



## Ontario eSecondary School Course Outline 2022-2023

<b>Ministry of Education Course Title:</b> Science, Grade 12, University/College Preparation	
<b>Ministry Course Code:</b> SNC4M	
<b>Course Type:</b> University/College	
<b>Grade:</b> 12	
<b>Credit Value:</b> 1.0	
<b>Prerequisite(s):</b> Grade 10 Science, Academic or any Grade 11 university (U), university/college (M), or college (C) preparation course in the science curriculum.	
<b>Department:</b> Science	
<b>Course developed by:</b> Kiran Sandhar	<b>Date:</b> February 1, 2021
<b>Length:</b> One Semester	<b>Hours:</b> 110
<p>This course has been developed based on the following Ministry documents:</p> <ol style="list-style-type: none"> <li>1. <i>The Ontario Curriculum, Grades 11 and 12: Science, 2008</i></li> <li>2. <i>Growing Success: Assessment, Evaluation, and Reporting in Ontario Schools (2010)</i></li> <li>3. <i>Learning for All (2013)</i></li> </ol>	

## **COURSE DESCRIPTION/RATIONALE**

This course enables students, including those who do not intend to pursue science-related programs at the postsecondary level, to further develop their understanding of science and its technological applications. Students will explore a range of topics, including organic products in everyday life; pathogens and disease; energy alternatives and their impact globally; communications systems; and science and contemporary societal issues. Emphasis will be placed on relating these topics to global issues as well as to daily life, and on developing skills in the areas of experimentation, research, critical thinking, and analysis

## **OVERALL CURRICULUM EXPECTATIONS**

### **Unit 1: Medical Technologies**

By the end of this course, students will:

- assess the impact of medical technologies and therapies, both conventional and alternative, used to diagnose and treat human health conditions;
- investigate the uses of, and analyse the information provided by, a variety of medical technologies;
- demonstrate an understanding of the function and use of a variety of medical technologies and the information they provide about the human body.

### **Unit 2: Pathogens and Disease**

By the end of this course, students will:

- evaluate the impact of scientific and technological knowledge and individual behaviour on the control of pathogens and the prevention of disease;
- investigate the nature and growth of pathogens and the effectiveness of measures intended to prevent their spread;
- demonstrate an understanding of pathogens, the diseases they cause, and ways of controlling their spread

### **Unit 3: Nutritional Science**

By the end of this course, students will:

- assess how personal and societal factors affect eating behaviours, and evaluate the social and economic impact of the use of non-nutrient food additives;
- investigate chemical components of and energy in food, and the processes by which food is digested
- demonstrate an understanding of chemical components of and energy in food, and the processes by which food is digested.

### **Unit 4: Science and Public Health**

By the end of this course, students will:

- assess the impact of scientific research, technological advances, and government initiatives on public health;
- investigate various strategies related to contemporary public health issues;
- demonstrate an understanding of major public health issues, past and present

### **Unit 5: Biotechnology**

By the end of this course, students will:

- analyse a variety of social, ethical, and legal issues related to applications of biotechnology in the health, agricultural, or environmental sector;
- investigate various techniques used in biotechnology and how they are applied in the food industry and the health and agricultural sectors;

- demonstrate an understanding of biological processes related to biotechnology and of applications of biotechnology in the health, agricultural, and environmental sectors.

## COURSE CONTENT

<i>Unit</i>	<i>Length</i>
Unit 1: Medical Technology	17 hours
Unit 2: Pathogens and Disease	26 hours
Unit 3: Nutritional Science	16 hours
Unit 4: Science and Public Health	21 hours
Unit 5: Biotechnology	18 hours
Unit 6: Culminating Project and Final Exam	12 hours

## UNIT DESCRIPTIONS

### UNIT 1: MEDICAL TECHNOLOGY

In this unit, students will explore the positive and negative effects of Medical Technologies can have on society, human health, the economy, and the environment. They will understand the use medical technologies, and the science behind them, can help patients better understand their diagnoses and treatment options

### UNIT 2: PATHOGENS AND DISEASE

In this unit, students will explore appropriate technologies and making informed choices with respect to personal behaviour can limit the spread of pathogens and diseases. They will also be exposed to methods used to control the spread of pathogens and diseases can have both positive and negative effects on human health.

### UNIT 3: NUTRITIONAL SCIENCE

In this unit, students will explore the nutrients and other substances found in foods affect human health and well-being. They will gain an understanding of the role of nutrients and other substances found in foods enables people to make healthy lifestyle choices

### UNIT 4: SCIENCE AND PUBLIC HEALTH

In this unit, students will gain an understanding of threats to public health and help individuals and societies adopt appropriate practices to protect their health and the health of others. They will also explore a global approach to public health that is necessary to help prevent future pandemics.

### UNIT 5: BIOTECHNOLOGY

In this unit, students explore many social, ethical, and legal issues and conflicting interests have to be considered when determining the appropriate uses of biotechnology. They will understand that scientific knowledge helps individuals and society make informed decisions regarding biotechnology.

## TEACHING AND LEARNING STRATEGIES

### The students will experience a variety of activities:

**Video presentations** and technological aids (research) with videos embedded to enrich the course content and clarify concepts and skills being studied. Also the use of online pre-approved quizzes and games to help a student become more familiar with the concepts and skills being studied.

**Diagnostic and review activities** (audio and video taping) can be student-lead or teacher-led to work as a review for students through audio and video made to share among each other to help reinforce the concepts and skills being studied.

**Brainstorming, charts and graphs** are a great way for students to demonstrate their knowledge of subject matter through graphic organizers, pictures, and texts. This is communicated through assignments in Moodle.

### Small Group Activities

The teacher sets up small group activities to provide opportunities for active and oral learning as well as to bolster practical communication and teamwork skills. The teacher plays a critical role during group activities by monitoring group progress as well as answering questions that arise and using questions to assist students in their understanding. In this way, the teacher also facilitates student understanding of effective learning, communication, and team building during group activities.

### The small group activities include the following:

**Practical extension and application of knowledge** is used as an effective learning strategy in this course because it allows the students to read and listen to the texts and stories and reflect back with connections to themselves, other texts and the world. Students are encouraged to share their understandings through work submitted each day, phone conversations about course work, or videoconferencing.

**Oral presentations** in an online environment we have the equipment to have student either live video conference oral presentations, or make videos and submit them for their oral presentations. These oral presentations can be viewed by fellow students (when appropriate) and the teacher. Students can learn from one another, and from their teacher. Such activities include dramatic readings and performances.

**Charts and graphs** are used to present effective learning opportunities of concepts and skills to students who would benefit from visual objects to learn. Every student learns differently, and it is used to help students discover another way to present their information such as graphic organizers, lists, and pictures.

### Individual Activities

The teacher should provide a variety of individual assignments to expand and consolidate the learning that takes place in the whole-class and small group activities. Individual activities allow the teacher to accommodate interests and needs and to assess the progress of individual students. The teacher plays an important role in supporting these activities through the provision of ongoing feedback to the students, both orally and in writing. Teachers are encouraged to include individual activities such as the following in the course:

**Research** is completed in an online environment by teaching the students first about plagiarism rules and giving examples of good sources to use. The students are not only limited to the online search for information, but have resources available by links on the Moodle page of information that has been scanned and uploaded.

**Individual assignments** are worked on at a student's own pace. The teacher can support the student in these activities with ongoing feedback.

**Oral presentations** are facilitated through the use of video conferencing and video recording.

**Practical extension and application of knowledge** helps students develop their own voice, and gives them the ability to make personal connections, and connections to the world throughout their course. Students

are given a variety of reading and viewing texts to give them many chances to apply their new concepts, skills, and knowledge.

**Reading** students are able to read a variety of texts online. The students may print out the reading material to use it to highlight, take notes, and have with them when a computer is not available.

**Written assignments** are used to allow students to develop their skills in writing, comprehension, and communication. With the online format students submit their work, and have a chance to get feedback from the teacher, and submit their best work. This can be demonstrated with reading responses, personal writing, report writing, essay writing, script writing, business and technical writing, and individual research assignments.

**Reflective/Comparative Analysis** for students working in their portfolios, giving them an opportunity for self-reflection on their accomplishments, skills, and concepts learned over the year. This can be accomplished with student and teacher conferences as well.

## ASSESSMENT, EVALUATION, AND REPORTING

**Assessment:** The process of gathering information that accurately reflects how well a student is achieving the identified curriculum expectations. Teachers provide students with descriptive feedback that guides their efforts towards improved performance.

**Evaluation:** Assessment of Learning focuses on Evaluation which is the process of making a judgement about the quality of student work on the basis of established criteria over a limited, reasonable period of time.

**Reporting:** Involves communicating student achievement of the curriculum expectations and Learning Skills and Work Habits in the form of marks and comments as determined by the teacher's use of professional judgement.

## STRATEGIES FOR ASSESSMENT

Assessment practices can nurture students' sense of progress and competency and information instruction. Many diagnostic tools, e.g. checklists and inventories, are used at regular intervals throughout the units to encourage students' understanding of their current status as learners and to provide frequent and timely reviews of their progress. Assessment of student acquisition of listening and talking, reading and viewing and writing skills also occurs regularly through unobtrusive teacher observation and conferencing.

Units conclude with performance tasks, e.g., interviews and from essays that build towards and prepare students for the end-of-course culminating task in Unit Five. Teachers are encouraged to share goals with students early in the course and to connect unit learning experiences frequently and explicitly with big ideas, overall expectations, and performance tasks, i.e. check bricks; teacher-adapted generic rubrics available in many sources, including the *Ontario Secondary School Literacy Course (OSSLC) Profile*, so that they are more task-specific. The teacher might ask: "What does the criteria look like for this particular task?" Or "What does limited effectiveness look like?" The teacher could involve students in the discussion, modification, or creation of rubrics, and teach students to use rubrics as a learning tool that can support the writing process and practice.

## ASSESSMENT ACTIVITIES

- Homework assignments
- Individual conference meetings
- Diagnostic tests and writing tasks
- Completed Templates & Graphic Organizers

- Reflections
- Oral presentations & Active Listening
- Evaluations
- Lab Reports

## EVALUATION

The final grade will be determined as follows:

- Seventy percent of the grade will be based on evaluation conducted throughout the course. This portion of the grade should reflect the student’s most consistent level of achievement throughout the course, although special consideration will be given to more recent evidence of achievement.
- Thirty percent of the grade will be based on a final evaluation administered at or towards the end of the course. This evaluation will be based on evidence from one or a combination of the following: an examination, a performance, an essay, and/or another method of evaluation suitable to the course content. The final evaluation allows the student an opportunity to demonstrate comprehensive achievement of the overall expectations for the course.

(*Growing Success: Assessment, Evaluation and Reporting in Ontario Schools*. Ontario Ministry of Education Publication, 2010 p.41)

<b>Weight</b>	
<b>Course Work</b>	<b>70</b>
Knowledge/Understanding	17.5
Thinking/Inquiry	17.5
Communication	17.5
Application	17.5
<b>Final</b>	<b>30</b>
Exam	20
Culminating Project	10

### TERM WORK EVALUATIONS (70%):

Evaluation Item	Description	Category	Weight Factor (1-10)
Critical Thinking: Research Projects	Research-based projects for each unit based on applications of learned functions to real life problems	K,T,C,A	5-7
Simulations/Live interview evaluations	Live interviews are used to evaluate students through observation and conversation. Students will answer questions on the unit big ideas.	K,T,C,A	2
Unit Assessments(s)	Unit assessments are based on curriculum expectations and cover the entirety of each unit	K,T,C,A	10

## FINAL EVALUATIONS (30%):

Evaluation Item	Description	Category
Final Exam 20%	A final, written examination, covering all curriculum expectations for the course.	K,T,C,A
Culminating Project 10%	A comprehensive project, covering all overall curriculum expectations for the course.	K,T,C,A

## AFL/AAL/AOL Tracking sheet:

### Unit 1: Medical Technology

AAL	AFL	AOL
<b>1.1 Vital Signs</b> <b>1.2 Homeostasis and Hyperthermia</b> <b>1.5 Organ Donation Opt In vs Opt Out</b> <b>1.7 Prosthetics</b> <b>1.8 FNMI Medicine vs Western Medicine</b> <b>1.9 End of Unit Interview</b>	<b>1.2 Diabetes and Obesity</b> <b>1.3 Decoding Cancer</b> <b>1.4 Investigating Blood Virtual Lab</b>	<b>1.6 Evaluating Health Care Devices</b> <b>1.9 Medical Technology Unit Test</b>

### Unit 2: Pathogens and Disease

AAL	AFL	AOL
<b>2.2 Virus Lytic Cycle Gizmo</b> <b>2.3 Gram Stains Virtual Lab</b> <b>2.6 Who Gets The Drug? Ethical Dilemma</b>	<b>2.1 Epidemics, Pandemics, Outbreaks</b> <b>2.3 Virus vs Bacteria Webquest</b> <b>2.4 Primary and Secondary Immune Response</b> <b>2.5 Controlling Bacterial Growth Virtual Lab</b> <b>2.7 Social Media Campaign for Personal Hygiene Practices</b>	<b>2.8 Organizations that Support and Promote Public Health Video</b> <b>2.9 Pathogens Unit Test</b>

### Unit 3: Nutritional Science

AAL	AFL	AOL
<b>3.1 Macromolecules AAL</b> <b>3.4 Additive Investigation AAL</b>	<b>3.2 Digestive System and Enzymes</b> <b>3.3 Nutrient Labelling Assignment</b>	<b>Unit 1-3 Interview</b> <b>3.5 Fad Diet Article Assignment</b>

**Unit 4: Science and Public Health**

AAL	AFL	AOL
4.2 Public Health Media Analysis 4.4 Substance Abuse Case Study 4.5 Climate Change Impact	4.1 History of Vaccines 4.3 Travel Brochure Assignment	4.6 Mental Health and Anti Smoking Campaign Analysis  4.7 Tuberculosis First Nations Action Plan

**Unit 5: Biotechnology**

AAL	AFL	AOL
5.1 Genetic Science Ethics 5.2 RNA Protein Synthesis 5.4 Viruses as Vectors 5.5 DNA Fingerprinting and Gel Electrophoresis 5.6 GMos	5.2 Transcription vs Translation 5.3 Restriction Enzyme AFL 5.7 Genome Editing and CRISPR	Unit 4-5 Interview  5.8 Biotechnology Unit Test

**End of Course: Final Tasks**

<b>AOL (30% of Final Mark)</b>
<b>Culminating Activity (10%): National Geographic Magazine</b>
<b>Final Exam (20%)</b>

## CONSIDERATION FOR PROGRAM PLANNING

### PLANNING PROGRAMS FOR STUDENTS WITH SPECIAL EDUCATION NEEDS

Classroom teachers are the key educators of students who have special education needs. They have a responsibility to help all students learn, and they work collaboratively with special education teachers, where appropriate, to achieve this goal. Special Education Transformation: The Report of the Co-Chairs with the Recommendations of the Working Table on Special Education, 2006 endorses a set of beliefs that should guide program planning for students with special education needs in all disciplines. Those beliefs are as follows: All students can succeed. Universal design and differentiated instruction are effective and interconnected means of meeting the learning or productivity needs of any group of students. Successful instructional practices are founded on evidence-based research, tempered by experience.

### PROGRAM CONSIDERATIONS FOR ENGLISH LANGUAGE LEARNERS

Ontario schools have some of the most multilingual student populations in the world. The first language of approximately 20 percent of the students in Ontario’s English language schools is a language other than English. Ontario’s linguistic heritage includes several Aboriginal languages; many African, Asian, and European languages; and some varieties of English, such as Jamaican Creole. Many English language learners were born in Canada and raised in families and communities in which languages other than English were spoken, or in which the variety of English spoken differed significantly from the English of Ontario classrooms. Other English language learners arrive in Ontario as newcomers from other countries; they may have experience of highly sophisticated educational systems, or they may have come from regions where



access to formal schooling was limited. When they start school in Ontario, many of these students are entering a new linguistic and cultural environment.

### THE ROLE OF TECHNOLOGY IN THE PROGRAM

Information and communications technologies (ICT) provide a range of tools that can significantly extend and enrich teachers' instructional strategies and support students' language learning. ICT tools include multimedia resources, databases, Internet websites, digital cameras, and word-processing programs. Tools such as these can help students to collect, organize, and sort the data they gather and to write, edit, and present reports on their findings. Information and communications technologies can also be used to connect students to other schools, at home and abroad, and to bring the global community into the local classroom. Whenever appropriate, therefore, students should be encouraged to use ICT to support and communicate their learning.

### ACCOMMODATIONS

Accommodations will be based on meeting with parents, teachers, administration and external educational assessment reports. The following three types of accommodations may be provided:

- Instructional accommodations:** such as changes in teaching strategies, including styles of presentation, methods of organization, or use of technology and multimedia.
- Environmental accommodations:** such as preferential seating or special lighting.
- Assessment accommodations:** such as allowing additional time to complete tests or assignments or permitting oral responses to test questions.

Other examples of modifications and aids, which may be used in this course, are:

- Provide step-by-step instructions.
- Help students create organizers for planning writing tasks.
- Record key words on the board or overhead when students are expected to make their own notes.
- Allow students to report verbally to a scribe (teacher/ student) who can help in note taking.
- Permit students a range of options for reading and writing tasks.
- Where an activity requires reading, provide it in advance.
- Provide opportunities for enrichment.