Sophomore Biology Laboratory Techniques

BIOL 220: Research Techniques in Biology: Antibiotic, Antifungal and Anti-cancerous Properties of Herbal Medicines

Fall 2024

Tuesdays: 9:30 – 12:20 pm (Face to Face)

Instructor information

Dr. Ifeoma Enweani-Nwokelo
Office: ISC 139 (Room D)
Office Hours: Mondays 12noon - 3:00pm
Tuesdays 08:00am – 09:30am
Thursdays 12:30 - 3:30pm
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Required Textbook

There is no textbook for this course. All materials will be provided in class or online in the Brightspace Learning Management System.

Course Description

This is a research opportunity in a course format, and the research topic is investigating antibiotic properties of traditional herbal medicines from Nigeria. It is appropriate for students in the second year or above who have already completed the first – year Biology courses. Students in the Biology Major can receive credit for their second-year lab course or an additional upper – level lab but this will require a waiver.

BIOL 220: Research Techniques in Biology: Antibiotic, Antifungal and Anti-cancerous Properties of Herbal Medicines

A sophomore laboratory course designed for students who want to explore the process of science in the research setting. Groups of students will have a chance to carry out experiments in biology that are aimed at exploring a specific problem at the forefront of knowledge. The subspecialty of this offering is Antibiotic, Antifungal and Anti-cancerous properties of Herbal medicines.

Prerequisites: Biology or Biochemistry Majors with Sophomore status; May be taken only once for credit. Not offered on a regular basis.

Investigate antibiotic, antifungal and anti-cancerous properties of herbs from Nigeria and contribute to a growing student-built data set of protein/ligand binding sites that enable the antimicrobial properties of the plants. In this class you will extract the secondary

metabolites from Nigerian herbs using solvents and test these plant extracts on different bacterial, fungal isolates and cancerous cells using molecular biology and biochemistry technologies. This is a wet-lab class. You will be working at the bench, which provides a great opportunity to develop your molecular biology lab skills while learning about secondary metabolites from plants and their binding activities on microorganisms that lead to antimicrobial properties of the plants. In this class you will learn to read primary literature, extraction from plant materials using various solvents; micro pipetting, preparation of media for culturing of microorganisms, prepare gel electrophoresis; search for resistant genes by sequencing microbial isolates, undertake susceptibility profile of the microbial isolates; extract DNA from microbial samples, conduct characterization assays. Your work in this class will contribute to scientific challenge to design, build, and test herbal antimicrobial properties.

Learning Objectives

1. You will participate actively in hands-on in research project that is broadly relevant and important to the scientific and academic community.
2. You will practice collaboration, iteration, creativity, and failure, through the tasks/assignments associated with the course
3. You will report gains in your understanding of the process of research
4. You will be exposed to field-specific practices/techniques
5. You will develop capability to do research
6. You will more strongly be identified as a researcher
7. You will learn scientific report writing

Laboratory Assignments

Laboratory Assignments will count toward most of your grade. I will be asking you to accomplish many assignments per week. You will receive full credit for each week's assignment as you accomplish the tasks. Sometimes things will not work, and this is not due to student error. I do not dock students for failures due to unknown biological complications. You will be graded for your attention to the proper procedures. Ask me questions if you feel at all unsure of what you should be doing.

Group Assignments and Evaluation of Your Peers

To practice and demonstrate interpersonal skills you will work on assignments together with a partner. You will also evaluate the contributions you and your partner make to assignments. The kind of partner you are judged to be by your peer you will factor into your *Group* Assignments grade and has the potential to alter your grade up to half of a grade. You will evaluate each other regarding professional integrity not on capability. Each person

should understand every point of the work and not force the others in the group to take up extra work.

Oral Presentation

Communication is an essential science skill. Your lab group will make a short report on your results of your antimicrobial properties of the plant extracts and the secondary metabolites present in the plants.

Tentative schedule (Still undergoing completion at the moment)

The following is the planned schedule subject to potential alterations.

Week	Date	Topic
1	8/27/2024	Intro, Safety, Necessary Tools, Downloads – Begin
2	9/3/2024	Description of the three plants for the research Preparation of plant samples and extraction Different methods of extraction from plant samples (solvent, Soxhlet) Characterization of plant secondary metabolites (Spectrophotometer, NMR)
3	9/10/2024	Purification of the plant secondary metabolites
4	9/17/2024	Sample collection for microbial growth. Media. Antimicrobial Sensitivity Testing (standard antibiotic discs / plant extracts)
5	9/24/2024	DNA extraction
6	10/01/2024	Disc diffusion; Agar well diffusion methods
7	10/08/2024	PCR Analysis
8	10/15/2024	Fall break: No classes
9	10/22/2024	Sequence Analysis
10	10/29/2024	NMR Analysis
11	11/05/2024	Determination of Kill Time Assay of Extracts
12	11/12/2024	Anti-cancerous properties of the Plant extracts
13	11/19/2024	Anti-Inflammatory properties of Plant extracts
14	11/26/2024	Data Analysis Day - Prepare Presentations
15	12/03/2024	Last Day - Presentations
16	12/10/24	Study Day - There is No final

Course Evaluation

Laboratory Assignments	50
Group Assignments	50
Total points	100

Grading Scale

The following scale will be used to calculate final grades and are rounded up at 0.85.

A = 100-93%	A- =92.9-90%	B+= 89.9-87%	B = 86.9-83%
B- = 82.9-80%	C+ = 79.9-77%	C = 76.9-73%	C- = 72.9-70%
D = 69.9-60%	F = 59-0%		

Accessibility

- Please talk to me, Dr. Enweani-Nwokelo, face-to-face, if you think any aspects of course logistics makes it hard for you to be successful. I would like to help you out.
- SUNY Geneseo strives to provide an equitable and inclusive educational experience for all students. The Office of Accessibility coordinates reasonable accommodations for persons with documented physical, emotional, or cognitive disabilities, as well as medical conditions related to pregnancy or parenting.
- Share with me your letter of accommodation at the beginning of the semester and discuss with me the specific arrangements that can help you succeed. Please contact the Office of Accessibility Services for questions related to access and accommodations.

Office of Accessibility Services
Erwin Hall 22
(585) 245-5112

Academic Honesty and Plagiarism

- Academic dishonesty includes cheating, knowingly providing false information, plagiarizing, and any other form of academic misrepresentation. Academic dishonesty will not be tolerated in this course.
- Please refer to the material in the “Plagiarism” pages on Geneseo.edu library website, which describes various types of plagiarism. Assignments containing plagiarism will receive no points.
- If you’re struggling, please ask me for help before you resort to cheating! I would much rather struggle with you than file a report, creating a record with the department chair, the Dean of the College, and at the Dean of Students Office.

Safeguarding your mental health

- Diminished mental health, including significant stress, mood changes, excessive worry, or problems with eating and/or sleeping can interfere with optimal academic performance. The source of symptoms might be strictly related to your course work; if so, please speak with me.
- SUNY Geneseo provides mental health services to support the academic success of students. Counseling Services, a part of the Lauderdale Center for Student Health & Counseling, offers free, confidential psychological services to help you manage personal challenges that may threaten your well-being.
- In the event I suspect you could be helped by support, I will express my concerns and the reasons for them, and remind you of resources that might be helpful to you. It is not my intention to coerce you to reveal private information, but simply to let you know I am concerned and that help, if wanted, is available. Getting help is a smart and courageous thing to do for yourself and for those who care about you.

Unplanned challenges

I understand that some problems can't be anticipated, and exceptions should be worked out. Please contact me as soon as reasonable to discuss options.

BIOL 220 and BIOL 116, BIOL 118

BIOL 220 will count for your requirement of BIOL 116, however, you will need to ask your academic advisor to submit a substitution request on your behalf after successful completion of the course.

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