**Independent Research Project in Science (360-RES-AB)**

**Course Outline (Winter 2025)**

**A. GENERAL INFORMATION**

**Program:** Science (200.B0)

**Course Name:** Independent Research in Science Course

**Number:** 360-RES-AB

**Competency codes:** OOUV - To apply the experimental method in a scientific field.

OOUU - To apply acquired knowledge to one or more subjects in the sciences.

**Ponderation:** 1 - 4 – 3

**Credits**: 2.67

**Prerequisites or Co-requisites:** 101-NYA, 201-NYA, 201-NYB, 201-NYC, 202-NYA, 202-NYB, 203-NYA,

203-NYB, 203-NYC.

**Semester**: Winter 2025

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1. **Introduction:**

This course is a capstone research project course for senior students enrolled in the Science Program. It involves the completion of a research task in a scientific or mathematical setting. It will take place under the guidance of a Research Supervisor, in a CEGEP, University or Industrial setting. Students accepted into the course are assigned to a project, and a corresponding Research Supervisor. They will report to the Research Supervisor for matters concerning the project, and to the Course Coordinator for matters related to progress through the course, as outlined in the series of Student Milestones below.

This course is intended to be taken at a point when most students in the Science Program are giving serious thought to the next stage of their education. Ideally they have begun to ask questions such as: What is fundamental research? Where is it done? Would I be good at it? Do I want to pursue a scientific career? What is involved? Taking this course is intended to provide answers to some of these questions.

This course will culminate in a gala end-of-semester event, a symposium in which student work is highlighted. Possibilities for students to present their work will include a poster or an oral presentation, allowing them to showcase their accomplishments to their peers and to the college community as a whole. The experience gained will be a terrific stepping stone to a university science career while providing a wonderful capstone to a highly successful CEGEP performance.

**Explanation of the Comprehensive Assessment for Students**

One of the requirements for graduation is that students pass a comprehensive assessment to evaluate their overall scientific competency. After completing most of the required science courses for their DEC, students enroll in three option courses. In each of these courses, students extend their core knowledge into an area of their interest. Because these courses are taken near the end of the program and require the students to draw on competencies which they have previously developed, these courses provide an appropriate context in which the Science Program Comprehensive Assessment can occur. A selection of these option courses (see list of science option courses) will include a comprehensive assessment project, and students will be required to enroll in at least one of these selected option courses in order to be assessed. Every student must successfully complete a Science Program Comprehensive Assessment in order to satisfy the requirements for graduation.

The goal of the project is to have the student demonstrate the ability to integrate what they have learned in the completion of a complex scientific task, thereby demonstrating their scientific competency. Over the course of their studies students develop a variety of competencies as identified by the *Ministère de l’Éducation et de l’Enseignement Supérieur*. The project will endeavour to evaluate these competencies to the greatest extent possible within the framework of a single integrated project. The project will have a weighting within the course of at least 10% in all option courses that include a comprehensive assessment.

In each course the project will be defined in such a way that successful completion of the project will demonstrate that the student can learn autonomously, apply what they have learned previously and that they have adopted the attitudes that are useful for scientific work.

This project may involve research of a scientific principle using various sources of information, experimentation, analysis of experimental data which may have been collected by others, or it may be a design project which incorporates scientific principles.

In the course of the students’ investigations, they must demonstrate their understanding of the scientific method, either through its direct application in their experimental work or in their explanation of the experimental work of others.

The project will include a written report in which the student will be required to demonstrate logical reasoning and effective written communication, following the standards of the John Abbott College Science Style Guide. As well, an oral presentation must be included at some stage in order that this aspect of communication can be evaluated.

Many projects will require overcoming problem solving challenges. In some cases the nature of the project will require the use of data-processing technologies. For some projects it will be necessary that the students work as members of a team. Whenever possible, students will be asked to make connections between science, technology and human progress and to demonstrate understanding of the context in which scientific concepts are discovered and developed.

In order to be evaluated in an option course, a student must have completed or have in progress 9 of the 12 science courses. Every student must register for at least one option course in which they are eligible to be evaluated for the Comprehensive Assessment.

Should a student complete all three option courses but fail all attempts at the Comprehensive Assessment, that student will be given the opportunity to complete a comprehensive assessment through an independent project approved and evaluated by a teacher appointed by the Dean. The opportunity to do this will be offered during the January intersession with the project to be completed by the last day of the intersession classes, and once in early June with the project to be submitted by mid-June.

1. **Course Objectives**

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| **Statement of the Competency**  **To apply the experimental method in a scientific field.** (00UV)**.**  **Elements of the Competency**   1. To read and interpret scientific literature 2. To describe and discuss various scientific topics, drawing upon relevant concepts, laws and principles of science. 3. To solve problems using a method proper to science. 4. To apply techniques of experimentation or validation specific to science. 5. To communicate original scientific work. | **Performance Criteria:**   * Proper use of concepts, laws and principles * Rigorous application of concepts, laws and principles * Appropriate use of terminology * Correct representation in a drawing or graph or in mathematical form * Consistency and rigour in problem solving, and justification of the approach used * Observance of the experimental method and, where applicable, the experimental procedure * Justification of the approach used * Assessment of the plausibility of the results |

1. **Evaluation Plan:**

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| Weight | Week | Assignment | Milestone | Elements of the Competency |
| 5% | 1-15 | Mini Progress Reports | 0 | 3,4 |
| 15% | 4 | Research Proposal | I | 1,2 |
| 5% | 7 | Journal Article Summary | II | 1,2 |
| 10% | 12 | Abstract for Symposium | III | 2,3,4,5 |
| 25% | 15 | Research Paper – final presentation | IV | 3,4,5 |
| 40% | Final Exam Period | Research Paper – written | V | 1,2,3,4,5 |

1. Mini Progress Reports will be filled out and submitted each Wednesday at the beginning of class. No preparation is required, but reports may not be submitted at any other time.
2. The grades for each evaluation will be submitted by the Course Coordinator. Milestones I-IV may be evaluated in consultation with the Research Supervisor.
3. The grade from Milestone V will be suggested by the Research Supervisor and submitted by the Course Coordinator.
4. The pass/fail grade for the Comprehensive Assessment will be derived from the grade assigned to the presentation of the student’s research project and participation in the symposium at the end of the semester.
5. The final evaluation in this course is comprised of the Research Paper – written.
6. **Course Content**

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| --- | --- |
| **Specific Performance Criteria**   1. Question and Hypothesis 2. Experiment 3. Analysis 4. Conclusions 5. Presentation | **Intermediate Learning Objectives** *For the items in this list, it is understood that each is preceded by:*  *‘The student is expected to be able ….’*  1.1. To formulate a question of a scientific nature, in a specific discipline of science.  1.2. To formulate a hypothesis of a scientific nature that answers the question.  2.1. To present a research proposal to address the Question and Hypothesis formulated above.  2.2. To design experiments to test the hypothesis, using an array of available resources.  2.3. To perform the experiments, making adjustments as required.  2.4. To gather data from the experiments.  3.1. To analyze the data collected.  3.2. To draw preliminary conclusions based on the analysis regarding further experiments.  4.1. To draw conclusions regarding the hypothesis.  4.2. To answer the original question.  5.1. To bring together all results, analysis and conclusions into a presentation format such as an oral presentation or a poster presentation.  5.2. To participate in a conference that includes all student participants in this course, for the purpose of exchanging ideas and learning objectives.  5.3. To produce a written research paper based on the work performed in the framework of this course. |

1. **Required Text and Course Costs:**
2. There are no required texts and/or materials. Reading will be given by the Research Supervisor.
3. There should be no costs necessarily associated with this course, although several costs may be incurred, such as the cost of transportation to the lab where the work is being done or the cost of materials associated with the preparation of the final presentation.
4. **Bibliography:**

Determined by Research Supervisor.

1. **Instructional Methods:**

The course will be approximately one day per week (~7 hours) spent working on the research project and 1.5 hours per week of class meeting time. Additional homework will consist of the Research Proposal, Journal Article Summary, and the Research Paper (written and presented), although work on these may be done during “research time”.

1. **DEPARTMENTAL POLICIES**

**Course-Specific Policies**

1. Regular attendance is expected for the research component of the course. Each student and their Research Supervisor will come to an agreement on the exact expectations regarding lab time at the beginning of the semester. Failure to meet these expectations may be noted by the Research Supervisor and brought to the attention of the Course Coordinator. In such a case the Course Coordinator may give the student a warning that their attendance is deemed unsatisfactory. In the case where attendance continues for a period of time to be unsatisfactory, the student risks failing the course.
2. All deadlines listed in **Student Milestones** must be respected. Failure to meet these deadlines must be satisfactorily explained to the Course Coordinator or the student risks failing the course.
3. **COLLEGE POLICIES**

The following are components of the John Abbott College Institutional Policy on the Evaluation of Student Achievement (IPESA). The purpose of the IPESA is to provide clear principles and procedures for the evaluation of student achievement. Details of this document can be found at [Policy-7-IPESA.pdf (johnabbott.qc.ca)](https://departments.johnabbott.qc.ca/wp-content/uploads/2017/08/Policy-7-IPESA.pdf)

**Changes to Evaluation Plan in Course Outline** (Article 5.3)**:** Changes require documented unanimous consent from regularly attending students and approval by the department and the program dean.

**Religious Holidays** (Articles 3.2.13 and 4.1.6): Students who wish to observe religious holidays must inform their teacher in writing within the first two weeks of the semester of their intent.

**Graded evaluations (Article 3.1):** Evaluation must be completed within two weeks after the due date or exam/test date, except in extenuating circumstances. Grades must be posted on Gradebook in a timely manner.

**Student Rights and Responsibilities**

(Article 3.2.18): It is the responsibility of students to keep all assessed material returned to them for at least one semester in the event of a grade review. (The deadline for a Grade Review is 4 weeks after the start of the next regular semester.)

(Article 3.3.6): Student have the right to receive graded evaluations, for regular day division courses, within two weeks after the due date or exam/test date, except in extenuating circumstances. A maximum of three (3) weeks may apply in certain circumstances (ex. major essays) if approved by the department and stated on the course outline. For evaluations at the end of the semester/course, the results must be given to the student by the grade submission deadline (see current Academic Calendar).

**Academic Procedure: Academic Integrity, Cheating and Plagiarism** (Article 9.1 and 9.2)

Cheating and plagiarism are unacceptable at John Abbott College. They represent infractions against academic integrity. Students are expected to conduct themselves accordingly and must be responsible for all of their actions.

* **College definition of Cheating:** Cheating means any dishonest or deceptive practice relative to examinations, tests, quizzes, lab assignments, research papers or other forms of evaluation tasks. Cheating includes, but is not restricted to, making use of or being in possession of unauthorized material or devices and/or obtaining or providing unauthorized assistance in writing examinations, papers or any other evaluation task and submitting the same work in more than one course without the teacher’s permission. It is incumbent upon the department through the teacher to ensure students are forewarned about unauthorized material, devices or practices that are not permitted.
* **College definition of Plagiarism:** Plagiarism is a form of cheating. It includes copying or paraphrasing (expressing the ideas of someone else in one’s own words), of another person's work or the use of another person’s work or ideas without acknowledgement of its source. Plagiarism can be from any source including books, magazines, electronic or photographic media or another student's paper or work.