DEPARTMENT OF ACADEMIC UPGRADING

COURSE OUTLINE FALL 2017

SC0100(A2): SCIENCE AND SOCIETY 0100 5(5 – 0 – 0) 75 HOURS FOR 15 WEEKS

Chemistry, Physics, Astronomy, and Geology:

INSTRUCTOR:	NANCY FRASER	**PHONE:**	539 – 2980
OFFICE:	J – 216	**E-MAIL:**	nfraser@gprc.ab.ca
OFFICE HOURS:	AS POSTED ON MY OFFICE DOOR		

Ecology and Genetics:

INSTRUCTOR:	NICOLETTA HARABOR	**PHONE:**	539 – 2945
OFFICE:	J – 222	**E-MAIL:**	NHarabor@gprc.ab.ca
OFFICE HOURS:	AS POSTED ON MY OFFICE DOOR		

CALENDAR

DESCRIPTION: This course is meant to increase the pre-high school student's understanding of connections between science, technology and society. You will be introduced to basic ideas about science, technology, biology, chemistry, physics, ecology, scientific method, along with related social issues.

PREREQUISITES/COREQUISITES(s): EN 0090 and MA 0090 or consent of instructor.

REQUIRED TEXT/

RESOURCE MATERIAL: A Little Bit of Science by N. Fraser
Lab notebook
Lab manual

DELIVERY MODE(S): Lecture, power point presentations, and videos will be the main method of delivery. There is also a large laboratory component in this course.

OBJECTIVES:

The following are the topics that we be covering in this course are:

1. introduction to science and discuss the scientific method.
2. introduce and define chemistry.
3. terminology related to chemistry.
4. scientific notation.
5. how to set up and solve chemistry problems.
6. build an atom.
7. two methods on nomenclature
8. the proper way to conduct oneself in a laboratory situation.
9. how to write up a formal lab report.
10. physical sciences including physics, geology, and astronomy.
11. formula relating displacement, constant velocity, and time and solving related problems.
12. definition of and distinguish between transverse and longitudinal waves.
13. parts if a wave.
14. the universal wave equation.
15. light.
16. reflection and refraction of waves.
17. spectroscopy.
18. how emission and absorption spectra can be used to identify substances.
19. several models of the solar system.
20. names of the planets in our solar system starting from the Sun.

21. meteoroids, meteors, meteorites and distinguish among them.
22. comets.
23. constellations and some bright stars.
24. how to read star charts and find some bright stars.
25. geology.
26. define and discuss plate tectonics, earthquake, and volcanoes.
27. explain characteristics of the three types of rocks and the rock cycle.
28. seasons.
29. phases of the moon, and tides.
30. definition of ecology
31. basic requirements of living things.
32. species, population, and community.
33. biotic and abiotic factors as well as interactions between them in an ecosystem.
34. ecosystems.
35. adaptation.
36. specific structural or behavioural adaptions required for animals and plants to survive in their environment.
37. definition of variation within a species and among species as well as discrete and continuous variation.
38. variation and adaptation.
39. niches.
40. symbiotic relationships including mutualism, parasitism and commensalism
41. producers, consumers, decomposers.
42. food chains and food webs.
43. the 10% rule in food chains and the relation to pyramids of numbers.
44. effect of loss of components of food webs
45. bioaccumulation and pollution.
46. succession,
47. urban sprawl, introduced species, pesticides, habitat destruction, indicator species
48. indicator species.
49. ecosystem monitoring.
50. threatened, endangered, extirpated and extinct species and reasons for occurrence.
51. uses of plants for food, fibres and medicine.

52. mitosis and meiosis
53. types of asexual reproduction
54. sexual and asexual reproduction
55. gametes, fertilization, zygote, embryo, chromosomes
56. alternation of generations
57. natural and artificial selection in evolution
58. genetics terms, traits, alleles, dominant, recessive, homozygous, heterozygous, genotypes, phenotypes
59. Punnett squares.
60. genetic engineering, genetically modified organisms, cloning, monocultures, sustainability, chemical and biological controls, use of fertilizers.

OUTCOMES: Course Content

Chemistry Time: 3 weeks

Unit 1: Introduction to Chemistry

On completing this section, you should be able to:

i) Explain the scientific method.
v) Define density, mass, volume and know the formula that relates them. You should also know the units for each variable.
vi) Distinguish between mass and weight
vii) Classify matter as homogeneous matter, heterogeneous matter, compounds, elements, pure substances &/or solutions.
viii) Define state of matter, and state changes.
ix) Define and distinguish between physical, and chemical properties, and physical and chemical changes

UNIT 2: Atomic Structure:

On completing this section, you should be able to:

i) Define a proton, an electron and a neutron and know where the are found in an atom.
ii) State the hypotheses Dalton made about the structure of an atom. You should also be able to state the laws of definite proportions and of multiple proportions.
iii) Define atomic number, atomic mass number.
iv) Draw the atomic structure diagrams of atoms or ions for the first 20 elements.

Unit 3: Periodic Table:

On completing this section, you should be able to:

i) State the chemical symbols for the elements and know the names of the elements. You should also have MEMORIZED the first twenty elements in periodic table format.
ii) See trends in the periodic table and state the periodic law.
iii) Draw the electron dot diagrams of atoms for the first 20 elements.
iv) Define and distinguish between groups and periods.
v) Define, distinguish and state characteristics of metals, nonmetal, and metalloids and be able to find them on the periodic table.

Unit 4: Inorganic Nomenclature:

On completing this section, you should be able to:

i) Single valence metals
ii) Two nonmetals

Computer assignment: There is a website called “FREE RICE”. The website sponsors send the rice you earn to needy people around the world. One of the subject that you can practice on this site is nomenclature. Choose the **BASIC CHEMISTRY** subject. While you are practising nomenclature you can earn rice for other people. You may use a periodic table.

Physics Time:2 weeks

Unit 1: Introduction:

On completing this section, you should be able to:

i) Define physics
ii) Become familiar with several instrument for measuring length.

Unit 2: Kinematics:(As time permits.)

On completing this section, you should be able to:

i) Solve problems related to distance, speed, and time.

Unit 3: Light: (As time permits.)

On completing this section, you should be able to:

i) Describe the nature of light.
ii) State the law of reflection, and draw and label related diagrams.
iii) Explain refraction of light, and draw and label related diagrams.
iv) Describe how holograms are made. (If time permits)

Astronomy Time: 2 weeks

Unit 1: Introduction to Astronomy

On completing this section, you should be able to:

i) Define astronomy
ii) Define universe, galaxy, star, comets, meteor, meteoroid and meteorite.

Unit 2: Our Solar System

On completing this section, you should be able to:

i) Label the layers of the sun on a diagram.
ii) State Ptolemy's model of the solar system. (Geocentric Model)
iii) State the refinements that Copernicus made to Ptolemy's model. (Heliocentric Model)
iv) State Galileo's contributions to astronomy.
v) State Kepler's three laws of planetary motion.
vi) State the refinements that Kepler made to Copernicus' model.
vii) State the order of the planets starting from the sun.

Unit 3: The Moon

On completing this section, you should be able to:

i) Name phases of the moon.
ii) Explain how tides are formed.

Unit 4: Whatever topic(s) interest students. (As time permits)

Expectations depend on topics selected by students.
i) Discuss fun stuff such as – blockholes, supernovae, red giants, reading star charts.

Geology Time: 2 weeks

Unit 1: Introduction to Geology

On completing this section, you should be able to:

i) Define geology.

Unit 2: Rock and minerals

On completing this section, you should be able to:

i) Define the terms rock, and minerals.
ii) Define igneous, metamorphic, and sedimentary rocks are describe how they are formed.
iii) Distinguish between magma and lava.
iv) Give an example of each type of rock.
v) Draw the rock cycle.
vi) Define weathering, and erosion.

Unit 3: Structure of the Earth

On completing this section, you should be able to:

i) Label layers of the Earth and the atmosphere.
ii) Define plate tectonics.
iii) Define earthquake and state why they occur.
iv) Discuss volcanoes and state how they are formed.

SC0100 Biology Time: 4 weeks

Part 1-Ecology

On completing this section, a student shall be able to:

i) Define ecology
ii) List the basic needs of all living things.
iii) Define the terms species, population and community.
iv) Define and give examples of biotic and abiotic factors.
v) Define the term ecosystem
vi) Describe various interactions between biotic and abiotic factors in an ecosystem.

vii) Define the term adaptation.

viii) Give examples of animals and plants that have specific structural or behavioral adaptions to survive in their environments.

ix) Define the term variation and give examples of variation with in species, and among species.

x) Differentiate between discrete and continuous variations.

xi) Discuss the importance of species variation during changing environmental conditions (resistance to disease, ability to survive extreme environments)

xii) Discuss the importance of variation to adaptation

xiii) Define the term niche.

xiv) Describe how niche variations allow closely related species to survive in the same environment.

xv) Describe the term symbiotic relationships.

xvi) Define the terms mutualism, parasitism, and commensalism.

xvii) Given and relationship, be able to identify the type.

xviii) Differentiate between and provide examples of producers consumers, and decomposers

xix) Define primary, secondary and tertiary consumers.

xx) Differentiate between decomposers and scavengers

xxi) Define food chains and analyze food chains to identify producers, various consumers, and decomposers

xxii) Define pyramid of numbers and relate it to the 10% rule of energy flow in a food chain.

xxiii) Define food webs and predict the change in an ecosystem as a result of the loss of a component of the food web.

xxiv) Describe the movement of pollution in the food chain explaining bioaccumulation

xxv) Define primary and secondary succession

xxvi) Identify the effects of human impact such as urban sprawl, introduced species, pesticides, and habitat destruction on an ecosystem.

xxvii) Define indicator species

xxviii) Identifying methods of ecosystem monitoring

xxix) Define and give examples of threatened, endangered, extirpated and extinct species and state some reasons for their occurrence.

xxx) Discuss the uses of plants for food, fibers and medicine.

Part 2 - Introduction to Genetics

On completing this section, a student shall be able to:

i) Compare, in general terms, mitosis and meiosis.

ii) Define asexual reproduction and list the types (fission, budding, spores, runners, tubers…) and representative species

iii) Define sexual reproduction and compare it to asexual reproduction

iv) Explain sexual reproduction in animals using the terms gametes, chromosomes, fertilization, zygote, and embryo.

v) Compare sexual reproduction in animals to sexual reproduction in plants as previously discussed.

vi) Discuss alternation of generations in plants

vii) Define natural selection and describe its role in the evolution

viii) Define the following inheritance terms: traits, alleles, dominant, recessive, homozygous, heterozygous, genotype, phenotype, artificial and natural selection.

ix) Construct and interpret a Punnett square

Discuss some biotechnologies and their implications: genetic engineering, genetically modified organisms, cloning, monocultures, resource management/sustainability (chemical and biological controls, use of fertilizers,)

TRANSFERABILITY: ** Grade of D or D+ may not be acceptable for transfer to other post-secondary institutions. Students are cautioned that it is their responsibility to contact the receiving institutions to ensure transferability.

EVALUATION:

Chemistry and Physics:

Assignments:	15%
Labs:	15%
Quizzes:	5%
Free Rice:	5%
Chapter Tests:	60%
	100%

Biology:

Assignments and quizzes:	40%
Labs:	15%
Unit Exams:	45%
	100%

The Final grade will be determined based on 66% of chemistry and physics grades and 34% of the Biology grade.

GRADING CRITERIA:

Alpha Grade	4-point Equivalent	Percentage Guidelines		Alpha Grade	4-point Equivalent	Percentage Guidelines
A+	**4.0**			**C+**	**2.3**	
A	**4.0**			**C**	**2.0**	
A–	**3.7**			**C–**	**1.7**	
B+	**3.3**			**D+**	**1.3**	
B	**3.0**			**D**	**1.0**	
B–	**2.7**			**F**	**0.0**	

STUDENT RESPONSIBILITIES:

Students will:

-- Regular attendance is expected of all students, and is crucial to passing this course. Students who miss classes will soon find themselves falling behind and failing. Lateness will **not** be tolerated as it interrupts the instructor and fellow classmates.

– As per Department Policy, if you miss more than 10 per semester of classes in any course, you may be debarred from the final exam for that course.

– A certificate (a doctor's or a note from the funeral home) will be required to make up the midterm or final exam. Call if you are going to miss a test. There may be a deduction of 10% for test rewrites.

– be at class regularly and on time. (If you miss more than 10 per semester of classes in any course, you may be debarred from the final exam for that course.)

– **There will be a major chapter tests test the Friday after the conclusion of each section. Student failing to write ALL of the chapter tests will receive a grade of F in the course.** The major test on the last unit will be during the final exam period. This date and time will be set by the registrar's office.

***Very important: **Laboratory attendance to each specific experiment is compulsory; a passing grade in the laboratory component is required to pass the course.** There are **NO** 'make up' labs in this course. Being absent from an experiment will result in a grade of **ZERO** for that experiment.

– complete all pre class and pre-lab assignments before arriving in class.

– keep up with course material.

– if experiencing difficulties with course material get help immediately.

– catch up on missed material before the next class. Get a phone number from someone in the class so you can keep up.

– provide documentation for missed midterms or finals.

– be aware of penalty for failing the lab component and not writing the final.

STATEMENT ON PLAGIARISM AND CHEATING:

Refer to the College Policy on Student Misconduct: Plagiarism and Cheating at:
www.gprc.ab.ca/about/administration/policies/fetch.php?ID=69

**Note: all Academic and Administrative policies are available at
https://www.gprc.ab.ca/about/administration/policies/