WINDWARD COMMUNITY COLLEGE MISSION STATEMENT

Windward Community College is committed to excellence in the liberal arts and career development; we support and challenge individuals to develop skills, fulfill their potential, enrich their lives, and become contributing, culturally aware members of our community.

COURSE DESCRIPTION

This course provides an introduction to the principles and practical techniques of plant biotechnology. Topics include fundamentals of molecular biology, plant tissue culture and micropropagation, plant DNA and RNA extraction, PCR, DNA cloning, DNA sequencing, plant functional genomics, plant genetic engineering, gene silencing, molecular farming, and their applications. This course provides students hands-on experience and training in recombinant DNA technology, plant tissue culture and genetic engineering.

Pre-Requisites: BOT 101, or AG 152, or MICR 130 and MICR 140, or BIOL 171 and 171L, or consent of the instructor.

Activities Required at Scheduled Times Other Than Class Times
You will need to inspect and maintain the growth of your plant tissue cultures. You might have to carry out extended laboratory works at times other than scheduled laboratory periods.

STUDENT LEARNING OUTCOMES

1. Understand the basic principles of molecular biology.
2. Understand and be able to perform experiments involving recombinant DNA.
3. Understand the principles, techniques and applications of plant tissue culture.
4. Understand the principles and techniques of plant genetic transformation mediated by agrobacterium and particle bombardment.
5. Understand the principles and techniques of plant functional genomics.
6. Discuss the benefits, issues, and risks of biotechnology

ASSESSMENT TASKS AND GRADING

Your learning outcomes will be achieved through the aid of the following activities:
1. Assigned readings (hand-outs)
2. Prepare a good journal/lab notebook.
3. Homework assignments

You will be evaluated based upon class and laboratory participation, laboratory reports, the ability to maintain aseptic cultures, presentation, and examinations as described below.

**Lecture and Laboratory Participation (50 points)**
You are expected to participate in all lecture and lab activities (50 points). You will also work safely and efficiently in the laboratory. Thus, you will be graded on lecture and laboratory attendance, level of participation, and laboratory work habits. Because of the difficulties in setting up laboratory material, students missing a regularly scheduled laboratory activity cannot be given an alternative assignment. Failure to participate in a scheduled laboratory session will result in a 15-point deduction for each session missed.

**Laboratory Reports (200 points)**
Your laboratory reports will be examined four times during the semester. Each lab report should consist of followings:

- Title of the experiment
- Introduction
- Materials
- Methods
- Results and Conclusions

**Maintenance of Plant Tissue Culture (50 points)**
You will maintain your own in vitro cultures. Assessment will be based upon non-contaminated and healthy cultures throughout the semester. Media transfer should be done accordingly. You should detect contaminated cultures as early as possible to repeat the operation before the end of the semester.

**Presentation (100 points)**
You will select one of topics on the benefits, issues, and risks of biotechnology and give a presentation in class. You will be graded based on your presentation and participation of discussion on those topics.

**Examinations (400 points)**
There are two exams (midterm and final) to assess your knowledge and skills in plant biotechnology. Exams are non-cumulative.

Make up exams will only be given with a valid reason (i.e. medical or other emergency) on the FIRST day you return to class. In such a circumstance, you should make every reasonable attempt to contact the instructor as soon as possible before the exam. Students involved in cheating will receive an “F” grade for the course.

**Method of Grading**

The total possible points:

1. Lecture and Laboratory Participation 50 points
2. Laboratory Reports (4) 200 points
3. Maintenance of Plant Tissue Culture 50 points
4. Presentation 100 points
5. Examinations (2) 400 points

Total 800 points

Letter grades will be assigned as follows:

A - - - 90% or above in total points.
B - - - 80-89% of total points.
C - - - 70-79% of total points.
D - - - 60-69% of total points.
F - - - Below 60% of total points.
I - - - Incomplete; given at the INSTRUCTOR'S DISCRETION when you are unable to complete a small part of the course because of circumstances beyond your control. It is your responsibility to make up incomplete work with a minimum level (or better) of achievement. Failure to satisfactorily make up incomplete work within the appropriate time period will result in a grade change for "I" to the contingency grade identified by the instructor (see catalog).

LEARNING RESOURCES

Textbook: There is no required textbook.

Lecture materials / Reading Hand-outs: https://laulima.hawaii.edu/portal

BOT 210 Schedule  Fall 2014
(Please note that the schedule is subject to change.)

PART I. Introduction

#1
Lecture/ Lab
Course introduction Standard laboratory operating and safety procedures

#2
Lecture/ Lab
Overview of plant biotechnology Micropipetting and equipment operation.

#3
Lecture/ Lab

PART II. Plant tissue culture and micropropagation

#4
Lecture/ Lab
Principles and applications of plant tissue culture Plant tissue culture media components and preparation

#5
Lecture/ Lab
Review of plant anatomy/development Aseptic technique and sterilization of plant seeds and explants.
#6
Lecture/ Lab
Contamination issues in plant tissue culture
Micropropagation of pineapple using crown tip meristem

Part III. Plant genetic engineering

#7
Lecture/ Lab
Arabidopsis thaliana as a model system
Germination of Arabidopsis seeds

#8
Lecture/ Lab
Agrobacterium-mediated plant transformation

#9
Lecture/ Lab
Particle bombardment-mediated plant transformation

#10
Lecture/ Lab
Plant gene silencing and its applications

Midterm Exam After #10 Lecture/Lab

Part IV Recombinant DNA technology

#11
Lecture/ Lab
Polymerase Chain Reaction (PCR) and its applications
Primer design and PCR amplification of the gene-of-interest from plants

#12
Lecture/ Lab
Molecular Cloning
Agarose gel electrophoresis of PCR products, purification of PCR products, and preparation of LB selective media

#13
Lecture/ Lab
Molecular Cloning
DNA ligation with the T-vector and *E. coli* Transformation

#14
Lecture/ Lab
Molecular Cloning
Selection and identification of clones using colony PCR

#15
Lecture/ Lab
Molecular Cloning
Plasmid preparation, restriction enzyme digestion and sequencing

Part V. Plant genomics and bioinformatics

#16
Lecture/Lab  Principles of genome analysis and functional genomics of plants  
Lab  Plant DNA extraction, purity analysis and quantification.

#17  
Lecture/Lab  Principles of genome analysis and functional genomics of plants  
Lab  Public genomic data resources

#18  
Lecture/Lab  Plant bioinformatics  
Lab  Analysis of sequences from the experiments and phylogeny
Reconstruction

Part VI  Molecular analysis of gene expression in plants

#19  
Lecture/Lab  Characterization of transgenic plants  
Lab  Plant RNA extraction and analysis

#20  
Lecture/Lab  Detection of transgene expression in plants by RT-PCR  
Lab  Detection of pathogenic microbes in plants by RT-PCR.

#21  
Lecture/Lab  Applications of plant biotechnology

#22  
Lecture/Lab  Public concerns and issues in plant biotechnology: case study and student presentation

#23  
Lecture/Lab  Public concerns and issues in plant biotechnology: case study and student presentation

Final Exam  1:00 PM December 17, 2014

DISABILITIES ACCOMMODATION STATEMENT

If you have a physical, sensory, health, cognitive, or mental health disability that could limit your ability to fully participate in this class, you are encouraged to contact the Disability Specialist Counselor to discuss reasonable accommodations that will help you succeed in this class. Ann Lemke can be reached at 235-7448, lemke@hawaii.edu, or you may stop by Hale `Akoakoa 213 for more information.