HOS3513C– Breeding and Production of Medicinal Plants and Herbs

CREDIT HOURS: 2
PREREQUISITE: BSC2010 or BSC2011 or BOT2010C or BOT2011C or equivalent
MEETING TIMES AND LOCATION: Monday and Wednesday 9th period (4:05pm – 4:55pm)
2318 in person

INSTRUCTORS:

Dr. Jeongim Kim (Section 1, coordinator)
Horticultural Sciences Department, Fifield Hall #1111, jkim6@ufl.edu; office) 273-4779
Office Hour: Tuesday 2 pm - 4 pm

Dr. Marcio Resende (Section 2)
Horticultural Sciences Department, Fifield Hall #2135, mrescende@ufl.edu; office) 273-4772
Office Hour: Monday 3:00 pm - 4:05 pm

Dr. Keun Ho Cho (Section 3)
Horticultural Sciences Department, Fifield Hall #1511, kencho@ufl.edu; office) 273-4586
Office Hour: Tuesday 2 pm - 4 pm

Dr. Tie Liu (Section 4)
Horticultural Sciences Department, Fifield Hall #1213, tieliu@ufl.edu; office) 846-2638
Office Hour: Tuesday 3 pm - 5 pm

COURSE DESCRIPTION
This course focuses on current and emerging breeding and cultivation practices used to produce high–value medicinal plants and herbs. Additionally, this course provides a critical analysis of health effects and therapeutic claims of plant-derived physiologically-active products.

MODE of DELIVERY
This course consists of four sections. Each section will be delivered in person.

ATTENDANCE and MAKE-UP WORK
Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at: *UF Attendance policy*, https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/

- If you are experiencing COVID-19 symptoms (Click here for guidance from the CDC on symptoms of coronavirus), please use the UF Health screening system and follow the instructions on whether you are able to attend class. Click here for UF Health guidance on what to do if you have been exposed to or are experiencing Covid-19 symptoms. Course materials will be provided to you with an excused absence, and you will be given a reasonable amount of time to make up work. Find more information in the university attendance policies.
- Make-up quizzes will be offered only if a valid and documented excuse is approved by the instructor.

LEARNING OBJECTIVES
Upon successful completion of this course, students will be able to:

- Discuss history and future perspectives of medicinal plants and herbs

- Explain breeding strategies for medicinal plants
- Compare anecdotal and traditional medicine claims of efficacy against scientific literature
- Explain in general terms how hydroponic systems, soilless media, supplemental lighting, and CO_2 enrichment are used to produce high-value crops
- Discuss how physiological stress factors can be used to optimize secondary metabolite production
- Appraise the importance of the medicinal plant niche in horticulture

COURSE MATERIALS

Textbook

The following textbooks are recommended for the course. Links to peer-reviewed reading materials will be made available via canvas.

- *Ball Redbook Volume 2*, Jim Nau (Ed) 2011, 18th Edition. ISBN 978-1-883052-68-3
- *Wicked plants: The Weed that Killed Lincoln's Mother and Other Botanical Atrocities*, Amy Stewart, 2009, 1st edition. ISBN 978-1565126831

COURSE WEBSITE

This course has a comprehensive mini-site in the Canvas platform. Take time to familiarize yourself with the "Start Here", "Syllabus", "Course Materials", and "Grades" tabs in the navigation menu. Digital copies of this syllabus, and other learning materials can be found there.

- *E-Learning in Canvas*, www.elearning.ufl.edu

TECHNOLOGY

Students will need to have access to a laptop computer or tablet to complete the quizzes.

GRADES and GRADES POINTS

For information on current UF policies for assigning grade points, see https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/.

COURSE GRADE

1. Weekly quizzes **28 points**

Each section has one to three quizzes during class. Quizzes will consist of multiple choice and short answer questions. Each quiz will be worth 4 points, and there will be 7 quizzes (Sections 1 and 4: 1 Quiz, Section 2: 2 Quizzes, Section 3: 3 Quizzes) during the semester. Each quiz will be available on Canvas during class and timed, and it can only be taken once. Each instructor will let the class know the date and the time of quizzes. Make up quizzes will be provided in accordance with the attendance policy described above.

2. Medicinal plant case study **40 points**

Students will select one medicinal plant from the provided list and notify Dr. Kim about the selected species. Each species can be selected by up to three students. Once the species is taken by three students, it will be removed from the list. Students will write their own case study to provide practice with technical writing and literature synthesis. Each student will turn in case study reports with the selected species individually at the end of each section. For first section case study, students will write a general description for their medicinal plants including the scientific name, its history, any known bioactive compounds, and impact on human health. For second section, they will compose a breeding strategy to improve the medicinal attributes of this crop. Then, students will write a production of medicinal plants and herbs. Finally, students will write a harvest manual and observation reports on the time and method of collection for two different

medicinal plants. There will be four partial submissions for this case study. Each partial submission will be worth 10 points. Additional guidelines, due dates, and grading rubrics for each submission will be provided via Canvas by the section instructors.

3. Presentation **32 points**

The objective of this assignment is to synthesize the information gathered in the medicinal plant case study from each section to present the selected medicinal crop in the class. The students who select the same species will be a team. Each team will prepare a 5-minute presentation where they will summarize all four section case study contents. On April 26 (Wed), the last class, the teams will present their case studies in the class and all of the team members are expected to participate in the presentation. Additional guidelines and grading rubrics for the presentation will be provided via Canvas.

GRADING SCALE

A	=	95 - 100 points	C	=	< 77 - 73 points
A-	=	< 95 - 90 points	C-	=	< 73 - 70 points
B+	=	< 90 - 87 points	D+	=	< 70 - 67 points
B	=	< 87 - 83 points	D	=	< 67 - 63 points
B-	=	< 83 - 80 points	D-	=	< 63 - 60 points
C+	=	< 80 - 77 points	E	=	<60 points

ONLINE COURSE EVALUATION PROCESS

Student assessment of instruction is an important part of efforts to improve teaching and learning. At the end of the semester, students are expected to provide feedback on the quality of instruction in this course using a standard set of university and college criteria. 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/.

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.

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 when 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

- *Disability Resource Center*, 0001 Reid Hall, (352) 392-8565, https://disability.ufl.edu/

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

Counseling Services Groups and Workshops Outreach and Consultation Self-Help Library Wellness Coaching

- U Matter We Care, www.umatter.ufl.edu/
- Career Connections Center, First Floor JWRU, 392-1601, https://career.ufl.edu/.
- Student Success Initiative, http://studentsuccess.ufl.edu.

STUDENT COMPLAINTS
You can file and resolve any complaints about your experience in this course in the following site:

- Residential Course: https://sccr.dso.ufl.edu/policies/student-honor-code-studentconduct-code/.
- Online Course: http://www.distance.ufl.edu/student-complaint-proces

ACADEMIC RESOURCES
E-learning technical support: Contact the UF Computing Help Desk at 352-392-4357 or via e-mail at helpdesk@ufl.edu.

Library Support: Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center: Broward Hall, 352-392-2010 or to make an appointment 352-392-6420. General study skills and tutoring.

Writing Studio: 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers.

STUDENT RECORDING
Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil

proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.
Policies regarding student in-class recordings are detailed here http://aa.ufl.edu/policies/in-class-recording/.

Breeding and Production of Medicinal Plants and Herbs
2 CREDITS

Week	**Date**	**Lecture Topics**	**Activity-Project**
Kim/Resende/Ken/Liu Week 1 Kim	Jan 9 (Mon)	Class introduction	One quiz for section 1
	Jan 11 (Wed)	Botany and Central Dogma	
Week 2 Kim	Jan 16 (Mon)	No Class	Holiday
	Jan 18 (Wed)	Historical uses of Plants as medicines	
Week 3 Kim	Jan 23(Mon)	Medicinal Plants and Human Health	
	Jan 25 (Wed)	Plant based medicines, Present and Future	
Week 4 Kim	Jan 30 (Mon)	Omics and metabolic engineering	
Week 4 Resende	Feb 1 (Wed)	Review of genetics	Two quizzes for section 2
Week 5	Feb 6 (Mon)	Domestication	

Resende	Feb 8 (Wed)	Breeding methods	
Week 6 Resende	Feb 13 (Mon)	Breeder's equation	
	Feb 15 (Wed)	Breeding for therapeutic compounds: anti-inflammatories, anti-microbials, antioxidants, psychoactives;	
Week 7 Resende	Feb 20 (Mon)	Invited speaker	
	Feb 22(Wed)	*Cannabis breeding*	
Week 8 Cho	Feb 27 (Mon)	Overview of plant secondary metabolism – classification, ecology and biosynthesis	Three quizzes for section 3
	Mar 1 (Wed)	Abiotic factors – Temperature and light	
Week 9 Cho	Mar 6 (Mon)	Abiotic factors II – Salinity, drought and pollution	
	Mar 8 (Wed)	Biotic factors – plant hormones and symbiosis microorganism	
Week 10 Cho	Mar 13 (Mon)	No Class	Spring Break
	Mar 15(Wed)	No Class	Spring Break
Week 11 Cho	Mar 20 (Mon)	Plant propagation – asexual and sexual	
	Mar 22 (Wed)	Micropropagation *in vitro*	
Week 12 Cho	Mar 27 (Mon)	Pest management – Pathogens, disease diagnosis and control	
	Mar 29 (Wed)	Plant production in controlled environment I – soilless culture	
Week 13 Cho	Apr 3(Mon)	Plant production in controlled environment II – LED and vertical farming	
	Apr 5 (Wed)	*In vitro* technologies for mass production of secondary metabolites	

Week 14 Mallory Morgan Liu	Apr 10 (Mon)	Guest Lecture (Mallory Morgan)	
	Apr 12 (Wed)	A Guide to harvesting medicinal plants: Developmental stages of medicinal plants	
Week 15 Liu	Apr17(Mon)	Methods of harvesting medicinal plants	One quiz for section 4
	Apr 19(Wed)	Important medicinal plant – postharvest technologies and uses (Part 1)	
Week 16 Liu Kim/Resende/Ken/Liu	Apr 24(Mon)	Important medicinal plant – postharvest technologies and uses (Part 2)	
	Apr 26(Wed)	Team Presentation	Presentation

List of medicinal plants

1. Nasturtium (*Tropaeolum majus)*
2. Lemon balm (*Melissa officinalis*)
3. Milk thistle (*Silybum marianum*)
4. Roseroot (*Rhodiola rosea*)
5. Yarrow (*Achilea millefolium*)
6. Dogwood (*Cornus florida*)
7. Staranise *(Illicium verum)*
8. Kava *(piper methylsticum)*