic factors in regards to the repetitive setups during the manufacturing processes for large scale production. A final exam worth 25% that focuses on jig/fixture design, pre-design analysis, tolerances, safety considerations, material/tool selections as well as economics. 15% of the course marks are for professional evaluation as a three 20% group projects that are presented via written reports and oral presentations. Due to the presence of professionalism, economics and ergonomics and the marks that are directed to those topics, 25% of the course will be granted towards Complementary Studies. 25% is granted to Engineering Science because the students are required to use Engineering Science skillsets in an applied manner to make decisions such as material selections while considering material properties. The remaining 50% of the course will be granted towards Engineering Design, respectfully. With 15 hours of classroom activity and 45 hours of laboratory/tutorial activity, the CU count is as follows:

  - 9 Complementary Studies
  - 9 Engineering Science
  - 18.8 Engineering Design

MET 521 (Thermodynamics)

- This course can be directly compared to Thermodynamics (06-85-212) which awards 25% to Natural Sciences and the remaining 75% towards Engineering Sciences. With 60 hours of classroom activity and zero hours of laboratory/tutorial activity, the CU count is as follows:
  - 15 Natural Science
  - 45 Engineering Science

MET 529 (Brake Design)

- This course requires students to understand Engineering Science topics learned in previous courses and apply via theoretical brake design. On top of industrial standards in regards to brake designing, the course also introduces the management of vehicle energy during braking, tire roadway interface, braking and stopping distances and driver reaction timing. The course has a 20% project on Braking system-sizing and 10% lab activities; the remaining 70% is awarded for tests and the final examination. As a result, 30% of the course is directed towards Engineering Design and the remaining 70% towards Engineering Science. With 30 hours of classroom activity and 15 hours of laboratory/tutorial activity, the CU count is as follows:
  - 26 Engineering Science
  - 11 Engineering Design

MET 541 (Heat Transfer)

- Similar to all other thermofluid courses, 25% is towards Natural Sciences and the remaining 75% is towards Engineering Sciences. With 30 hours of classroom activity and zero hours of laboratory/tutorial activity, the CU count is as follows:
  - 7.5 Engineering Science
  - 22.5 Engineering Science

MET 542 (Mechanics of Mechanisms)

- Some similar topics of 92-210 (Dynamics). No direct relation to one course. Two tests and one final exam worth a total of 65% of the final mark are directed towards analysis and design questions. 20% of the final mark is for lab assignments in a team environment that require the students to solve design/analysis questions. A project worth 15% of the final grade which is also in a team environment related to a design/analysis problem. As a result of the course curriculum, MET 542 will be split evenly between Engineering Science and Engineering Design. With 30 hours of classroom activity and 30 hours of laboratory/tutorial activity, the CU count is as follows:
  - 22.5 Engineering Science
  - 22.5 Engineering Design

MET 543 (Mould Design)

- This course requires students to design a simple two-plate plastic injection mould that meets industry standards. The marking in this course is based on progress of the mould design throughout the term. Using skills from previous CATIA courses, students are able jump directly into the design of the plastic injection mould with short lectures on the purpose, layout and industrial standards of a two-plate plastic injection mould. MET 543 is a heavily based design course with a fraction towards Engineering Sciences. As a result, 25% is granted towards Engineering Sciences and the remaining 75% towards Engineering Design. With 15 hours of classroom activity and 30 hours of laboratory/tutorial activity, the CU count is as follows:
  - 7.5 Engineering Science
  - 22.5 Engineering Design

MET 548 (Engine Design I)

- Introduces the students in the process of designing engines as well as the components present and how they work to help transmit power to the crankshaft. Advanced topics include power transfer from combustion chamber to crankshaft, engine forces and balancing, engine loads affecting component sizing and loads for design of journal bearings as well as many other relevant topics. With the entire course directed to classroom activities, 100% of the course is granted towards Engineering Science. With 45 hours of classroom activity and 0 hours of laboratory/tutorial activity, the CU count is as follows:

  - 45 Engineering Science

MET 623 (Mechanics of Machines & Materials)

- Most topics covered in MET 623 are similar to Stress Analysis I (06-92-311) with a couple (Clutches & Brakes) similar to Machine Design II (06-92-421) as well as an introduction to static and dynamic balancing similar to Machine Dynamics (06-92-323). This course does not subject the students to open ended design problems but does require them to solve theoretical failure analysis problems using proper engineering procedures. As a result, only 25% of the course is granted towards Engineering Design and the remaining 75% towards Engineering Sciences. With 30 hours of classroom activity and 15 hours of laboratory/tutorial activity, the CU count is as follows:
  - 28 Engineering Science
  - 9 Engineering Design

MET 629 (Machine Design)

- MET 629 is similar to both, Design for Failure Prevention (06-92-411) and Machine Design (06-92-421), as far as topics covered. MET 629 requires the students to solve many design problems during tests and assignments using industrial standards. Also, an open ended team oriented design project worth 25% of their final grade is completed by the students. Due to the heavily weighted grade directed to design problems and the project as well as skills needed to execute these problems, 25% is granted towards Engineering Science and the remaining 75% towards Engineering Design. With 20 hours of classroom activity and 25 hours of laboratory/tutorial activity, the CU count is as follows:
  - 8 Engineering Science
  - 24 Engineering Design

MET 637 (Driveline & Transmission Design II)

- Similar to Driveline & Transmission Design I (MET 332) with more emphasis on design and less on vehicle safety, 75% granted towards Engineering Science and the remaining 25% towards Engineering Design. With 30 hours of classroom activity and 15 hours of laboratory/tutorial activity, the CU count is as follows:
  - 28 Engineering Science
  - 9 Engineering Design

MET 648 (Engine Design II)

- A more hands on take to engine design than Engine Design I (MET 548). Students are responsible to not only learn more theory but are responsible for a research project. The research project involves the students grouping in teams of two where they disassemble an engine and set them up on a flow bench to analyse the import heads. Initially the heads have a rough cast iron finish. After the initial test, they're responsible for making a mould of the import heads to closely analyse the surface finish. Students are then responsible for grinding the import heads to a smooth finish, setting them back up on the flow bench and thoroughly analysing the gains achieved from their smooth finish to the original cast iron finish. Unlike Engine Design I, Engine Design II has more emphasis on design and as a result, 25% of the course is granted towards Engineering Design and the remaining 75% towards Engineering Sciences. With 15 hours of classroom activity and 30 hours of laboratory/tutorial activity, the CU count is as follows:
    - 22.5 Engineering Science
    - 7.5 Engineering Design

MET 658 (Finite Element Analysis)

- Similar to Computer Aided Engineering (06-92-459). Students are introduced to ANSYS Workbench as well as ANSYS design modeller and Static Design Modeller. Not unlike 06-92-459, 100% of MET 658 is granted towards Engineering Science. With five hours of classroom activity and 15 hours of laboratory/tutorial activity, the CU count is as follows:
    - 12.5 Engineering science

CHM 161A (Chemistry I)

- Chemistry I is a classroom based chemistry course which introduces the students to the theory of chemistry topics related to engineering applications. 100% of the course granted towards Natural Science. With 45 hours of classroom activity and zero hours of laboratory/tutorial activity, the CU count is as follows:
    - 45 Natural Science

PHY 168 (Physics)

- Introductory physics course which introduces the study of kinematics, forces (2D) and heat transfer to prepare the students with the tools needed to solve problems in later courses. 100% granted towards Natural Sciences. With 30 hours of classroom activity and 15 hours of laboratory/tutorial activity, the CU count is as follows:
    - 37.5 Natural Science

MTH 128 (Technical mathematics I)

- An introductory math course which prepares students for calculus courses. 100% granted towards mathematics. With 75 hours of classroom activity and zero hours of laboratory/tutorial activity, the CU count is as follows:
  - 75 Mathematics

MTH 158 (Geometry)

- A geometry course which prepares students in solving problems in regards to CAD, Mechanics of Mechanisms, and Applied Engineering I. 100% granted towards Mathematics. With 30 hours of classroom activity and zero hours of laboratory/tutorial activity, the CU count is as follows:
  - 30 Mathematics

MTH 203 (Differential Calculus)

- Introduces students to differential calculus. 100% towards Mathematics. With 45 hours of classroom activity and zero hours of laboratory/tutorial activity, the CU count is as follows:
  - 45 Mathematics

MTH 404 (Integral Calculus)

- Introduces students to integral calculus. 100% towards Mathematics. With 45 hours of classroom activity and zero hours of laboratory/tutorial activity, the CU count is as follows:
  - 45 Mathematics

MTH 505 (Linear Algebra)

- Advanced university level Linear Algebra course offered to selected students who are interested in transferring into the university. 100% granted towards Mathematics. With 60 hours of classroom activity and zero hours of laboratory/tutorial activity, the CU count is as follows:
  - 60 Mathematics

MTH 605 (Calculus B)

- Advanced calculus course offered to college students interested in transferring into university. 100% granted towards Mathematics With 60 hours of classroom activity and zero hours of laboratory/tutorial activity, the CU count is as follows:

- 60 Mathematics

MTH 700 (Advanced Calculus)

- Advanced calculus course offered to college students interested in transferring into university. 100% granted towards Mathematics. With 45 hours of classroom activity and zero hours of laboratory/tutorial activity, the CU count is as follows:
  - 45 Mathematics

Development of the Multiplication (J-Factor)

To ensure the St. Clair College's Mechanical Engineering Technology-Automotive Product Design (APD) alumni entering the University of Windsor's Mechanical Engineering are exposed to sufficient Accreditation Units such that, not only is their enrolment justified, they're equipped with the necessary tools required to successfully complete the remaining four semesters as well as the bridging semester and obtain their B.A.Sc. in Mechanical Engineering. A College Unit (CU) has been obtained for each St. Clair College APD course in accordance with the Accreditation Units (AU) required by the Canadian Engineering Accreditation Board under the following subsections: Mathematics, Natural Sciences, Complementary Studies, Engineering Science and Engineering Design. A multiplication factor (J-Factor), not unlike the K-Factor for non-conventional courses, is used to convert CU's to AU's. A unique J-Factor is obtained for each college course to attain an adequate conversion factor. For many APD courses, direct course comparison with University of Windsor's Mechanical Engineering courses is a sufficient method in selecting the J-Factors while considering topics covered as well as relative difficulty. For APD courses that cannot be compared with the University of Windsor's Mechanical Engineering courses, a more thorough justification of the J-Factors is necessary. Depending on the course, four possible J-Factors can be selected: 0.25, 0.5, 0.75 and 1. Furthermore, all courses designated with a J factor of one are compliant with section 3.4.6 (courses taught at a university level). Finally, all non-integer AU's will be rounded down to the closest integer for conservative purposes. After all of the AU found for the advanced diploma courses, further analysis will be implemented under Accreditation Requirements. Compliance with section 3.5.5 will be stated when applicable; All Engineering Science and Engineering Design cells which do not comply with section 3.5.5 are shaded for bookkeeping purposes.

MET 137 (Mechanical Drafting)

- MET 137 can be directly compared to 06-85-133 (Engineering and Design). The relative difficulty as well as topics covered justifies a J-Factor of 1. **This course does not comply with section 3.5.5 of the Accreditation Criteria Procedure 2016.**

	Math	N.S	C.S	E.S	E.D
CU's	0	0	7.5	7.5	15
AU's	0	0	7	7	15

MET 139 (PC-CAD)

- MET 139 can also be compared to 06-85-133 (Engineering and Design) with a J-Factor of 1, as well. **This course does not comply with section 3.5.5 of the Accreditation Criteria Procedure 2016.** The conversion from CU's to AU's are as followed:

	Math	N.S	C.S	E.S	E.D
CU's	0	0	7.5	7.5	15
AU's	0	0	7	7	15

MET 181 (Inspections Methods – CMM)

- There is no direct comparison with MET 181. Students completing this course are exposed to various types of dimensional measurement equipment. The tools gained by completing this course can prove to be essential to the students when practicing engineering. After evaluating the level of difficulty of MET 181, a J-Factor of 0.5 will be enforced. **This course does not comply with section 3.5.5 of the Accreditation Criteria Procedure 2016.** The conversion from CU's to AU's are as followed:

	Math	N.S	C.S	E.S	E.D
CU's	0	0	0	16.9	5.6
AU's	0	0	0	8	2

MET 202 (PC CAD II – GD & T)

- MET 202 can be directly compared to both, 06-85-133 (Engineering and Design) and 06-85-119 (Technical Communications) due to the similar topics as well as difficulty. GD & T is taught in both, 85-133 and 85-119. Not unlike 85-133 and 85-119, students are also exposed to AUTO CAD. MET 202 is a more advanced CAD course than 85-133. As a result, a J-Factor of 1 is enforced. **This course does not comply with section 3.5.5 of the Accreditation Criteria Procedure 2016**. The conversion from CU's to AU's are as followed:

	Math	N.S	C.S	E.S	E.D
CU's	0	0	11.25	11.25	22.5
AU's	0	0	11	11	22

MET 227 (Applied Engineering I)

- Direct comparison is made with 85-111 (Engineering Mechanics I), due to their similar course structure as well as the topics in the course curriculums. Due to the level of difficulty, a J-Factor of 0.75 is enforced. **This course does not comply with section 3.5.5 of the Accreditation Criteria Procedure 2016**.The conversion from CU's to AU's are as followed:

	Math	N.S	C.S	E.S	E.D
CU's	**0**	**13**	**0**	**39**	**0**
AU's	**0**	**9**	**0**	**29**	**0**

MET 243 (Analysis of Electrical Circuits)

- Analysis of Electrical Circuits is in close relation to 85-234 (Electrical and Computing Fundamentals). Students in this class are exposed to a more hands on experience during lab and not unlike 85-234 which uses Pspice for circuit simulations; MET 243 uses Automation Studio / Multism. Students are also exposed to the use of physical electrical equipment. Though the topics covered are not as challenging, the hands-on experience is valuable to the students. As a result, a J-Factor of 0.75 is enforced. **This course does comply with section 3.5.5 and the conversion from CU's to AU's are as followed**:

	Math	N.S	C.S	E.S	E.D
CU's	**0**	**7.5**	**0**	**15**	**7.5**
AU's	**0**	**5**	**0**	**11**	**5**

MET 248 (Manufacturing Processes & Workshop)

- Manufacturing Processes & Workshop provides students with hands-on experience operating precision tool cutting machines such as drills, mills, lathes and other machines; skills which are not present in the University of Windsor's Mechanical Engineering's first two years. This course provides the students with an insight as to how mechanical parts are manufactured and will help them in selecting appropriate datums, and working views necessary for releasing manufacturing prints in a sufficient manner. These skills are also useful for project management in the manufacturing industry. Due to the level of difficulty, a J-Factor of 0.5 is enforced. **This course does not comply with section 3.5.5 of the Accreditation Criteria Procedure 2016**. The conversion from CU's to AU's are as followed:

	Math	N.S	C.S	E.S	E.D
CU's	**0**	**0**	**13**	**26**	**13**
AU's	**0**	**0**	**6**	**13**	**6**

MET 317 (Metallurgy)

- Metallurgy has similar course topics to that of 06-85-219 (Engineering Materials Fundamentals). Valuable hands on laboratories expose students to material properties under certain conditions.

Due to the level of difficulty compared to that of 85-219 as well as the amount of material covered, a J-Factor of 0.75 is enforced. **This course does not comply with section 3.5.5 of the Accreditation Criteria Procedure 2016**. The conversion from CU's to AU's are as followed:

	Math	N.S	C.S	E.S	E.D
CU's	**0**	**11**	**0**	**26**	**0**
AU's	**0**	**8**	**0**	**19**	**0**

MET 327 (Applied Engineering II)

- MET 327 relates to topics covered in 06-210 (Dynamics). Due to the relative difficulty and only a brief introduction to general plane motion in MET327, a J-Factor of 0.5 is enforced. **This course does not comply with section 3.5.5 of the Accreditation Criteria Procedure 2016** .The conversion from CU's to AU's are as followed.

	Math	N.S	C.S	E.S	E.D
CU's	**0**	**18**	**0**	**34**	**0**
AU's	**0**	**9**	**0**	**17**	**0**

MET 328 (CATIA I)

- CATIA I has similar course content to 06-85-113 (Engineering and Design) and 06-85-230 (Advanced Engineering Design). When comparing the relative difficulty of the course, a J-Factor of 1 is enforced, respectfully. **This course does not comply with section 3.5.5 and the conversion from CU's to AU's are as followed**:

	Math	N.S	C.S	E.S	E.D
CU's	**0**	**0**	**7.5**	**7.5**	**15**
AU's	**0**	**0**	**7**	**7**	**15**

MET 332 (Driveline & Transmission Design)

- Unlike any course in the first two years of the Mechanical Engineering program at the University of Windsor, MET 332 introduces driveline components as well as their ability to transmit power from the engine to the wheels. Since there is no relative comparison between any of the Mechanical Engineering courses, a conservative J-Factor of 0.5 is enforced. **This course does comply with section 3.5.5 and the conversion from CU's to AU's are as followed**:

	Math	N.S	C.S	E.S	E.D
CU's	**0**	**0**	**9.4**	**18.8**	**9.4**
AU's	**0**	**0**	**4**	**9**	**4**

MET 430 (Computer Aided Design – CATIA II)

- MET 430 is a more in-depth CAD course than 06-85-230 (Advanced Engineering Design). As a result, a J-Factor of 1 is enforced. **This course does not comply with section 3.5.5 of the Accreditation Criteria Procedure 2016**.

	Math	N.S	C.S	E.S	E.D
CU's	**0**	**0**	**7.5**	**7.5**	**15**
AU's	**0**	**0**	**7**	**7**	**15**

MET 438 (Fluid Mechanics)

- MET 438 can be directly compared to the third year 06-85-233 Fluid Mechanics I. Due to the lack in fluid momentum content and considering the level of difficulty, a J-Factor of 0.75 is enforced. **This course does not comply with section 3.5.5 of the Accreditation Criteria Procedure 2016.** The conversion from CU's to AU's are as followed:

	Math	N.S	C.S	E.S	E.D
CU's	**0**	**11**	**0**	**33.8**	**0**
AU's	**0**	**8**	**0**	**25**	**0**

MET 439 (Strength of Materials)

- Strength of Materials has a direct relation to 06-85-218 (Deformable Bodies). Due to the lack of laboratory activities in MET 439 compared to 06-85-218 while considering relative difficulty, a J-Factor of 0.5 is enforced. **This course does not comply with section 3.5.5 of the Accreditation Criteria Procedure 2016**.The conversion from CU's to AU's are as followed:

	Math	N.S	C.S	E.S	E.D
CU's	**0**	**13**	**0**	**39**	**0**
AU's	**0**	**6**	**0**	**19**	**0**

MET 443 (Suspension & Steering Design)

- No direct comparison between MET 443 and a University of Windsor course. Considering workload as well as a relatively difficult design project, a J-Factor of 0.75 is enforced. **This course does comply with section 3.5.5 and the conversion from CU's to AU's are as followed**:

	Math	N.S	C.S	E.S	E.D
CU's	**0**	**13**	**0**	**22.5**	**7.5**
AU's	**0**	**6**	**0**	**16**	**5**

MET 448 (Manufacturing Processes II)

- Manufacturing Processes II is a polymer based course with emphasis on applications, forming and recycling. Forming of materials is a topic which is lacking in the first two years of the B.A.Sc. and is highly beneficial to those who are exposed to it. As a result, while still considering the difficulty level, a J-Factor of 0.75 is enforced. **This course does not comply with section 3.5.5 of the Accreditation Criteria Procedure 2016**.The conversion from CU's to AU's are as followed:

	Math	N.S	C.S	E.S	E.D
CU's	**0**	**0**	**9**	**21**	**0**
AU's	**0**	**0**	**6**	**15**	**0**

MET 471 (Fluid Power)

- Fluid power is a course that introduces the concepts of fluid power as well as fluid equipment. It is a hands on course in which students are responsible for designing various types of fluid circuits for the transmission of fluid power and automated systems. Do to the level of difficulty as well as the benefits of this course; a J-Factor of 1 is enforced. **This course does comply with section 3.5.5 and the conversion from CU's to AU's are as followed:**

	Math	N.S	C.S	E.S	E.D
CU's	**0**	**0**	**0**	**15**	**15**
AU's	**0**	**0**	**0**	**15**	**15**

MET 510 (Jig & Fixture Design)

- Jig & Fixture Design is a topic that is neglected in the B.A.Sc. Mechanical Engineering program. Students are given a physical mechanical part in which they are required to design a fixture to manufacture this part for mass production while considering minimal setups and the economics in producing this part. This open ended project is a useful exercise for students and in relation to all CAD courses in the first two years of the B.A.Sc. Mechanical Engineering; a J-Factor of 1 is enforced. **This course does not comply with section 3.5.5 of the Accreditation Criteria Procedure 2016.**

	Math	N.S	C.S	E.S	E.D
CU's	**0**	**0**	**9.4**	**9.4**	**18.8**
AU's	**0**	**0**	**9**	**9**	**18**

MET 521 (Thermodynamics)

- This course is a thermodynamic course that covers topics in thermodynamics in a more in-depth manner than that of Engineering Thermofluids (06-85-120). As a result, a J-Factor of 1 is enforced. **This course does not comply with section 3.5.5 of the Accreditation Criteria Procedure 2016.**

	Math	N.S	C.S	E.S	E.D
CU's	**0**	**15**	**0**	**45**	**0**
AU's	**0**	**15**	**0**	**45**	**0**

MET 529 (Brake Design)

- Brake design cannot be compared to any course in the B.A.Sc. Mechanical Engineering program. After considering the relative difficulty to the B.A.Sc. program's first two years, a J-Factor of 0.75 is enforced. **This course does comply with section 3.5.5 and the conversion from CU's to AU's are as followed:**

	Math	N.S	C.S	E.S	E.D
CU's	**0**	**0**	**0**	**26.3**	**11.3**
AU's	**0**	**0**	**0**	**19**	**8**

MET 541 (Heat Transfer)

- MET 541 exposes students to the topics of heat transfer equivalent, in both topics and difficulty, to the heat transfer section in Engineering Thermofluids (06-85-120). As a result, a J-Factor of 1 is enforced. **This course does not comply with section 3.5.5 of the Accreditation Criteria Procedure 2016**.

	Math	N.S	C.S	E.S	E.D
CU's	**0**	**7.5**	**0**	**22.5**	**0**
AU's	**0**	**7**	**0**	**22**	**0**

MET 542 (Mechanics of Mechanisms)

- The topics covered in MET 542 are more advanced than the mechanics courses offered in the first two years of the B.A.Sc. Mechanical Engineering program. As a result, a J-Factor of 1 is enforced. **This course does comply with section 3.5.5 and the conversion from CU's to AU's are as followed:**

	Math	N.S	C.S	E.S	E.D
CU's	**0**	**0**	**0**	**22.5**	**22.5**
AU's	**0**	**0**	**0**	**22**	**22**

MET 543 (Mould Design)

- Mould Design is an advanced CAD course which requires students to design a simple two-plate plastic injection mould that meets industrial standards. Relative to the CAD courses offered in the first two years of the B.A.Sc. Mechanical Engineering, MET 543 is the most advanced. As a result, a J-Factor of 1 is enforced. **This course does not comply with section 3.5.5 of the Accreditation Criteria Procedure 2016**.

	Math	N.S	C.S	E.S	E.D
CU's	**0**	**0**	**0**	**7.5**	**22.5**
AU's	**0**	**0**	**0**	**7**	**22**

MET 548 (Engine Design)

- Engine Design I is a course that introduces the students to the components of engines and their uses. There's no direct relation to that of any course offered in the first two years of the B.A.Sc. Mechanical Engineering program. Considering the difficulty as well as the benefits to a student taking this course who will have a thorough understanding of how engines work, a J-Factor of 0.75 is selected. **This course does comply with section 3.5.5 of the Accreditation Criteria Procedure 2016.**

	Math	N.S	C.S	E.S	E.D
CU's	**0**	**0**	**0**	**45**	**0**
AU's	**0**	**0**	**0**	**33**	**0**

MET 623 (Mechanics of Machines and Materials)

- Topics covered in MET 623 are similar to the third year B.A.Sc. courses 06-92-311 (Stress Analysis I) and 06-92-323 (Machine Dynamics) and the fourth year B.A.Sc. course 06-92-421 (Machine Design II). As a result, the J-Factor selected is 1. **This course does not comply with section 3.5.5 of the Accreditation Criteria Procedure 2016.**

	Math	N.S	C.S	E.S	E.D
CU's	**0**	**0**	**0**	**28**	**9**
AU's	**0**	**0**	**0**	**28**	**9**

MET 629 (Machine Design)

- Topics covered in Machine Design are similar to the fourth year B.A.Sc. courses 06-92-411 (Design for Failure Prevention) and 06-92-421 (Machine Design II) with more emphasis on design projects. A J-Factor of 1 is enforced. **This course does comply with section 3.5.5 and the conversion from CU's to AU's are as followed:**

	Math	N.S	C.S	E.S	E.D
CU's	0	0	0	8	24
AU's	0	0	0	8	24

MET 637 (Driveline & Transmission Design II)

- With more advanced topics than that of MET 332 (Driveline and Transmissions Design I), MET 637 is enforced with a J-Factor of 0.75**. MET 637 does comply with section 3.5.5 and the conversion from CU's to AU's are as followed:**

	Math	N.S	C.S	E.S	E.D
CU's	0	0	0	28	9.4
AU's	0	0	0	21	7

MET 648 (Engine Design II)

- With similar difficulty to that of MET 548 (Engine Design I) but with a more hands on approach, the J-Factor is 0.75. **MET 648 does comply with section 3.5.5 and the conversion from CU's to AU's are as followed:**

	Math	N.S	C.S	E.S	E.D
CU's	0	0	0	22.5	7.5
AU's	0	0	0	16	5

MET 658 (Finite Element Analysis)

- Similar to the latter portion of the B.A.Sc. course 06-92-459 (Computer Aided Design) using ANSYS instead of CATIA, which is more appropriate for industrial applications, a J-Factor of 1 is enforced. **This course does comply with section 3.5.5 of the Accreditation Criteria Procedure 2016**

	Math	N.S	C.S	E.S	E.D
CU's	0	0	0	12.5	0
AU's	0	0	0	12	0

MET 161A (Chemistry I)

- Due to the relative difficulty, topics covered and the lack of laboratory compared to the B.A.Sc. course 03-59-110 (Topics in General Chemistry), a J-Factor of 0.5 is enforced, respectfully. The conversion from CU's to AU's are as followed:

	Math	N.S	C.S	E.S	E.D
CU's	0	45	0	0	0
AU's	0	22	0	0	0

PHY 168 (Physics)

- Due to the Relative difficulty, topics covered and the lack of laboratory activities compared to the B.A.Sc. course, 03-64-141 (Introductory Physics) a J-Factor of 0.5 is selected. The conversion from CU's to AU's are as followed:

	Math	N.S	C.S	E.S	E.D
CU's	0	37.5	0	0	0
AU's	0	18	0	0	0

MTH 128 (Technical Mathematics I)

- A preliminary mathematics course which prepares students for calculus, a J-Factor of 0.25 is selected. The conversion from CU's to AU's are as followed:

	Math	N.S	C.S	E.S	E.D
CU's	75	0	0	0	0
AU's	18	0	0	0	0

MTH 158 (Geometry)

- A preliminary mathematics course which introduces topics in geometry necessary to successfully the latter courses in the APD program, a J-Factor of 0.25 is selected. The conversion from CU's to AU's are as followed:

	Math	N.S	C.S	E.S	E.D
CU's	30	0	0	0	0
AU's	7	0	0	0	0

MTH 203 (Differential Calculus)

- An intermediate math course introducing students to topics in differential calculus, a J-factor of 0.5 is selected. The conversion from CU's to AU's are as followed:

	Math	N.S	C.S	E.S	E.D
CU's	45	0	0	0	0
AU's	22	0	0	0	0

MTH 404 (Integral Calculus)

- An intermediate math course introducing students to topics in integral calculus, a J-factor of 0.5 is selected. The conversion from CU's to AU's are as followed:

	Math	N.S	C.S	E.S	E.D
CU's	45	0	0	0	0
AU's	22	0	0	0	0

MTH 505 (Linear Algebra)

- A university level course covering topics of Linear algebra, a J-Factor of 1 is enforced. The conversion from CU's to AU's are as followed:

	Math	N.S	C.S	E.S	E.D
CU's	60	0	0	0	0
AU's	60	0	0	0	0

MTH 605 (Calculus B)

- A university level course covering topics in advanced calculus, a J-Factor of 1 is enforced. The conversion from CU's to AU's are as followed:

	Math	N.S	C.S	E.S	E.D
CU's	60	0	0	0	0
AU's	60	0	0	0	0

MTH 700 (Advanced Calculus)

- A university level course covering topics in advanced calculus, a J-Factor of 1 is enforced, respectfully. The conversion from CU's to AU's are as followed:

	Math	N.S	C.S	E.S	E.D
CU's	**45**	**0**	**0**	**0**	**0**
AU's	**45**	**0**	**0**	**0**	**0**

The following is a comparison of the converted AU's from the Mechanical Engineering Technology program at St. Clair College and the first two years of the B.A.Sc. Mechanical Engineering program. When developing the bridge semester for the transfer students, both, the necessary accreditation units, at minimum, match the first two years of the B.A.Sc. Mechanical Engineering program's Accreditation Units, as well as topics necessary for students to successfully complete the remaining four semesters are considered.

AU Category	Math	N.S	C.S	E.S	E.D
St. Clair College (MET Program)	234	107	64	477	234
University of Windsor (Mechanical Program)	263	235	144	371	75

As can be concluded from the above comparison, The AU gaps that need to be accommodated are in Math, Natural Science and Complementary Science; with the extremes in Natural Science and Complementary Studies. Furthermore, section 3.5.5 still needs to be considered for the 600 Specific AU as well as the minimum 225 AU for Engineering Science and 225 Engineering Design.

Development of the Bridging Courses

Current transfer agreements exist with the St. Clair College's Mechanical Engineering Technology Automotive Product Design (APD) program and the University of Windsor's Bachelors in Applied Science Mechanical Engineering with the Automotive Option (B.A.Sc.) program. Table 10 in the Appendix shows the current transferable B.A.Sc. mechanical Engineering courses and their corresponding semesters. Table 11 in the Appendix shows the B.A.Sc. Mechanical Engineering courses for the first four semesters and their corresponding semesters that are not present in the current transfer agreement. In addition to the current transfer agreement, a summer bridge semester is to take place in the summer of 2019 which allows the students transferring into the University of Windsor's B.A.Sc. Mechanical Engineering degree program from St. Clair College's APD program to start in the fifth semester of the B.A.Sc. program. As can be seen in Table 2, several third and fourth semester courses need to be accommodated. For many of these courses, students entering the bridging semester have already been exposed to a great deal of the topics covered in the non-transferable courses. To avoid redundancy, as well as making the bridge semester plausible over the span of a twelve week study period, certain topics will be selected from the non-transferable courses and projected to the summer bridging semester. Table 1 contains three transferable courses that are present in the fifth semester of the B.A.Sc. Mechanical Engineering program: Thermodynamics, Fluid Mechanics I and the non-technical elective. The two vacant time slots for Thermodynamics and Fluid Mechanics I will be replaced with designed-specific courses for the transfer students. Since these courses will remain present in the transfer agreement, it is important to count their AU along with the two year evaluation. The previous non-technical elective transfer agreement will be discussed in the latter portion of this report.

Section 3.4 of the Accreditation Criteria and Procedures last revised in 2016 provided by the Canadian Engineering Accreditation Board (CEAB) states that, with no exceptions, each student graduating from an accredited engineering program must be exposed to a certain number of Accreditation Units (AU's) under the following subsections: Mathematics, Natural Sciences, Complementary Studies, Engineering Sciences and Engineering Design. The following is collected from section 3.4.2 (Minimum curriculum components) of the Accreditation Criteria and Procedures which states the minimum required accreditation units for each subsection that all students must be exposed to:

- Mathematics: 195 AU
- Natural Sciences: 195 AU
- Mathematics and Natural Sciences combined: 420 AU
- Engineering Science: 225 AU
- Engineering Design: 225 AU
- Engineering Science and Engineering Design combined: 900 AU
- Complementary Studies: 225AU
- Laboratory experience and safety procedures instruction

Of the combined 900 AU for Engineering Science and Engineering Design, a minimum of 600 AU must be taught by a licensed professional engineer. Of the 600 AU, a minimum of 225 AU must be present in both, the Engineering Science and Engineering Design categories.

While considering the above, a careful evaluation of each APD course to grant an AU count has been completed. The following is an AU comparison of the APD program and the B.A.Sc. Mechanical Engineering program:

AU Category	Math	N.S	C.S	E.S	E.D
St. Clair College (MET Program)	234	107	64	491	239
University of Windsor (Mechanical Program)	263	246	144	405	75

As can be concluded from the above, the APD program lacks in Natural sciences and Complementary studies. Not only do the above AU need to be accommodated during the summer bridge semester, the students entering the 5th semester of the B.A.Sc. Mechanical Engineering program need to be equipped with the necessary skills to successfully complete the remaining two years of the program. The following are proposed course titles, course outlines and their AU counts for the bridging semester:

Engineering Software Fundamentals & Applications (85-261):

A combination of Engineering Software Fundamentals (85-232) & Numerical Analysis for engineering (85-220), this course is a four hour per week course in which two hours is appointed towards lecture hours and the remaining towards laboratory hours. With 85-232 having 100% towards Engineering science and 85-220 having a 50/50 split towards Mathematics and Engineering science, Engineering Software Fundamentals & Applications will have 25% towards Mathematics and 75% towards

Engineering science. Furthermore, this course will be taken over the full 12 week span of the summer transitional semester. The following is the AU for 85-261:

Math	N.S	C.S	E.S	E.D
9	0	0	27	0

Statistics & Electrical Circuits (85-262):

This is a statistics course that provides the students with the appropriate skills necessary for interpreting numerical and experimental engineering data. Similar to the second year university course, Treatment of Experimental Data (85-222), which grants 25% towards both Math and Engineering Design and the remaining 50% towards Engineering Science; Statistics will follow the same trend. This course will span over a six week period with four hours of lecture per week and one hour of tutorial. The remaining six weeks of the semester will cover topics from Electrical & Computing fundamentals which introduce the students to a more advanced electrical circuit's class which requires them to use the fundamentals of linear algebra and calculus while performing the analysis of these circuits. Similar to the topics discussed in Electrical and Computing Fundamentals (85-234) with the exemption of the computing section, Electrical Circuits will grant 35% towards Natural Science and 65% towards Engineering Science, not unlike 85-234. With four hours of lecture and one hour of tutorials for the duration of six weeks, the AU is shown in Table 12. The following is the AU for 85-262:

Math	N.S	C.S	E.S	E.D
6.75	9.45	0	30.4	6.75

Communication & Professional Engineering (85-160):

This course is involves topics between two first year engineering courses: Technical Communication (85-118) & Engineering & the Profession (85-119). The course begins off by introducing the students to professional writing and finishes off with topics relevant to the Engineering Profession. This course is a complementary based course. This course will consist of four hours of lecture per week with 100% granted towards Complementary Studies. The following id the AU for 85-160:

Math	N.S	C.S	E.S	E.D
0	0	48	0	0

Introduction to Globalized Manufacturing & Environmental Science (85-260):

This course introduces the students to the world of manufacturing and covers similar topics to that of Engineering Management and Globalization (91-201). This course is an industrialized type of course and similar to 91-201, 100% of the course will be directed to Complementary Studies. This class is a six week class with four hours of lecture, one hour of lab per week. The remaining six weeks will cover topics similar to the topics to that of Engineering & the Environment (85-250) which will introduce the mechanical engineering students to environmental topics such as sustainability, population dynamics, climate change and energy consumption. Not unlike 85-250, the latter six weeks of this course grants 40% to Natural Science, 25% to Complementary Studies and 35% to Engineering Science. The portion of the course will contain four hours of lecture per week and 2 hours of laboratory. The following is the AU for 85-260:

Math	N.S	C.S	E.S	E.D
0	12	31.5	10.5	0

Topics in General Chemistry (59-110):

During their winter break between semesters 3A and 3B, the transfer students will be required to take the course "Topics in General Chemistry (03-53-110)". With three hours of lecture and three hours of laboratory per week over the span of 12 weeks and 100% granted towards Natural Science. The following is the AU for 59-110:

Math	N.S	C.S	E.S	E.D
0	54	0	0	0

Introductory Physics II (64-141)

In addition to taking Topics in General Chemistry during their winter semester between semesters 3A and 3B, the students will also take Introductory Physics II (64-141). The topics covered in this course are very different to the physics course they take at St. Clair College. The following is the AU for 64-141:

Math	N.S	C.S	E.S	E.D
0	51	0	0	0

Dynamics (92-210)

During their transitioning summer semester, students will take the Dynamics 92-210 course. This is a more advanced dynamics course than the students are exposed to at St. Clair College and is an essential course for all B.A.Sc. mechanical engineering students to partake in. The following is the AU for 92-210:

Math	N.S	C.S	E.S	E.D
0	12	0	24	12

Vector Calculus (62-215)

Since Vector Calculus is already offered in during the summer semester, it is chosen to be a part of the summer transitioning semester. The following is the AU for 62-215:

Math	N.S	C.S	E.S	E.D
42	0	0	0	0

Differential Equations (62-216)

Differential Calculus is also offered in the summer and the transfer students will be required to take this course during their transitioning summer semester as well. The following is the AU for 62-216:

Math	N.S	C.S	E.S	E.D
42	0	0	0	0

Previous Non-technical Elective Agreement:

During their studies at St. Clair College, Mechanical Engineering Technology students are required to complete 3 nontechnical electives. If they maintain a B average in those three courses, previous transfer agreements allowed them a credit towards the mandatory nontechnical elective at the University of Windsor. Since they will not be granted this credit with new transfer agreement, the Complementary AUs will be accounted for, separately. Using a conservative approach by counting three lecture hours per week over the span of 12 weeks, the following AU is shown:

Math	N.S	C.S	E.S	E.D
0	0	36	0	0

After summing up the total AU in accordance with their subsections, the following comparison between the AU is made:

AU Category	Math	N.S	C.S	E.S	E.D
St. Clair College to U of W Agreement	334	245.5	180	582.9	257.75
University of Windsor (Mechanical Program)	263	246	144	405	75

After completing the remaining four semesters in the B.A.Sc. program at the University of Windsor, the transfer students will be above the minimum required AU in all subsections upon graduation. In addition to this evaluation the 600 Specific AU and the minimum 225 AU for Engineering Science and the minimum 225 AU for Engineering Design will be addressed in Accreditation Requirements.

The following contains all the semesters which deviate from the normal semesters taken by the average B.A.Sc. Mechanical Engineering student. All other semesters will remain the same. All courses designated with * are designed specific courses. All courses in italics are two dissimilar courses which split the semester from first to last 6 weeks.

Summer Transitioning Semester:

- 62-215 Vector Calculus
- 62-216 Differential Equations
- 92-210 Dynamics
- 85-261 Engineering Software Fundamentals & Applications*
- 85-160 Communication & Professional Engineering*

Fall Semester 3A:

- 85-313 Engineering Economics
- 92-311 Stress Analysis I
- 92-323 Machine Dynamics
- Nontechnical Elective
- *85-260 Introduction to Globalized Manufacturing & Environmental Science **
- *85-262 Statistics & Electrical Circuits**

Winter Semester between semesters 3A and 3B:

- 59-110 Topics in General Chemistry
- 64-141 Introductory Physics

Even though the transfer students will be required to take the two courses during the Winter Semester, this process will still prove to be highly beneficial to the students since they will receive their B.A.Sc. in Mechanical Engineering over the span of two years as opposed to the usual three year duration post transferring. The course outlines for the designed-specific courses is shown in Tables 12 through 15 in the Appendix.

Accreditation Requirements

The Mechanical Engineering program at the University of Windsor consists of five option programs: Automotive option, Materials option, Environmental option, Aerospace option and General option. Of these options, the General option grants the least AU which are not specified in the subsection categories; the AU can only be counted towards an overall AU count. As a result, using a minimum path approach, the General option will be used in the analysis for the Accreditation Requirements. If the General option AU are satisfactory, all other options will suffice. For the Accreditation Requirements, the following sections from the CEAB's requirements will be recalled and addressed: 3.4.2, 3.4.3, 3.4.4, 3.4.5, 3.4.6 and 3.5.5. In addition to those sections stated, line 6 of Appendix 3 will also be addressed.

The following tables in the appendix are used to justify Accreditation Requirements: Table 16 (AU for St. Clair College's APD Program), Table 17 (AU for Bridging Agreement), Table 18 (AU for the remaining Compulsory Courses) and Table 19 (AU for advanced diploma courses in compliance with section 3.4.6). The total AU for the General option is 246 using the minimum path approach.

3.4.2: Minimum curriculum components: An engineering program must include the following minima for each of its components.

- Mathematics: Minimum 195 AU
- Natural Sciences: Minimum 195 AU
- Mathematics and Natural Sciences combined: Minimum 420 AU
- Engineering Science: Minimum 225 AU
- Engineering Design: Minimum 225 AU
- Engineering Science and Engineering Design combined: Minimum 900 AU
- Complementary Studies: Minimum 225 AU
- Laboratory experience and safety procedures instruction

After summing up the AU in accordance with section 3.4.2 while using Tables 16, 17 and 18, the AU count is as followed:

Math	NS	Math+NS	ES	ED	ED+ED	CS
347.6	**245.5**	**593**	**993**	**432.6**	**1425.9**	**287.1**

All minimum curriculum components are satisfied from the table above.

3.4.3: A minimum of 420 AU of a combination of mathematics and natural sciences. Within this combination, each of mathematics and natural sciences must not be less than 195 AU.

As can be concluded from the above analysis, section 3.4.3 is also satisfied.

3.4.4: A minimum of 900 AU of a combination of engineering science and engineering design: Within this combination, each of Engineering Science and Engineering Design must not be less than 225 AU.

The above analysis shows that section 3.4.4 is satisfied.

3.4.5: A minimum of 225 AU of complementary studies: Complementary studies include humanities, social sciences, arts, management, engineering economics and communications that complement the technical content of the curriculum.

Section 3.4.5 is also satisfied from the above analysis.

3.4.6: The program must have a minimum of 1,950 Accreditation units that are at a university level.

Totaling the AU from Tables 17 through 19 in the Appendix as well as the addition of the 246 AU present in the General option yields a total AU of 2070, thus, section 3.4.6 is satisfied.

3.5.5: Professional status of faculty members: Faculty delivering curriculum content that is engineering science and/or engineering design are expected to be licensed to practise engineering in Canada, preferably in the jurisdiction in which the institution is located. In those jurisdictions where the teaching of engineering is the practice of engineering, they are expected to be licensed in that jurisdiction. To evaluate this criterion, the Accreditation Board will rely on the interpretive statement on licensure expectations and requirements, which is attached as an appendix to this document.

Appendix 3:

6. A minimum of 600 Accreditation Units (AU) of a combination of engineering science and engineering design curriculum content in an engineering program shall be delivered by faculty members holding, or progressing toward, professional engineering licensure as specified in points 1 and 4 above. These are referred to as Specific AU.

Summing the Specific AU from Tables 16 through 18 yields:

ES	ED	ES+ED
698.3	**293.6**	**991.9**

As can be concluded, all accreditation requirements have been assessed and are satisfied.

c. Implementation process and timelines

Prior to implementing the degree completion program of interest, the following approval processes must adhere: review and approval from the Canadian Engineering Accreditation Board to attain accreditation, pre-approval from the Internal Program Development Committee and final approval from the Program Development Committee. The degree completion program has been accepted from the Engineering Departmental Committee. Due to the pending approvals which still need to be made, the Mechanical Engineering articulation agreement is expected to take off for the first time in the spring of 2019.

5. Summary of Pathway Created

Upon completion of the Advanced Diploma in Mechanical Engineering Technology – Automotive Product Design, students who attain the required GPAs in the necessary courses as well as an overall GPA of 3.0 out of 4.0 have the availability to enroll in a degree completion program in which a number of additional courses are required to complete on top of the remaining two years of the B.A.Sc. Mechanical Engineering Program. The students will be able to complete their degree in mechanical engineering over the span of two years.

6. Appendix

Table 1: Pre-Accreditation Unit Analysis

Curriculum Content		263	235	144	371	75
Learning Activity	Learning Activity Description	MATH	NS	CS	ES	ED
59-110	Topics General Chemistry		54			
62-126	Linear Algebra	42				
62-140	Differential Calculus	60				
62-141	Integral Calculus	42				
62-215	Vector Calculus	42				
62-216	Differential Equations	42				
64-141	Introduction to Physics II		51			
85-111	Engineering Mechanics I		12		36	
85-118	Engineering and the Profession			36		
85-119	Technical Communications			27		9
85-120	Engineering Thermofluids		19		29	
85-133	Engineering and Design			14	14	27
85-212	Thermodynamics		11		34	
85-218	Mech. of Deformable Bodies		14		41	
85-219	Engineering Materials Fundamentals		14		34	
85-220	Numerical Analysis for Eng'g	24			24	
85-222	Treatment Experimental Data	11			21	0
85-230	Adv. Engineering and Design			8	8	15
85-232	Engineering Software Fund.				36	
91-321	Manufacturing Process Design		12		24	12
85-234	Electrical & Computing Fund.		17		31	
85-250	Eng'g & the Environment		19	12	17	
91-210	Eng. Management and Globalization			48		
92-210	Dynamics		12		24	12

Table 2: Direct Course Comparison for Drafting, CAD & GD&T

University of Windsor Courses			St Clair College Courses	
Course Code	**Course Name**			
85-133	**Engineering & Design**	**Major Topics**	**Course Code(s)**	**Course Name(s)**
		Engineering Design Process	MET 137	Mechanical Drafting
		Sketching	MET 137	Mechanical Drafting
		Multiviews and Visualization	MET 137	Mechanical Drafting
		Applications involving inclined planes/surfaces	MET 137	Mechanical Drafting
		Applications involving oblique planes/surfaces	MET 137	Mechanical Drafting
		Auxiliary view projection theory	MET 137	Mechanical Drafting
		Multiviews and Auxiliary views	MET 137	Mechanical Drafting
		Axometric projection	MET 137	Mechanical Drafting
		Section views	MET 137	Mechanical Drafting
		Dimensioning practices and symbols	MET 137	Mechanical Drafting
		Engineering design teams	MET 629	Machine Design
		Design Phase 1: Needs Assessment	MET 629	Machine Design
		Design Phase 2: Problem Formulation	MET 629	Machine Design
		Design Phase 3: Abstraction and Synthesis	MET 629	Machine Design
		Design Phase 4: Analysis	MET 629	Machine Design
		Design Phase 5: Implementation	MET 629	Machine Design
		Engineering Reports and Presentations	MET 629	Machine Design
		Laboratory Experience	**Course Code(s)**	**Course Name(s)**
		Freehand Sketching	MET 137	Mechanical Drafting
		Auxiliary views	MET 137	Mechanical Drafting
		Isometric Sketching	MET 137	Mechanical Drafting
		Section views	MET 137	Mechanical Drafting
		Dimensioning	MET 137	Mechanical Drafting
		Teamwork	MET 629	Machine Design
		Design Process / Project Management	MET 629	Machine Design
85-119	**Technincal Communications**	**Major Topics**	**Course Code(s)**	**Course Name(s)**
		Intro to Design and Engineering, Comm. & Interp.	MET 139	PC CAD
		Working in Teams	MET 510	Jig & Fixture Design
		GD&T, CAD standards, Intro to 2D & 3D Representation	MET 202	PC CAD II - GD&T
		Graphical Representaion (symbols)	MET 137	Mechanical Drafting
		Working with Excel Spreadsheets, Charts, Graphs,etc.	MET 529	Brake Design
85-230	**Advanced Engineering & Design**	**Major Topics**	**Course Code(s)**	**Course Name(s)**
		Sketcher Workbench	MET 328	CATIA I
		Part Design Workbench	MET 328	CATIA I
		Assembly Design	MET 430	CAD (CATIA Design II)
		Drafting Workbench	MET 328	CATIA I
		Tolerance Design	MET 202	PC CAD II - GD&T
		Laboratory Experience	**Course Code(s)**	**Course Name(s)**
		Sketcher/Part Design Applications	MET 328	CATIA I
		Part Design Applications	MET 328	CATIA I
		Working Drawings	MET 328	CATIA I
		Assembly Design	MET 430	CAD (CATIA Design II)
		Design Project	MET 543	Mould Design

Table 3: Direct Course Comparison for Rigid Body Statics & Dynamics

University of Windsor Courses			St Clair College Courses	
Course Code	**Course Name**			
85-118	**Engineering Mechanics I**	**Major Topics**	**Course Code(s)**	**Course Name(s)**
		Introduction to Engineering Mechanics	MET 227	Applied Engineering I
		Forces on Particles	MET 438	Fluid Mechanics
		Equilibrium of a Particle	MET 438	Fluid Mechanics
		Moments	MET 227	Applied Engineering I
		Equilibrium of Rigid Bodies	MET 227	Applied Engineering I
		Trusses, Frames and Machines	MET 227	Applied Engineering I
		Friction	MET 227	Applied Engineering I
		Centre of Gravity and Centroid	MET 227	Applied Engineering I
		Tutorials	**Course Code(s)**	**Course Name(s)**
		Forces on Particles - 2D and 3D	MET 438	Fluid Mechanics
		Equilibrium of Forces - 2D & 3D - Scalar & Vector Analysis	MET 227	Applied Engineering I
		Moment of Forces and Torque	MET 227	Applied Engineering I
		Equilibrium of Rigid Bodies & Equivalent Loading	MET 438	Fluid Mechanics
		Analysis and Equilibrium of Trusses, Frames and Machine	MET 227	Applied Engineering I
		Friction	MET 227	Applied Engineering I
		Centre of Gravity, Centre of Mass & Centroids	MET 227	Applied Engineering I
92-210	**Dynamics**	**Major Topics**	**Course Code(s)**	**Course Name(s)**
		Kinematics of Particle (1D,2D & 3D motion) 2D Rigid Body	MET 542	Mechanics of Mechanisms
		Second Moments of Area & Mass of Engineering Structures	MET 327	Applied Engineering II
		Force and Acceleration Methods (Engineering Analysis of particles and Rigid Bodies)	MET 327	Applied Engineering II
		Work and Energy Methods Applied to Engineering Analysis of Structures (P & RB)	MET 327	Applied Engineering II
		Impulse and Momentum Methods Applied to the Engineering Analysis of Structures (P & RB)	MET 327	Applied Engineering II
		Application of the Above Topics in a Team Setting to Design, Analyze and Demonstrate a Trebuchet		

Table 4: Direct Course Comparison for Thermofluids

University of Windsor Courses			St Clair College Courses	
Course Code	**Course Name**			
85-120	**Engineering Thermo-fluids**	**Major Topics**	**Course Code(s)**	**Course Name(s)**
		Units, Temperature, Joule's Law	MET 541	Heat Transfer
		Thermal Expansion, Calorimetry, Phase Change	MET 623	Mechanics of Materials & Machines
		Equations of State, Kinetic Theory of Gases	MET 521	Thermodynamics
		First Law of Thermodynamics, Ideal Gas Processes	MET 521	Thermodynamics
		Specific Heat, Intro to Entropy	MET 521	Thermodynamics
		Entropy, Power Generation & the Environment	MET 521	Thermodynamics
		Laboratory Experience	**Course Code(s)**	**Course Name(s)**
		Ideal Gas Lab	MET 521	Thermodynamics
		Tutorial Problems Based on Lecture Topics	MET 438	Fluid Mechanics
		Bernoulli's Experiment	MET 438	Fluid Mechanics
		Specific Heat	MET 541	Heat Transfer

Table 5: Direct Course Comparison for Deformable Mechanics

University of Windsor Courses			St Clair College Courses	
Course Code	**Course Name**			
85-218	**Mechanics of Deformable Bodies**	**Major Topics**	**Course Code(s)**	**Course Name(s)**
		stress, average shear stress, allowable stress design, deformation, strain, Hooke's law, Poisson ratio	MET 439/MET 658	SoM/FEA
		failure of materials due to creep and fatigue, elastic deformation of axially loaded members	MET 629	Machine Design
		principle of superposition, statically indeterminate axially loaded members	MET 623	MM&M
		thermal stress, torsional deformation of a circular shaft, torsion formula	MET 439	Strength of Materials
		power transmission, angle of twist,	MET 439	Strength of Materials
		statically indeterminate torque-loaded members, shear and moment diagram,	MET 629	Machine Design
		graphical method for constructing shear and moment diagrams	MET 629	Machine Design
		bending deformation of straight members, eccentric axial loading,	MET 439	Strength of Materials
		shear in straight members, the shear formula	MET 439	Strength of Materials
		shear flow in built-up members		
		Laboratory Experience	**Course Code(s)**	**Course Name(s)**
		Tension Test	MET 439	Strength of Materials
		Torsion Test		
		Flexural Stresses in Beams		
		Stress Distribution under Eccentric Load		

Table 6: Direct Course Comparison for Natural Science

University of Windsor Courses			St Clair College Courses	
Course Code	Course Name			
64-141	Introductory Physics II	Major Topics	Course Code(s)	Course Name(s)
		Mechanics	PHY 168	Physics
		Wave and Acoustics		
		Electromagnetism		
		Optics		
		Laboratory Experience	Course Code(s)	Course Name(s)
		Simple Harmonic Motion of a Spring		
		Resonance in an Open Organ Pipe		
		Resistors in Series and Parallel and the RC Circuit	MET 243	Electrical Circuits
		The Prism Spectrometer		
		The Focal Length of Lenses		
		Diffraction and Interference of Light		
59-110	Topics in General Chemistry	Major Topics	Course Code(s)	Course Name(s)
		Atoms, molecules, structure, mass, bonding, periodic table	CHM 161A	Chemistry I
		Molecules, moles, chemical equations, formulae, equations, solutions, the mole concept, quantitative relationships	CHM 161A	Chemistry I
		Stoichiometry	CHM 161A	Chemistry I
		Gases, pressure, the Gas Law, partial pressure, stoichiometry, ideality	CHM 161A	Chemistry I
		Periodic table and atomic structure, nature of light, spectra,	CHM 161A	Chemistry I
		quantum mechanical model, electron configurations, periodic trends	CHM 161A	Chemistry I
		Chemical bonding and structure, ionic and covalent bonds,	CHM 161A	Chemistry I
		electronegativity and polarity, electron inventory, orbital concept, shapes of molecules	CHM 161A	Chemistry I
		Molecules and materials, condensed phases, polymers		
		Energy and chemistry, transformation and conservation, heat capacity, enthalpy, heats of reaction, stoichiometry	CHM 161A	Chemistry I
		Entropy and the Second Law of Thermodynamics, spontaneity,	MET 521	Thermodynamics
		entropy, Second and Third Laws, free energy and reactions	MET 521	Thermodynamics
		Chemical kinetics, rates and rate laws, temperature effects, reaction mechanisms, catalysis		
		resistance to change, solubility equilibria, acid-base equilibria, free-energy relationships		
		Chemical equilibrium, equilibrium constants and concentrations,		
		electrochemical cells, cell potentials, equilibria, batteries, stoichiometry, nuclear chemistry		
		Electrochemistry, oxidation-reduction reactions,		
		Laboratory Experience	Course Code(s)	Course Name(s)
		Lab and safety orientation		
		Precision, accuracy, and density measurements		
		Determination of a chemical formula		
		The synthesis of alum		
		Titration of sodium carbonate		
		Experimental determination of the Gas Law constant		
		The enthalpy of decomposition of H_2O_2		
		Electrochemistry and the Nernst Equation		
		Spectrophotometric phosphate analysis		

Table 7: Direct Course Comparison for Material Science

University of Windsor Courses			St Clair College Courses	
Course Code	Course Name			
85-219	Introduction to Engineering Materials	Major Topics	Course Code(s)	Course Name(s)
		Introduction; Mechanical properties (Tensile testing, hardness)	MET 317	Metallurgy
		Mechanical properties (Continued); Thermal expansion,	MET 317	Metallurgy
		Crystal & amorphous structures; Atomic Arrangement in Metals	MET 317	Metallurgy
		Atomic motion by stress, FCC vs. HCP structures in metals	MET 317	Metallurgy
		, Types of Imperfections (Defects) in Atomic Arrangements	MET 317	Metallurgy
		Importance of Crystal Defects ,	MET 317	Metallurgy
		Strengthening methods (Hall-Petch, solid solutioning), Work hardening & Annealing	MET 317	Metallurgy
		Toughness and Impact energy, Diffusion	MET 317	Metallurgy
		Solidification, Casting	MET 317	Metallurgy
		Phase diagrams	MET 317	Metallurgy
		Phase diagram of steel	MET 317	Metallurgy
		Steels, Corrosion and Fatigue	MET 317	Metallurgy
		Ceramics	MET 317	Metallurgy
		Polymers	MET 448	Manufacturing Processes II
		Polymers, Composites	MET 448	Manufacturing Processes II
		Laboratory Experience	Course Code(s)	Course Name(s)
		Rolling, Hardness testing	MET 317	Metallurgy
		Impact testing	MET 317	Metallurgy
		Microstructural analyses, Diffusion	MET 317	Metallurgy
		Microstructure observation of different types of steels	MET 317	Metallurgy

Table 8: Direct Course Comparison for Electrical Circuits

University of Windsor Courses			St Clair College Courses	
Course Code	Course Name			
85-234	Electrical & Computing Fundamentals	Major Topics	Course Code(s)	Course Name(s)
		Basic Concepts	MET 243	Analysis of Electrical Circuits
		Basic Laws	MET 243	Analysis of Electrical Circuits
		Methods of Analysis	MET 243	Analysis of Electrical Circuits
		Circuit Theorems	MET 243	Analysis of Electrical Circuits
		Operational Amplifiers		
		Capacitors and Inductors	MET 243	Analysis of Electrical Circuits
		Major Topics	Course Code(s)	Course Name(s)
		Matlab and Pspice Tutorials (Computer Simulation)	MET 243	Analysis of Electrical Circuits
		Tutorial Classes	MET 243	Analysis of Electrical Circuits
		Computing Labs (Computer Simulation)	MET 243	Analysis of Electrical Circuits

Table 9: Direct Course Comparison for Mathematics

University of Windsor Courses			St Clair College Courses	
Course Code	Course Name			
62-140	Differential Calculus	Major Topics	Course Code(s)	Course Name(s)
		Limits and Continuity		
		Derivatives	MTH 203	Differential Calculus
		Intermediate Value Theorem		
		Mean Value Theorem		
		Related Rates	MTH 203	Differential Calculus
		Curve Sketching	MTH 203	Differential Calculus
		Optimization Problems	MTH 203	Differential Calculus
		Rieman Sum	MTH 605	Calculus B
62-126	Linear Algebra	Major Topics	Course Code(s)	Course Name(s)
		Systems of Linear Equations & their Applications	MTH 505	Linear Algebra
		Matrices	MTH 505	Linear Algebra
		Determinants	MTH 505	Linear Algebra
		Vector Spaces and Subspaces	MTH 505	Linear Algebra
		Basis and Dimensions of Vectorspaces	MTH 505	Linear Algebra
		Orthoganality, Projection	MTH 505	Linear Algebra
		Linear Transformations	MTH 505	Linear Algebra
		Eigenvalues and Eigenspaces	MTH 505	Linear Algebra
62-141	Integral Calculus	Major Topics	Course Code(s)	Course Name(s)
		Anti-derivatives (indefinite Integral)	MTH 605	Calculus B
		Funamental Theorem of Calculus	MTH 404	Integral Calculus
		Definite Integrals	MTH 404	Integral Calculus
		Applications: Area between curves, Volume	MTH 404	Integral Calculus
		Arc Length , Surface area, Work, Centroid	MTH 404	Integral Calculus
		Series and Sequence	MTH 605	Calculus B
62-215	Vector Calculus	Major Topics	Course Code(s)	Course Name(s)
		Quadratic surfaces		
		Vector and multivariable differential calculus		
		Multiple Integration		
		Line and surface integrals		
62-216	Differential Equations	Major Topics	Course Code(s)	Course Name(s)
		Differential equations	MTH 700	Advanced Calculus
		Initial value problems		
		System of differential equations		
		Laplace Transforms	MTH 700	Advanced Calculus
		Applications in Science and Engineering	MTH 700	Advanced Calculus

Table 10: Current transferable courses

Course	Semester
62-126 Linear Algebra	1st
62-140 Differential Calculus	1st
85-111 Engineering Mechanics I	1st
85-133 Engineering & Design	1st
62-141 Integral Calculus	2nd
64-141 Introductory Physics II	2nd
85-120 Engineering Thermo-fluids	2nd
85-219 Introduction to Engineering Materials	4th
85-230 Advanced Engineering & Design	4th
85-212 Thermodynamics	5th
85-233 Fluid Mechanics I	5th
Nontechnical Elective	5th
94-330 Automotive Engineering Fundamentals	6th

Table 11: Current non-transferable courses

Course	Semester
85-118 Engineering & the Profession	1st
85-119 Technical Communications	2nd
59-110 Topics in General Chemistry	2nd
62-215 Vector Calculus	3rd
85-232 Engineering Software Fundamentals	3rd
85-234 Electrical & Computing Fundamentals	3rd
85-250 Engineering & the Environment	3rd
91-201 Eng. Management & Globalization	3rd
92-210 Dynamics	3rd
62-216 Differential Equations	4th
85-222 Treatment of Experimental Data	4th
85-218 Mechanics of Deformable Bodies	4th
85-220 Numerical Analysis for Engineering	4th

Table 12: Course Outline for 85-261

	Engineering Software Fundamentals & Applications	
Text:	*MATLAB for Engineers (3rd Ed) (ME) Holly Moore; Applied Numerical Methods with MATLAB (3rd Ed) (ANM) Steven C. Chapra*	
Week #	**Course Outline:**	**Text & Chapter Sections**
1	MATLAB Windows, Soliving Problems with MATLAB, Saving your Work, MATLAB Built-in Functions	ME: 1-2
2	Matrices & Plotting	ME: 4-5
3	User-Defined Functions: Creating Function M-Files,Sub-Functions, User-Controlled Input & Output, Graphical Input	ME: 6-7.3
4	Reading & Writing Data from Files, Debugging, Relational Operators, Logical Functions	ME: 7.5-7.6, 8.1-8.3
5	Selection Structures: If, If/Else, Elseif, Switch & Case	ME: 8.1-8.3
6	Transpose, Dot Product, Matrix Inverse, Cross Products, Solutions of Systems of Linear Equations	ME: 10
7	For Loops, While Loops, Midpoint Break Loops,	ME: 9.1-9.4
8	Roots: Bracketing Methods	ANM: 5.1-5.4
9	Roots: Open Methods	ANM: 6.1-6.3, 6.5-6.7
10	Iterative Method, Eigen Values	ANM: 12.1-12.2, 13.1-13.4
11	Linear Regression, General Least Squares and Nonlinear Regression	ANM: 14.3-14.4, 15.1,15.3,15.5
12	Numerical Integration and Differentiation	ANM: 19.1-19.4, 21.1-21.4

Table 13: Course Outline for 85-160

	Communication & Professional Engineering	
Text:	*Making Sense: Engineering & the Technical Sciences (Northey); Engineering your Future (Oakes); Topics from (85-119) & (85-118)*	
Week #	**Course Outline:**	**Chapter Sections**
1	Proper Wrtiting: Intro, Initializing Strategies, Purpose, the Reader, The Question, Structure, Length, Tone, Form, Guidelines	(Northey) Ch. 1
1	Keeping Notes & Doing Research, Writing Summaries & Abstracts	(Northey) Ch. 2-3
2	Writing Lab Reports, Proposals and Project Reports	(Northey) Ch. 4-5
2	Giving Presentations, Writing a Resume, Letter of Application and Cover Letters	(Nothey) Ch. 7, 12
3	Writing for Readabilty: Intro, Clearity, Avoiding Amiguity, Being Concise, Being Convincing, Consistency, Being Objective etc.	(Northey) Ch. 13
3	Common Errors in Grammar and Usage	(Northey) Ch. 14
4	Punctuation & Misused Words & Phrases	(Northey) Ch. 15-16
4	Referencing & Citation Styles	(85-119)
5	Documentation	(Northey) Ch. 9
5	**Midterm Examination**	
6	The History of Engineering	(Oakes) Ch. 1
6	Professional Practice - Professional Engineers Ontario	(85-119)
7	Engineering Majors	(Oakes) Ch. 2
7	Engineering Work Experience	(Oakes) Ch. 21
8	Global & International Engineering; Teamwork	(Oakes) Ch. 5,11
8	Population	(85-118)
9	Future Challenges: Resources	(85-118)
9	Review of World Energy-End of Oil	(85-118)
10	Project Management	(Oakes) Ch. 12
10	Introduction to Engineering Design	(85-119)
11	Ethics & Engineering	(Oakes) Ch. 15
11	Computer Tools for Engineers	(Oakes) Ch. 10
12	Problem Solving	(Oakes) Ch. 8
12	Connections Between Liberal Arts and Engineering	(Oakes) Ch. 22

Table 14: Course Outline for 85-260

	Introduction to Globalized Manufacturing	
Text:	*The Global Manufacturing Revolution by Yoram Koren*	
Week #	**Course Outline:**	**Chapter Sections**
1	Globalization & Manufacturing Paradigms, Manuf. Large Quantities, 1990's, Global Manufacturing Revolution	Ch 1.1-1.4
1	The Manufacturing Paradigm Model, Four Major Paradigms, Paradigm Transistions Over Time	Ch 1.5-1.7
2	Technology-Driven Products, Customer-Driven Products, Competition-Driven Products, Product Inventions, Development & Development Process	Ch 2.1-2.6
2	Mass Production & Lean Manufacturing: Principles, Supply & Demand, Modeling of Mass Production, Lean Production & Principles	Ch 4.1-4.5
3	Intro to Mass Customization, Business Strategies of Mass Customization, Manufaturing System Characteristics	Ch 5.1-5.3
3	Economics of Product Variation, Mathematical Analysis of Mass Customization, Manufacturing Systems	Ch 5.4-6.1
4	Production of Complex Products, State of the Art at the End of the 20th Century, Assembly Systems	Ch 6.2-6.4
4	Life-Cycle Economics, Capacity Planning Strategies, Econonomics of System Configurations, Economics of Buffers, Batch Production, Optimal Cutting Speeds	Ch 7.1-7.6
5	Business Models: Examples, Manufacturing Companies, Competitive Advantage, Strategic Resources, Supply Chains, Business Models, Product Life Cycle	Ch 11.1-11.7
5	IT-Based Enterprise Organizational Structure	Ch 12
6	Enterprise Globalization Strategies	Ch 13
6	The Twenty-first Century Global Manufacturing Enterprise	Ch 14
	Environmental Science	
Text:	**University of Windsor's 85-250 Engineering & The Environment (Wiley)**	
Texts	*Environmental Engineering: Fundamentals, Sustainability, Design, 2nd Ed (Mihelcic); Visualizing the Environment, Canadian Ed. (Berg); Environment 8th Ed. (Raven)*	
Week #	**Course Outline:**	**Book/Sections**
7	Evolution from Environmental Protection to Sustainability, Operationalizing Sustainability, Measuring Susainablity & Policies Driving Green Engineering	Ch1.1-1.4
7	Environtmental Measurments (Units): Mass Concentration, Volume/Volume & Mole/Mole, Partial-Pressure & Mole Volume	Ch 2.1-2.4
8	Mass Balances: Control Volume, Mass Balance eq for a CMFR, Reactor Analysis (CMFR), Batch Reactor	Ch 4.1-4.1.4
8	Energy Balances: Forms of Energy, Conducting an Energy Balance, Impact of Greenhouse Gas Emissions on Earth's Energy Balance	Ch 4.2-4.2.3
9	Population Dynamics: Units of Expression for Population Size, Models of Population Growth	Ch 5.2
9	Environmental Risk: Risk and the Engineer, Risk Perception, Hazardous Waste and Toxic Chemicals, Hazardous Waste, Toxicity	Ch 6.1-6.3.2
10	Pollution Prevention; Engineering Ethics and Risk; Risk Assessment, Hazard Assessment, Dose Response Assessment, Risk Characterization	Ch 6.3.3-6.5.4
10	Global Climate Change: Natural and Enhanced Greenhouse Effect, Causes of the Enhanced Greenhouse Effect, Cooling of the Atmosphere, Effects, Dealing with Global Climate Change	Ch 10
11	Ozone and Ozone Loss in the Stratosphere, Causes of Ozone Depletion, Effects of Ozone Depletion, Recovery of the Ozone Layer	Ch 10 Cont'd
11	Energy Consumption, Coal Oil and Natural Gas, Nuclear Energy	Ch 11
12	Direct Solar Energy, Biomass Energy, Wind Energy, Hydroelectric Energy	Ch 11 Cont'd
12	**Open for project review, presentations or catchup**	

Table 15: Course Outline for 85-262

	Statistics	
Text:	*Elementary Statistics 2nd ed. (Bluman, Mayer)*	
Week #	**Course Outline:**	**Chapter Sections**
1	Introduction: Descriptive & Interferential Statistics- Population, Sample, Types of Variables & Levels of Measurements	Ch 1
1	Organizing Data, Types of Frequency Distributions, Introduction to types of graphs	Ch 2
2	Mean, Median, Mode, Midrange, Skeweness, Variance and Stardard Deviation, Imperical Rule (Grouped and Randomized Data) Standard Scores (Z Score)	Ch 3.1-3.3
2	Percentiles, Exploratory Data Analysis (Boxplots); Intro to Probability, addition rule & Multiplication rule (independent events and depenedent events) Conditional Prob	Ch 3.3-4.3
3	Permutation and Combination rules - Binomial Distribution, Normal Distribution introduction	Ch 4.4, 5.3,6.1
3	Applications of the normal distribution, The central limit theorem (Standard error of the mean), Normal approximation to the Binomial distribution.	Ch 6.2-6.4
4	Confidence intervals and Sample size	Ch 7.1-7.2
4	Hypothesis testing, Z Test for a mean, t-test for a mean, z Test for a Proportion	Ch. 8.1-8.4
5	Hypothesis testing Type I & Type II errors and the power of a test. Testing the difference between two means (t and z Tests)	Ch. 8.6
5	Testing the difference between two means (z and t testing, dependent samples)	Ch 9.1-9.3
6	Testing the difference between proportions & Review	Ch 9.4 and ALL
6	**Examination**	
	Electrical Circuits	
Text:	*Fundamentals of Electrical Circuits, 5th Ed*	
Week #	**Course Outline:**	**Chapter Sections**
7	Introduction, Units, Charge & Current, Voltage, Power & Energy, Circuit Elements,	Ch 1.1-1.6
7	Applications, Ohm's Law, Nodes, Branches & Loops, Kirchhoff's Laws, Series Resistors & Voltage Division, Paralell Risistors & Current Division	Ch. 2.2-2.6
8	Wye-Delta Transformations, Applications, Nodal Analysis w/ without Voltage Sources,	Ch. 2.7-2.8, 3.2-3.3
8	Mesh Analysis, Mesh Analysis with Current Sources, Nodal & Mesh by Inspection	Ch. 3.4-3.6
9	Applications of DC Transistor Circuits, Linearity Property, Superpositon, Source Transformation	Ch. 3.9, 4.2-4.4
9	Thevenin's Theorem, Norton's Theorem, Derivations of Thevenin's Theorem and Norton's Theorem	Ch. 4.5-4.7
10	Maximum Power Theorem, Operational Amplifiers, Ideal Op Amp	Ch. 4.8,5.2-5.3
10	Inverting Amplifier, Noninverting Amplifier, Summing Amplifier	Ch. 5.4-5.6
11	Difference Amplifier, Cascade Op Amp Circuits, Applications	Ch. 5.7-5.8, 5.10
11	Capacitors, Series & Parallel Capacitors, Inductors	Ch. 6.2-6.4
12	Series & Parallel Inductors, Applications	Ch. 6.5-6.6.2
12	**Open to review, examination or catchup**	

Table 16: AU for St. Clair College's APD Program

	AU For St. Clair College APD Program							
	TOTAL NUMBER OF AU					Specific AU		
	234	107	64	477	234	182	95	277
Course Code	MATH	NS	CS	ES	ED	ES	ED	Total
MET 137	0	0	7	7	15	0	0	0
MET 139	0	0	7	7	15	0	0	0
MET 181	0	0	0	8	2	0	0	0
MET 202	0	0	11	11	22	0	0	0
MET 227	0	9	0	29	0	0	0	0
MET 243	0	5	0	11	5	11	5	16
MET 248	0	0	6	13	6	0	0	0
MET 317	0	8	0	19	0	0	0	0
MET 327	0	9	0	17	0	0	0	0
MET 328	0	0	7	7	15	0	0	0
MET 332	0	0	4	9	4	9	4	13
MET 430	0	0	7	7	15	0	0	0
MET 438	0	8	0	25	0	0	0	0
MET 439	0	6	0	19	0	0	0	0
MET 443	0	0	0	16	5	16	5	21
MET 448	0	0	6	15	0	0	0	0
MET 471	0	0	0	15	15	15	15	30
MET 510	0	0	9	9	18	0	0	0
MET 521	0	15	0	45	0	0	0	0
MET 529	0	0	0	19	8	19	8	27
MET 541	0	7	0	22	0	0	0	0
MET 542	0	0	0	22	22	22	22	44
MET 543	0	0	0	7	22	0	0	0
MET 548	0	0	0	33	0	33	0	33
MET 623	0	0	0	28	9	0	0	0
MET 629	0	0	0	8	24	8	24	32
MET 637	0	0	0	21	7	21	7	28
MET 648	0	0	0	16	5	16	5	21
MET 658	0	0	0	12	0	12	0	12
CHM 161A	0	22	0	0	0	0	0	0
PHY 168	0	18	0	0	0	0	0	0
MTH 128	18	0	0	0	0	0	0	0
MTH 158	7	0	0	0	0	0	0	0
MTH 203	22	0	0	0	0	0	0	0
MTH 404	22	0	0	0	0	0	0	0
MTH 505	60	0	0	0	0	0	0	0
MTH 605	60	0	0	0	0	0	0	0
MTH 700	45	0	0	0	0	0	0	0

Table 17: AU for Bridging Agreement

	AU for Bridging Agreement							
	TOTAL NUMBER OF AU					Specific AU		
	100	138	116	92	19	91.9	18.75	110.65
Course Code	Math	NS	CS	ES	ED	ES	ED	Total
85-261	9	0	0	27	0	27	0	27
85-262	6.75	9.45	0	30.4	6.75	30.4	6.75	37.15
85-160	0	0	48	0	0	0	0	0
85-260	0	12	31.5	10.5	0	10.5	0	10.5
59-110	0	54	0	0	0	0	0	0
94-141	0	51	0	0	0	0	0	0
92-210	0	12	0	24	12	24	12	36
62-215	42	0	0	0	0	0	0	0
62-216	42	0	0	0	0	0	0	0
Elective	0	0	36	0	0	0	0	0

Table 18: AU for the remaining Compulsory Courses

	AU for remaining Compulsary Courses							
	TOTAL NUMBER OF AU					Specific AU		
	13.8	0.0	107.6	424.4	179.9	424.4	179.9	604.2
Course Code	MATH	NS	CS	ES	ED	ES	ED	Total
06-85-313	0.0	0.0	46.1	0.0	0.0	0.0	0.0	0.0
06-85-421	0.0	0.0	36.9	0.0	0.0	0.0	0.0	0.0
06-92-311	0.0	0.0	0.0	36.9	12.3	36.9	12.3	49.2
06-92-317	0.0	0.0	0.0	49.2	0.0	49.2	0.0	49.2
06-92-320	0.0	0.0	0.0	49.2	0.0	49.2	0.0	49.2
06-92-321	0.0	0.0	0.0	32.3	10.8	32.3	10.8	43.1
06-92-323	0.0	0.0	0.0	49.2	0.0	49.2	0	49.2
06-92-324	13.8	0.0	0.0	32.3	0.0	32.3	0.0	32.3
06-92-328	0.0	0.0	0.0	49.2	0.0	49.2	0.0	49.2
06-92-400	0.0	0.0	24.6	0.0	73.8	0.0	73.8	73.8
06-92-411	0.0	0.0	0.0	27.7	27.7	27.7	27.7	55.4
06-92-418	0.0	0.0	0.0	27.7	27.7	27.7	27.7	55.4
06-92-421	0.0	0.0	0.0	27.7	27.7	27.7	27.7	55.4
06-92-459	0.0	0.0	0.0	43.1	0.0	43.1	0.0	43.1

Table 19: Advanced Diploma AU in compliance with section 3.4.6

	APD Compiant with 3.4.6				
	TOTAL NUMBER OF AU				
	165	22	48	207	192
Course Code	**MATH**	**NS**	**CS**	**ES**	**ED**
MET 137	0	0	7	7	15
MET 139	0	0	7	7	15
MET 181	0	0	0	0	0
MET 202	0	0	11	11	22
MET 227	0	0	0	0	0
MET 243	0	0	0	0	0
MET 248	0	0	0	0	0
MET 317	0	0	0	0	0
MET 327	0	0	0	0	0
MET 328	0	0	7	7	15
MET 332	0	0	0	0	0
MET 430	0	0	7	7	15
MET 438	0	0	0	0	0
MET 439	0	0	0	0	0
MET 443	0	0	0	0	0
MET 448	0	0	0	0	0
MET 471	0	0	0	15	15
MET 510	0	0	9	9	18
MET 521	0	15	0	45	0
MET 529	0	0	0	0	0
MET 541	0	7	0	22	0
MET 542	0	0	0	22	22
MET 543	0	0	0	7	22
MET 548	0	0	0	0	0
MET 623	0	0	0	28	9
MET 629	0	0	0	8	24
MET 637	0	0	0	0	0
MET 648	0	0	0	0	0
MET 658	0	0	0	12	0
CHM 161A	0	0	0	0	0
PHY 168	0	0	0	0	0
MTH 128	0	0	0	0	0
MTH 158	0	0	0	0	0
MTH 203	0	0	0	0	0
MTH 404	0	0	0	0	0
MTH 505	60	0	0	0	0
MTH 605	60	0	0	0	0
MTH 700	45	0	0	0	0