FOS6226C ADVANCED FOOD MICROBIOLOGY
SYLLABUS

Spring 2024

SCHEDULE AND CLASS LOCATION/FORMAT

Lectures

Thursday	6-7 Periods	12:50 pm – 2:45 pm	MCCB 3096 (McCarty Hall B)
Friday	3 Period	9:35 am – 10:25 am	WEIM 2056 (Weimer Hall) or Labs (**Check 'Critical Dates' for Fri locations**)

Labs

Thursday	2-4 Periods	8:30 am – 11:30 am	FSN 310 or AFPL 208 or Zoom
Friday	3 Period	9:35 am – 10:25 am	WEIM 2056 (Weimer Hall) or Labs (**Check 'Critical Dates' for lab locations**)

All guest lectures, the zoom lectures, lecture audits, and lab 8 will be delivered via Zoom.

INSTRUCTOR

Dr. Boce Zhang
Office: AFPL 216
Email: boce.zhang@ufl.edu
Office Hours: Fridays 1-3 pm, or by appointment

POST-DOCTORAL ASSISTANT

Dr. Zhen Jia, Post-doctoral research associate
Lab: AFPL 208
Email: jia.zhen@ufl.edu
Office Hours: TBD

TEACHING ASSISTANT

Ms. Tingting Gu, Ph.D. student
Lab: AFPL 208
Email: tingting.gu@ufl.edu
Office Hours: TBD

CREDITS & COURSE DESCRIPTION

4 Credits.
Selection of laboratory methods, characterization of food-borne pathogens and spoilage organisms.

WHAT TO EXPECT IN ADVANCED FOOD MICROBIOLOGY

Advanced Food Microbiology is intended to provide an advanced understanding of contemporary and emerging issues in controlling pathogenic microorganisms from farm to fork. Focus is placed on linking pathogens with relevant reservoirs and understanding basic mechanisms used by microorganisms to survive mitigation strategies in the production, distribution, and consumption of food. This course integrates lectures and microbiology labs. Students will be assessed by midterm and final exams, lecture and lab sections, guest lecture participation, and seminar presentation.

COURSE OBJECTIVES

1. Develop an advanced understanding of microbiological issues in the food system.
2. Comprehend the physiological mechanisms of pathogen survival against food processing interventions.
3. Practice traditional and advanced microbiology lab techniques.
4. Characterize the etiological agents of foodborne diseases, including, for each, clinical presentations, epidemiology, points of entry into the food supply chain, and preventive control.
5. Summarize and present peer-reviewed articles for contemporary and emerging food safety challenges.

COURSE PREREQUISITES

FOS 4222/4222L, MCB 4303/4303L and BCH 6415, or permission of instructor.

RELEVANT COURSES

FOS4202/5205 Food Safety and Sanitation
FOS4222/4222L/5225C Food Microbiology
FOS4223/6224 Food and Environmental Virology
FOS6936 Topics in Food Science: Food Toxicology
BSC4434C Introduction to Bioinformatics

TEXTBOOK AND COURSE MATERIALS (REQUIRED)

1) Textbook

Doyle, Michael. Buchanan, Robert (2012). Food Microbiology - Fundamentals and Frontiers (4th Edition). American Society for Microbiology:
https://app.knovel.com/web/toc.v/cid:kpFMFFE001/viewerType:toc//root_slug:food-microbiology-fundamentals
Full text is available free of charge to the UF students through Knovel.com (use your UF email address to sign up).

2) Lab materials

a) Lab manual (required):
A lab manual will be provided on Canvas. Please print Lab 1 – Lab 6, and bring it to every lab sessions. Do NOT print Lab 8 – Bioinformatics!

b) Bioinformatic resource center (required):
Access to Pathosystems Resource Integration Center (PATRIC) is free of charge on: https://www.patricbrc.org/
Access to Galaxy is free of charge on: https://nanopore.usegalaxy.eu/

3) Other materials

Optional Reading:

- Optional Textbook: Food Safety Theory and Practice Author: Paul L. Knechtges
- Optional Textbook: National Environmental Health Association - Professional Food Manager Training Guide (3rd Edition)
- Risk Mitigation Programs in Food Systems

https://www.fsis.usda.gov/wps/portal/fsis/topics/regulatory-compliance/haccp
https://www.fda.gov/Food/GuidanceRegulation/HACCP/
https://www.ams.usda.gov/services/auditing/gap-ghp
http://www.fao.org/prods/gap/
https://www.fda.gov/food/guidanceregulation/cgmp/

- Food Safety Modernization Act (FSMA)
  https://www.fda.gov/Food/GuidanceRegulation/FSMA/ucm253380.htm
- Food and Drug Administration FDA Federal Food Code 1999
  http://www.fda.gov/Food/GuidanceRegulation/RetailFoodProtection/FoodCode/ucm2018345.htm

Optional Software:

- USDA Pathogen Modeling Program (PMP): https://pmp.errc.ars.usda.gov/default.aspx
- http://ars.usda.gov/Services/docs.htm?docid=11550
- http://www.ifr.ac.uk/MicroFit/
- http://www.combase.cc/
- http://www.icmsf.iit.edu/main/software_downloads.html

COURSE ANNOUNCEMENTS

All lecture slides will be posted on Canvas prior to the class. All announcements will be made through Canvas (make sure to turn on the notifications in Canvas, available under your profile). It is the student's responsibility to check the announcement. Students can reach out to the instructor and TAs via email.

COURSE EVALUATIONS

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

TESTS AND GRADING

- **Exams**: There will be two mid-term exams and one final.
- **Labs**: There are 8 labs (11 lab reports).
- **Discussion/journal club**: Each student is required to lead 1 journal club discussion (see instructions below).
- **Presentation:** Each student will summarize and present peer-reviewed articles for a contemporary or emerging food safety topic.

FOS6226C Final grade (see below) You cannot drop a test.

Activities	**Grade percentage**
Lab reports	30%
Presentation	10%

Journal Club & Participation (Discussion)	10%
Mid-term exams	30% (15% each)
Final Exam (cumulative)	20%

Grading Scale: A (93 to 100), A- (90 to <93), B+ (87 to <90), B (83 to <87), B- (80 to <83), C+ (77 to <80), C (73 to <77), C- (70 to <73), D+ (67 to <70), D (63 to <67), D- (60 to <63), E (0 to <60).

COURSE POLICIES

- Attendance is required. Please refrain from checking or sending e-mails, texts, etc during class or lab sessions. Students are expected to participate in class discussions. Makeup exams will only be given with the permission of the instructor if adequate notice and documentation (such as doctor's note) is provided in advance. A 10% pt penalty per day will be assigned for late assignments or reports turned in within two days after the due date. No submission will be accepted after two days past the due date.
- There are no make-up labs available. Missing one lab session will result in a 50% pt penalty from the lab report grade of the lab missed, unless due to excuses compliant with university policies.
- Requirements for make-up exams, assignments, and other work in this course are consistent with university policies that can be found at https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/

LAB SAFETY GUIDELINES

All students are required to read the Lab Safety Guidelines in this syllabus. You are required to watch an instructional video highlighting the importance of biosafety and be familiar with the University's Exposure Control policy, Chemical Hygiene Manual, and Accident Report Manual. In addition, you will need to complete a Blood borne Pathogen consent form and the microscope agreement form.

1. You will be working in a BSL-2 lab environment. All students must maintain all these EHS mandatory training as 'current' throughout the course:
    a. Chemical Hygiene Plan Online course (UF_EHS869_OLT)
    b. BBP/BMW Training: (General Audience) (UF_EHS850G_OLT)
    c. Hazardous Waste Management (UF_EHS809_OLT)
2. Students must follow Standard Microbiological Practices and Universal Precautions. Detailed instructions of these laboratory safety rules and procedures shall be provided to the student by the instructor.
3. Lab Cleaning and Sanitation. Surfaces must be cleaned after each lab session. Students will use the 10% bleach for bench surfaces and supply drawer handles (at their benches)-this should be done before the lab begins and when it finishes. Also clean your writing utensils before leaving the lab.
4. The laboratory dress policy is strict and required for personal safety. Proper dress is required and includes long pants covering legs and ankles, tops covering chest and torso, socks and shoes covering feet and toes. Students will not be permitted to participate in lab if they wear the following: shorts, skirts, capris, slippers, sandals, slip-ons, and any open-toed footwear.

5. Personal protective equipment (PPE) consists of a lab coat, mask, and disposable gloves. Students must wear PPE at all times while in the lab. Do NOT share your PPE with others.
6. If the fire alarm sounds or an order is issued for emergency evacuation students shall follow the emergency exit plan and directions outlined by the instructor.
7. Failure to comply with these Lab Safety Guidelines shall result in immediate dismissal from the lab classroom and a zero grade.

DISCUSSION/JOURNAL CLUB GUIDELINES

Each student will be required to select ONE high-quality & high-impact publication to give a brief 15-minute overview, followed by critiques, questions, or discussions. This is a practice for critical thinking and scientific philosophy & methodology.

1) The paper should be relevant to food microbiology or microbiology (in general). In addition, the paper needs to include at least one of the following areas: DNA/RNA biology, bioinformatics, artificial intelligence, or astromicrobiology.
2) The publication must be peer-reviewed article within the past 5 years. It is highly recommended to select from top-tier journal that are high-quality and high-impact.
3) The article MUST be an original research article. Review articles are NOT allowed.
4) The selected article must be shared with the whole class at least ONE week before the discussion date.
5) The lead will give a 15-minute overview of the paper, include:
    a. High-level overview of the research question that this paper is trying to address
    b. Background, Introduction, Rationale/Objectives, Methods, Results, Conclusions. (Tips are available on Canvas)
6) All students are required to read the selected article before the discussion. Be prepared with questions.

PRESENTATION GUIDELINES

Each student will be required to select one of the topics below to conduct a literature review, using the state-of-the-art literature. Only use peer reviewed journal articles that were published within the past 5 years. This may be an individual presentation or a group presentation depending on course enrollment and available course time. Each presentation will be 20 minutes followed by a 5 minutes Q&A.

Topics include:

1) Antimicrobial resistance in food system – epidemiology and mitigation strategies
2) Microbiology opportunities and challenges in space food programs
3) Microbiome and food safety
4) Omics and emerging food microbiology platforms
5) Artificial intelligence in microbiology (including food microbiology, but can expand the discussions to general microbiology)

Framework of the presentation should include, but not limited to:

1) Problems and challenges facing our society
2) What solutions have been explored
3) Summary of latest scientific evidence
4) Critical assessment of the literatures – identify drawbacks & propose next steps

Presentation will be assessed by the instructor, TA(s), and peer students. Check "Grading Rubrics for Presentation" on how presentations are assessed.

Grading Rubrics for Presentation

Name: _____
Topic: _____

Categories	3 pts. (A level)	2 pts. (B level)	1-0 pt. (C-D level)
Identifies and summarizes problem at issue	Identifies not only the basics of the issue, but recognizes nuances of the issue	Identifies the main problem and subsidiary, embedded, or implicit aspect of the problem	Does not identify and summarize the problem, is confused or identifies a different or in appropriate problem
Personal perspective and position	Draws support from experience and information not available from assigned sources	Identifies, appropriately, one's own position on the issue	Addresses a signal source or view of the argument and fails to clarify presented position relative to the one's own
Quality of evidence	Observes cause and effect and addresses existing or potential consequences. Clearly distinguishes between fact, opinion, and acknowledges value judgments	Examines the evidence and source of the evidence, questions its accuracy, precision, evidence, and completeness	Merely repeat information provided, taking it as truth or denies evidence without adequate justification
Completeness	A background of the topic and target audience is very clearly outlined and organized.	A background of the topic and target audience is somewhat outlined.	No, or minimal attempt made
Critical thinking & creativity	Identifies and questions the validity of the key assumptions and addresses the fundamental dimensions that underlie the issue	Identifies some of the key assumptions and issues	Does not surface the assumptions and fundamental questions that underlie the issue

Grade:_____/ 15

MINIMUM TECHNICAL SKILLS/REQUIREMENTS

To complete your tasks in this course, you will need a basic understanding of how to operate a computer, how to use Zoom, how to use iClicker, and how to use word processing software. The University of Florida expects students entering an online program to acquire computer hardware and software appropriate to his or her degree program. Most computers are capable of meeting the following general requirements. A student's computer configuration should include:

- Webcam; Microphone; Speakers or headphones; Broadband connection to the Internet and related equipment (Cable/DSL modem).
- Your instructor might request that you obtain the iClicker Cloud (free for students) to respond to polls and in-class quizzes.
- Microsoft Office Suite installed (provided by the university).

Individual colleges may have additional requirements or recommendations, which students should review prior to the start of their program.

ACADEMIC HONESTY

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "*We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity*." You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: "*On my honor, I have neither given nor received unauthorized aid in doing this assignment*."

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code.

NETIQUETTE AND COMMUNICATION COURTESY

All members of the class are expected to follow rules of common courtesy during, before, and after class, in all email messages, threaded discussions, and chats.

SOFTWARE USE

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

SERVICES FOR STUDENTS WITH DISABILITIES

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation
0001 Reid Hall, 352-392-8565, https://disability.ufl.edu/

GETTING HELP

Technical Difficulties:

For issues with technical difficulties for Canvas, please contact the UF Help Desk at:

- http://helpdesk.ufl.edu
- (352) 392-HELP (4357)
- Walk-in: HUB 132

Any requests for make-ups due to technical issues should be accompanied by the ticket number received from the Help Desk when the problem was reported to them. The ticket number will document the time and date of the problem. You should e-mail your instructor within 24 hours of the technical difficulty if you wish to request a make-up.

CAMPUS HELPING RESOURCES

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, www.counseling.ufl.edu/cwc/
- Counseling Services, Groups and Workshops, Outreach and Consultation, Self-Help Library, Wellness Coaching
- U Matter We Care, www.umatter.ufl.edu/
- Career Resource Center, First Floor JWRU, 352-392-1601, https://career.ufl.edu/
- Student Success Initiative, http://studentsuccess.ufl.edu
- Complaints: https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf & https://sccr.dso.ufl.edu/policies/student-honor-code-studentconduct-code/
- Online Course: http://www.distance.ufl.edu/student-complaint-process
- Library Support: Various ways to receive assistance with respect to using the libraries or finding resources. cms.uflib.ufl.edu/ask
- Teaching Center: 352-392-2010 General study skills and tutoring: teachingcenter.ufl.edu/
- Writing Studio: 352-846-1138. Help brainstorming, formatting, and writing papers: writing.ufl.edu/writing-studio/

SCHEDULE (SUBJECT TO CHANGE)

Week/Day		Topics	Notes
W1 01/08	Th-8:30a		
	Th-12:50p	1. Syllabus & Introduction Microbiology overview - characteristics of bacterial growth	
	F	2. Lab intro: General information and safety guidelines Aseptic technique and microbiology lab overview	
W2 01/15	Th-8:30a	J1. Journal Club	
	Th-12:50p	3. Microbial growth: temperature, pH, water, oxygen/redox potential, catabolite repression, antimicrobials, biological structures, hurdles	
	F	4. Detecting and Enumerating Bacteria	
W3 01/22	Th-8:30a	**Lab 1: MPN & plate count** - prelab & inoculation	FSN 310
	Th-12:50p	5. Impact of injury & viable but nonculturable (VBNC) 6. Persistence	
	F	**Lab 1: MPN & plate count** - interpretation & lab report	FSN 310
W4 01/29	Th-8:30a	**Lab 2: VBNC lab** – thermal/acid-induced injury	FSN 310
	Th-12:50p	J2. Journal Club	
	F	**Lab 2: VBNC lab** - interpretation & lab report	FSN 310
W5 02/05	Th-8:30a	**Lab 3: Biofilm lab** – pre-lab, CV, & quantification	FSN 310
	Th-12:50p	J3. Journal Club	
	F	**Lab 3: Biofilm lab** – interpretation & lab report	FSN 310
W6 02/12	Th-8:30a		
	Th-12:50p	***Midterm 1***	
	F	7. Microbial genetics & molecular technique	
W7 02/19	Th-8:30a	**Lab 4: HGT lab** – pre-lab, transformation, plating	AFPL 208
	Th-12:50p	7. Microbial genetics & molecular technique 8. Microbial control & antimicrobial resistance	
	F	**Lab 4: HGT lab** – interpretation & lab report	AFPL 208
W8 02/26	Th-8:30a	**Lab 5: PCR lab** – DNA extraction	AFPL 208
	Th-12:50p	9. Gram positive – spore-forming pathogens	
	F	10. Gram positive pathogens	
W9 03/04	Th-8:30a	**Lab 5: PCR lab** – PCR Lab	AFPL 208
	Th-12:50p	11. Gram negative pathogens	
	F	**Lab 5: PCR lab** – Gel electrophoresis, interpretation & lab report	AFPL 208
03/11	Spring Break		
W10 03/18	Th-8:30a	**Lab 6: AMR lab** – prelab, MIC, & Kirby-Bauer inoculation	FSN 310
	Th-12:50p	***Midterm 2***	
	F	**Lab 6: AMR lab** – interpretation & lab report	FSN 310
W11 03/25	Th-8:30a	**Lab 7: NGS Lab** – Core facility (no lab report due)	TBD
	Th-12:50p	12. Introduction of NGS and 3rd Gen. Sequencing	
	F	13. Introduction of Bioinformatics	
W12 04/01	Th-8:30a	**Lab 8: Bioinformatics lab** – Galaxy	Zoom
	Th-12:50p	14. Genomics, transcriptomics, & meta-omics	
	F	Student seminars	
W13 04/08	Th-8:30a	**Lab 8: Bioinformatics lab** – PATRIC	Zoom
	Th-12:50p	15. Machine learning & its food safety applications	
	F	**Lab 8: Bioinformatics lab** – interpretation & lab report	Zoom
W14 04/15	Th-8:30a	Student seminars	GatorEval Opens
	Th-12:50p	***Final exam*** (cumulative)	
	F		

CRITICAL DATES

Weeks	Thursday, morning FSN 310/AFPL 208/Zoom	Thursday, afternoon MCCB 3096 (McCarty B)	Friday WEIM 2056 (Weimer) or Labs
W1, 01/08		1. Syllabus & overview MCCB 3096	2. Lab intro FSHN310
W2, 01/15	Journal club FSN 310	3. Micro growth MCCB 3096	4. Detection WEIM 2056
W3, 01/22	Lab 1 – MPN FSN 310	5. Injury & 6. Persistence MCCB 3096	Lab 1 – continued FSN 310
W4, 01/29	Lab 2 – VBNC FSN 310	Journal club MCCB 3096	Lab 2 – continued FSN 310
W5, 02/05	Lab 3 – Biofilm FSN 310	Journal club MCCB 3096	Lab 3 – continued FSN 310
W6, 02/12		**Midterm 1** MCCB 3096	7. Genetics WEIM 2056
W7, 02/19	Lab 4 – HGT AFPL 208	7. Genetics & 8. AMR MCCB 3096	Lab 4 – continued AFPL 208
W8, 02/26	Lab 5 – DNA extraction AFPL 208	9. Gram+ spore MCCB 3096	10. Gram+ WEIM 2056
W9, 03/04	Lab 5 – PCR AFPL 208	11. Gram- MCCB 3096	Lab 5 – GE AFPL 208
03/11	Spring Break		
W10, 03/18	Lab 6 – AMR FSN 310	**Midterm 2** MCCB 3096	Lab 6 – continued FSN 310
W11, 03/25	Lab 7 – NGS TBA (e.g., ICBR)	12. NGS & sequencing MCCB 3096	13. Bioinformatics WEIM 2056
W12, 04/01	Lab 8 – Galaxy Zoom*	14. Multi-omics MCCB 3096	Seminar WEIM 2056
W13, 04/08	Lab 8 – PATRIC Zoom*	15. ML and AI MCCB 3096	Lab 8 – continued FSN 310
W14, 04/15	Seminar FSN 310	**Final exam** MCCB 3096	

Color codes				
Lectures	Labs	Journal clubs	Seminar	Exams

* Lab 8 will be delivered via Zoom: https://ufl.zoom.us/j/3522943712.