ILLINOIS MATHEMATICS AND SCIENCE ACADEMY®
igniting and nurturing creative, ethical scientific minds that advance the human condition

Comprehensive Course Syllabus

*Cancer Biology

INSTRUCTOR(S):
- *Name(s):Sarah O'Leary-Driscoll and Crystal Randall

- Office Number(s) (When and where you are available for help.):
  C days 12:30-2:30 in science study area or by appointment
  B10-11 D 1-2

  - Telephone number(s): ext 5363 O'Leary ext: 5039 Randall

- Email address(es): soleary@imsa.edu and crandall@imsa.edu

Meeting Days, Time and Room(s) B156: A/C 3-4 B/D 7-8

Text(s) / Materials:
We will use scientific review articles to go through the basics of cancer hallmarks, and may use some excerpts from cancer biology texts, but most of the sources will be found by students in research.

***Essential Content:**
This course will be divided into three major content areas, Gene Control and Signalling, Tumor Characteristics and Physiology, and Cancer Risks, Diagnoses, and Treatments. Through these three sections, students will gain an in depth understanding of how regulation plays a role in cell function, how tumors form, what characteristics they have, and how the body responds to them, and lastly, the context of cancer both in the medical community with diagnosis and treatment, and from a social context as we examine risk factors. Lab work will be done throughout each unit, and is outlined in a later section.

I. Gene control and Signalling.

1) Review of DNA and protein fundamentals
2) Promoter
3) Gene Regulation Basics
4) Signalling Basics
5) Epigenetics
6) Cell Cycle pathways
7) Mutation basics
8) DNA repair

Tumor Characteristics and Physiology

9) Outcomes of mutations: using specific mutations and pathways
10) Tumor physiology and differentiation
11) Immune Response

Cancer Risks, Diagnosis, and Treatments

12) Cancer Treatments
13) Identification Diagnoses of Cancer
14) Tracking Cancer Risks: UNSDG health

Labs & Experiments:
Students will have a chance to try some of the most commonly used molecular biology techniques in this class, and will use their knowledge and experience to develop a focused research question that they can use various techniques to answer. Some of the techniques students may be exposed to include:

- Cell culturing and manipulation
- Western Blotting
- AMES testing
- Cell Staining
- Microscopy

***SSLs and Outcomes:**

IA. Students are expected to demonstrate automaticity in skills, concepts, and processes that enable complex thought by:

- *completing homework activities and assigned reading to support content,*
- *becoming adept at identified lab skills,*
- *demonstrating competence on quizzes, and*
- *applying content knowledge with novel scenarios and problems.*

IB. Students are expected to construct questions, forge connections and deepen meaning

- *informally in discussion groups, during set up and analysis of labs, and when observing data from experiments, and*
- *on formal assessments.*

IC. Students are expected to precisely observe phenomena and accurately record findings

- *through formative and summative assessments, and*
- *through analysis of data generated from lab experiments.*

ID. Students are expected to evaluate the soundness and relevance of information and reasoning

- *by evaluating sources for research papers,*
- *through analysis of experiments completed in lab, and*
- *through explanation of models of phenomena in biology.*

IIA. Students confront misconceptions

- *by completing pre-assessments,*
- *engaging in discussion in class, and*
- *completing a follow-up assessment to determine extent of resolution of misconceptions.*

IIIA. Students use appropriate technologies as extensions of the mind

- *through daily use of computers, including web sources and videos,*
- *by using the course website as a resource,*
- *by using computers to create graphical representations and perform other analyses of laboratory data, and*
- *through use of standard laboratory equipment.*

IIIB. Students recognize, pursue, and explain substantive connections within and among areas of knowledge

- *by studying the chemistry behind the biology, and*
- *by studying the connections between areas within biology.*

IIIC. Students recreate models and systems in biology, such as cell theory, evolution, DNA synthesis, as well as structures and functions of the cell and DNA, etc.,

- *with classroom discussion, projects, and activities, and*
- *on formal assessments.*

VB. In order for students to make reasoned decisions which reflect ethical standards, and act in accordance with those decisions, students

- *are made aware of what plagiarism is, its ethical implications, and repercussions of plagiarizing,*
- *are made aware of the scientific and ethical significance of accurately representing data (vs. not skewing data to fit expectations), and are assessed for the authenticity of written work and the efficacy of analysis of lab experimentation.*

***Instructional Design and Approach:**

This course helps

In this course, students will engage with the material in a variety of ways. After learning some necessary core concepts, other activities would involve reading work written by experts in the field, engaging in research into topics assigned or of their choosing, communicating understanding through presentations, papers, and posters, and a variety of other avenues. The lab components are still to be determined, but may include work with tissue culturing and manipulating cancer cell lines, as well as simulations and analyses the students can do with each other or with pre-existing data.

***Student Expectations:**

1) Late work:

Students may submit work late with a penalty of 10% each day the assignment is late up to 3 calendar days maximum. Once any assignments are returned to students with

grades/comments, this late work will not be accepted. Once the deadline has passed, a zero will be assigned.

Computer problems of any kind (including document corruption, hard drive failure, problems with uploading to Moodle) will not be treated as acceptable excuses for submitting late work. This being the case, it would be wise to make a backup copy of any computer work that you do for this course, and we suggest ensuring that you've received return receipts in your email from Turnitin. However, if you are having problems getting your work in, it is recommended that you talk with your teacher.

2) Attendance:
See the IMSA handbook for official attendance policy. If you have a counselor excused absence, or an unexcused absence, you will not be able to make up the missed work. This includes earning a zero on any tests or quizzes given during the missed period.

If you have an excused absence, be sure to contact your teacher to find out what you will miss. If that is not possible, you should see your teacher as soon as possible to discuss your absence. It is **your responsibility** to follow up on what you missed in class.

3) Plagiarism:
Plagiarism is unacceptable and will be dealt with as per IMSA policy on academic dishonesty. Plagiarism includes, but is not limited to, knowingly using another person's work – whether it is a student or a research paper – as your own, improper citations and bibliographic information, improper use of secondary sources, or any other behavior that is deemed dishonest.

***Assessment Practices, Procedures, and Processes:**
Assessments may include quizzes, tests, presentations, projects, writing assignments, and homework. We will also be gauging student progress with respect to both learning skills and mindset, as highlighted in the Standards of Significant Learning.
Tests are used to examine factual knowledge and problem solving. Also, students will be asked to apply knowledge gained in class to address novel situations (approximately 30-40% of any individual test grade). We call this ability 'transfer' and tests generally prompt a developing skill over the course of time.

Written reports are used to examine both communication and critical thinking skills in students. Students will be asked to forge connections between the lab activities or literature research and a broader context in the field of Biology. This sort of work mimics science practice and expands student thinking in science.

Projects and Presentation: This category of student work examines model building and critical thought. This complements reports as students must draw upon various activities and knowledge to construct holistic models that represent their understanding.

Various categories of work are not weighted to calculate the student grades in this course. Instead, a running total of all work is maintained to reflect on student grades. An approximate contribution percentage of categories of assessment toward the final grade is:

- Formative assessment: projects, reports, presentations: 60%
- Summative assessments: tests and major projects: 40%

Grading generally follows the scale:

90% and above = A
80-89% = B
70-79% = C
Below 70% = D

Major assessments will be graded and returned to students for review as soon as possible. This will usually be seven to ten days for tests, major projects and reports. Formative work that demands quick turnaround time to support continued student progress will be given priority in grading.