



Aquaponics Design

BE 334 (3units)
[ONLINE]

Description of Course

This course begins with an introduction into the field of aquaponics – the culture of fish and plants together and then provides an in depth guide into designing and building aquaponics systems. Various types of aquaponics systems and their parts will be discussed in addition to learning about water pressure and flow in aquaponics systems. The course provides students with hands-on learning activities and offers students the opportunity to engage in an online, group project. Typically offered: Summer, On-Line.

Course Prerequisites or Co-requisites

There are no prerequisites for this class, however Math 111 and Math 112 are recommended

Instructor and Contact Information

Matthew "Rex" Recsetar, Office at CEAC, cell:(847) 814-2741, msreecs@email.arizona.edu

Office Hours: Noon-2:00 pm Wed or by appointment

Course homepage: <https://d2l.arizona.edu/d2l/home/593665>

Course Communications

Students can communicate with the instructor through email (msreecs@email.arizona.edu), or D2I Discussion board

Course Format and Teaching Methods

The course will consist of online mini-lectures, videos, and activities. Weekly discussion posts will be required of which two will be live discussions. There will be two small group activities, one of which will be a final design project of an aquaponic system. There will also be short daily quizzes to assess class participation. In addition, students will be required to complete 4 extracurricular activities designed to familiarize students with working aquaponics systems and aid in discussion posts.

Course Objectives and Expected Learning Outcomes

Course Objectives

This course will:

1. Emphasize the various issues pertaining to aquaponics.
2. Familiarize students with scientific literacy related to aquaponics.
3. Discuss the different types of aquaponics systems and their components.
4. Demonstrate techniques, skills and tools necessary for building an aquaponics system

Student Learning Outcomes

Students can:

1. **Describe** what aquaponics is and **explain** how it works
2. **Identify, describe** and **select** the appropriate aquaponic systems for growing various plants/crops.
3. **Develop** a framework of the various components that are needed to fabricate a successful aquaponics system and estimate its costs
4. **Discuss** the benefits of aquaponics to individuals and society as a whole.
5. **Design** and **Build** a small-scale aquaponics system.

Required Texts or Readings

[There is no required text for this class]

1. Recsetar, M. & Kelly, A. 2015. *Is Aquaponics for you? Realities and Potentials for Arkansas*. University of Arkansas Cooperative Extension Service FSA 9618. 6 pp.
2. Rakocy, J., Losordo, T. & Masser, M. 1992. *Recirculating Aquaculture Tank Production Systems. Integrating Fish and Plant Culture*. SRAC Publication No. 454. 8 pp.
3. Tyson, R.V., Treadwell, D.D., Simonne, E.H. 2011. *Opportunities and challenges to sustainability in aquaponic systems*. Horttechnology, 21 pp. 6-13
4. Somerville, C., Cohen, M., Pantanella, E., Stankus, A. & Lovatelli, A. 2014. *Small-scale aquaponic food production. Integrated fish and plant farming*. FAO Fisheries and Aquaculture Technical Paper No 589. Rome, FAO. 262 pp.
5. Goddek S et al. 2015. *Challenges of Sustainable and Commercial Aquaponics*. Sustainability vol. 7 no. 4, pp. 4199-4224
6. Goddek S, Espinal CA, Delaide B, Jijakli MH, Schmautz Z, Wuertz S, Keesman KJ. 2016. *Navigating towards decoupled aquaponic systems: a system dynamics design approach*. Water 8:303

(PDF links will be provided for the above articles)

Required or Special Materials

Parts for mini-aquaponics system

Required Extracurricular Activities (if any)

Extracurricular activities: 4 of the following activities must be completed:

- Visit the Biosphere 2 (document with pictures and write a paragraph on what you learned or what your favorite part was)
- Arrange to visit the U of A Aquaponics greenhouse with me
- Build a mini aquaponics system with parts from around your house (document with pictures)
- Watch at least 3 aquaponics videos on YouTube and explain what is scientific about the person's claims
- Read a scientific journal article pertaining to aquaponics and write a brief summary

- also commenting on why the research is relevant (1/2 page minimum)
- Visit a local aquaponics system, then take pictures and make a list of pros and cons about the system
- Discuss how aquaponics fits in with the future of food (1 page minimum)

*Specific direction and rubrics for the assignments will be posted in the content area of D2L.

Assignments and Examinations: Schedule/Due Dates

Exams will be online and taken on the assigned day unless there is previous approval by the instructor. 90 minutes will be allowed for exams, which will consist of multiple choice, short answer and fill in the blank questions.

There will be 6 discussion posts required that relate to course material, two of these discussions will be live discussions over Zoom. You will also be required to respond to at least 1 other student's post for each discussion. I will respond with feedback to each of your discussion posts.

*Specific direction and rubrics for the assignments will be posted in the content area of D2L.

Your course grade will be based on Exams and quizzes, a final group project, participation in discussions, and completion of 4 extracurricular activities.

Assignment	Value
Exams (2 @ 80)	160
Final Group project	80
Discussion Board (6 @ 10)	60
Quizzes (12 @ 10)	120
Activities (4 @ 20)	80
Total	500

Final Examination or Project

The final project will consist of you and your group developing plans for an aquaponic system of your choosing. Groups will collaborate using an online meeting platform such as Zoom, Adobe Connect or Google Hangouts, but will be up to each group to decide which they will use. Your project will identify which plants and fish will be grown in your system, and include a complete blueprint of the system with all associated costs. I require that I am present for at least one of your first few group sessions to offer guidance on the project. The design blueprint can be done in AutoCAD, Sketch-up or by hand. Up to 25 points extra credit will be given to groups that build a system, with video or pictures of each step. A short report will be turned in and Each project will be presented in Zoom on the last two days of class. Attendance at other group presentations is encouraged.

The final project will be in lieu of the final exam.

*Specific direction and rubrics for the assignments will be posted in the content area of D2L.

Grading Scale and Policies

DETERMINATION OF CLASS GRADES:

Score	Grade
90-100% (450-500)	A
80-89% (400-449.9)	B
70-79% (350-399.9)	C
60-69% (300-349.9)	D
Below 300	E

GRADE DEFINITIONS

A: Achievement that is outstanding relative to the level necessary to meet course requirements.

B: Achievement that is significantly above the level necessary to meet course requirements.

C: Achievement that meets the course requirements in every respect.

D: Achievement that is worthy of credit even though it fails to fully meet the course requirements.

E: Represents failure (no credit) and signifies that the work was not worthy of credit or was not completed.

Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policies, which are available at <http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete> and <http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal> respectively.

Dispute of Grade Policy

Students will have one week to dispute a grade on a project, quiz or exam.

Scheduled Topics/Activities

List topics in logical units in a weekly/daily schedule, including assignment due dates and exam dates.

Week	Date	Day	Video, PowerPoint, and Class Notes	Homework Due	D2L Quiz Due
1	6-8	M	Introduction to Aquaponics, Reading 1 (Recsetar and Kelly)	Discussion 1: Why is aquaponics important?	Quiz 0 (Inventory) Quiz 1
	6-9	T	Floating raft Systems, Reading 2 (Rakocy et. Al)		Quiz 2
	6-10	W	NFT Systems		Quiz 3
	6-11	R	Media Bed Systems 1		Quiz 4
	6-12	F	Filters; Reading 3 (Tyson)	First Extracurricular Activity	
2	6-15	M	Caring for Fish and Plants Reading 4 (Sommerville et. al)	Discussion 2: Which system would you choose and why?	Quiz 5
	6-16	T	Selecting the Appropriate Systems		Quiz 6
	6-17	W		Exam 1	
	6-18	R	Working with PVC	Discussion 3: Reevaluation of discussion 2	
	6-19	F	Designing your system	Second Extracurricular	Quiz 7

			Reading 5 (Goddek et. al 2015)	Activity	
3	6-22	M	Selecting and Gathering Materials		Quiz 8
	6-23	T	Aeration	Discussion 4: Which type of system is cheapest and/or easiest to build?	Quiz 9
	6-24	W	Sizing pumps and Systems		
	6-25	R	Pressure and Flow 1		
	6-26	F	Pressure and Flow 2	Third Extracurricular Activity	Quiz 10
4	6-29	M	Innovative Design 1 Reading 6 (Goddek et. al 2016)		
	6-30	T	Innovative Design 2	Discussion 5: Possible Innovation	Quiz 11
	7-1	W	Upkeep and Troubleshooting	Discussion 6: The most difficult factor in aquaponics production?	
	7-2	R	Insects and Pests	Fourth Extracurricular Activity	Quiz 12
	7-3	F		EXAM 2	
5	7-6	M	Work on Group Projects		Quiz 13
	7-7	T		Project Presentations	
	7-8	W		Project Presentations	

Absence and Class Participation Policy

The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: <http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop>

The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, <http://policy.arizona.edu/human-resources/religious-accommodation-policy>.

Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: <https://deanofstudents.arizona.edu/absences>

Participating in the course and viewing online lectures and other course events are vital to the learning process. As such, attendance of online lectures as scheduled is recommended and if a student must miss the lecture session, they are required to view the recorded lecture as soon as possible. Students who miss quizzes due to illness or emergency are required to bring documentation from their health-care provider or other relevant, professional third parties. Failure to submit third-party documentation will result in a zero on the quiz.

Makeup Policy for Students Who Register Late

Since this is a 5-week summer course, students will only be allowed to miss the first 3 days due to late registration. These students will be allowed to complete past assignments as deemed appropriate by the instructor

Threatening Behavior Policy

The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See <http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students>.

Accessibility and Accommodations

At the University of Arizona we strive to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, you are welcome to let me know so that we can discuss options. You are also encouraged to contact Disability Resources (520-621-3268) to explore reasonable accommodation. For additional information on the Disability Resource Center and reasonable accommodations, please visit <http://drc.arizona.edu>.

If our class meets at a campus location: Please be aware that the accessible table and chairs in this room should remain available for students who find that standard classroom seating is not usable.

Code of Academic Integrity

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See: <http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity>.

The University Libraries have some excellent tips for avoiding plagiarism, available at <http://www.library.arizona.edu/help/tutorials/plagiarism/index.html>.

Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

UA Nondiscrimination and Anti-harassment Policy

The University is committed to creating and maintaining an environment free of discrimination; see <http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy>

Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Additional Resources for Students

UA Academic policies and procedures are available at <http://catalog.arizona.edu/policies>

Student Assistance and Advocacy information is available at <http://deanofstudents.arizona.edu/student-assistance/students/student-assistance>

Confidentiality of Student Records

<http://www.registrar.arizona.edu/personal-information/family-educational-rights-and-privacy-act-1974-ferpa?topic=ferpa>

Subject to Change Statement

Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.