



THE UNIVERSITY OF ARIZONA  
COLLEGE OF AGRICULTURE & LIFE SCIENCES  
COLLEGE OF ENGINEERING

## Biosystems Engineering

BAT BE 201 (2 credit hours): Introduction to Biosystems Analytics, Technology, and Engineering  
Tuesdays & Thursdays from 3:30 PM to 4:20PM – Shantz Building #38; Room 440

### Description of Course

This course introduces the focus areas within the Biosystems Engineering department and introduces career development skills. Through a survey of the focus areas of the department, students will participate in lectures, tours, visits, hands-on activities, and presentations by alumni. Emphasis is placed on building critical thinking skills to solve problems in the biosystems fields. Discussion topics include internship opportunities and professionalism. Laboratory exercises may include assembling a landscape irrigation system, demonstrating drones, using sensors and controls in controlled environment agriculture settings, using an Arduino or Raspberry Pi to control a device, and biological sensing. Presentations, guest speakers, discussions, and writing exercises provide communication experiences.

### Course Prerequisites or Co-requisites

MATH 122B or MATH 124 or MATH 125 or permission of Academic Advisor

### Instructors and Contact Information

Dr. Akrum H. Tamimi, Professor of Practice; Forbes Bldg. #36, room 140;  
520-621-9663; [akrumt@arizona.edu](mailto:akrumt@arizona.edu)

Office Hours: "Open Door Policy"; I am on campus all weekdays, please make an appointment via email to make sure I am in my office. Zoom can be used for appointments.

Ms. Dava Jondall, Academic Program Manager; 425C Shantz,  
520-621-1753; [davaj@arizona.edu](mailto:davaj@arizona.edu)

Office Hours: by appointment

D2L: <https://d2l.arizona.edu/d2l/home/1048523> or [Homepage - BAT BE 201 FA21 001 301 \(arizona.edu\)](https://d2l.arizona.edu/d2l/home/1048523)

### Course Format and Teaching Methods

This is a flipped class. It will be taught in a collaborative, interactive way. Part of the homework and activities will be completed outside the class and other parts will be conducted and completed during class time. Therefore, to get credit for in-class work students need to be present in class.

Students are responsible to check materials, assignments, quizzes, and announcements posted to D2L on a regular basis. Materials will be posted to D2L before it is covered in class. The students will be required to review the materials and take quizzes before class time. In class, a short lecture will be presented emphasizing the main points and to answer students' questions. Quizzes and/or a Questions Game will be conducted to emphasize learning objectives for the lecture. Students are required to participate in the discussion and in the quizzes and Questions Games as part of groups to get credit. Students will be able to ask questions about the homework assignments related to the out-of-class building circuits activities and assignments.

### Course Objectives

1. Department of Biosystems Engineering themes and research topics

2. Research labs and fabrication facilities available to students
3. Biological and microbiological skills
4. Monitoring systems and environmental factors
5. Career development, internships, and public speaking skills

## Expected Learning Outcomes

At the conclusion of the course, students will be able to

1. Identify and build simple sensors and controls to measure and monitor agricultural, control environment agricultural, and environmental factors utilizing Raspberry Pi
2. Practice critical thinking skills to solve biological challenges and apply in professional development
3. Define Renewable Energy and Organic Residuals concepts
4. Recognize Controlled Environment Agriculture elements and processes
5. Use Biosystems Analytics and Technology tools
6. Identify with data science and number crunching tools
7. Describe the use of Drones in biosystems engineering and data analytics
8. Utilize biosensors in monitoring biosystems
9. Articulate the potential of associating big data gathering using biosystems technology, data science, and analytics

## 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 attending lectures and other course events are vital to the learning process. As such, attendance is required at all lectures and discussion section meetings. Absences may affect a student's final course grade. If you anticipate being absent, are unexpectedly absent, or are unable to participate in class online activities, please contact me as soon as possible. To request a disability-related accommodation to this attendance policy, please contact the Disability Resource Center at (520) 621-3268 or [drc-info@email.arizona.edu](mailto:drc-info@email.arizona.edu). If you are experiencing unexpected barriers to your success in your courses, the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office is located in the Robert L. Nugent Building, room 100, or call 520-621-7057.

## Makeup Policy for Students Who Register Late

If you register after the first class meeting, you can make up missed assignments/quizzes and the deadline for doing so will be determined case-by-case. Please talk to the instructor to determine those due dates.

## Course Communications

Official UA e-mail address and the course D2L

## Required Texts or Readings

No textbook is required for this course. Handouts in the form of PDF files for specific topics will be provided by the instructor via D2L.

## Required or Special Materials

You are expected to bring a laptop to every class meeting. The laptop will be used for Zoom Classes, taking quizzes including a daily attendance quiz and to work on and submit your individual and group in-class assignments. In addition, you are required to purchase a Raspberry Pi package. Circuit elements, sensors, and controls will be provided by the instructor.

Raspberry Pi 3 basic starter kit

- Raspberry Pi 3
- Heat sinks
- Power cable
- Case

More Information on how and where to purchase those materials will be provided on D2L.

## Required Extracurricular Activities

Students are expected to build few biosystems tools during the semester to develop hands-on experience based on the course learning objectives. Virtual and actual tours and visits will be part of this class.

## Assignments and Examinations: Schedule/Due Dates

The schedule listed below shows assignments for each week. Quizzes are due at the end of the day they are assigned. Other homework assignments are usually due one week after assignment is assigned. There will be a final project which is part of career development module. There will be assignments for every week as shown in the schedule below.

You can request a review of your grade for any homework, quiz, or activity. You have two weeks to discuss your grade after the due materials are graded and returned. There will be no credit for late quizzes, homework, and assignments.

## Final Examination or Project

The date and time of the final exam are as per UA Academic calendar and will be announced in class. Due dates for project presentation, evaluation, and report submission are per schedule shown below. Please see Final Exam Regulations, <https://www.registrar.arizona.edu/courses/final-examination-regulations-and-information>, and Final Exam Schedule, <http://www.registrar.arizona.edu/schedules/finals.htm>

There will be no final exam for this course.

## Grading Scale and Policies

Grade distribution for the course are shown in the table below. University policy regarding grades and grading systems is available at <http://catalog.arizona.edu/policy/grades-and-grading-system>

No.	Module (Topic)	Grade
1	Attendance / Participation	10
2	Career Development	20
3	Controlled Environment Agriculture	10
4	Biosystems Analytics	8
5	Sensors and Controls	12
6	Biosensors	8
7	Water Resources / Irrigation	10
8	Renewable Energy	12
9	BE Fabrication Tour	5
10	Internship Videos/Posters	5
<b>11</b>	<b>Total</b>	<b>100</b>

Letter Grade	% Upper Limit	% Lower Limit
<b>A</b>	<b>100</b>	<b>90</b>
<b>B</b>	<b>89</b>	<b>80</b>
<b>C</b>	<b>79</b>	<b>65</b>
<b>D</b>	<b>64</b>	<b>60</b>
<b>E</b>	<b>59</b>	<b>0</b>

## Incomplete (I) or Withdrawal (W):

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

All grades can be disputed within 2 weeks of posting them on D2L.

## Scheduled Topics/Activities

Schedule of topics and activities is **shown on the next page.**

## Classroom Behavior Policy

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).

Students are asked to refrain from disruptive conversations with people sitting around them during lecture. Students observed engaging in disruptive activity will be asked to cease this behavior. Those who continue to disrupt the class will be asked to leave lecture or discussion and may be reported to the Dean of Students.

## 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

Please visit Disability Resource Center website: <http://drc.arizona.edu/instructors/syllabus-statement>.

## 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://new.library.arizona.edu/research/citing/plagiarism>.

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.

Module Class No.	Date (2021)	Activity Leader	Module	Topic	Presenter(s)	Homework Assignment
0	Tue Aug 24	Dr. Akrum Tamimi & Ms. Jondall	Introduction	Course Syllabus, Course Format, course modules. Everyone Introducing themselves	Dr. Tamimi, Ms. Dava Jondall	
1	Thu Aug 26	Dr. Akrum Tamimi & Ms. Jondall	Career Development	What is a Flipped Class? Complete in class assignment. Description of the BAT and the BE Programs. Explain VT Homework.	Dr. Tamimi, Ms. Dava Jondall	VT 1 Introduction of Self Due: Initial Post Aug 27, Response Post Aug 29
1	Tue Aug 31	Dr. Stephen Poe	Water Resources / Irrigation	Lecture	Dr. Poe	View Presentation 1 and take quiz
2	Thu Sep 2			Hands-on Activity	Dr. Poe	View Presentation 2 and take quiz
3	Tue Sep 7			Guest Lecturer	TBD	View Presentation 3 and provide module Reflection
2	Thu Sep 9	Ms. Dava Jondall	Career Development	Survival Guide Crash Course on Surviving College (-Emotional Intelligence and Leadership Skills + Resources D2L BE Undergraduate site)	Ms. Jondall	Complete Quiz on BAT/ BE D2L Undergraduate Site by Sept 12
1	Tue Sep 14	Mr. Michael Mason	Tour	BE Fabrication Shop	Mr. Mason	Google Location, Take Virtual Tour, Fill out Safety Form and Sign it
1	Thu Sep 16	Dr. Tamimi	Biosystems Analytics	Biosystems Analytics Presentation	Dr. Tamimi	Read Introduction to Data Science Chapters, Take Quiz
3	Tue Sep 21	Ms. Dava Jondall	Career Development	Resume and Cover letters- preparing for internships	Ms. Jondall	Bring Resume to class- for peer review. Upload revised resume by Oct 12
2	Thu Sep 23	Dr. Tamimi	Biosystems Analytics	Hands-on Activity	Dr. Tamimi	Bring your laptop to class. Install Python on your laptop. In class Python programming. Install at least one library on your laptop. Turn in report. For Python Use Windows 10. If you are using a MAC computer, try to borrow Windows 10 from Library
3	Tue Sep 28			Biosystems Analytics company rep/alumni	TBD	Provide Module Reflection
1	Thu Sep 30	Mr. Brian Little & Dr. Akrum Tamimi	Intro to Applied Sensors & Controls	Basic Electronic Concepts	Mr. Brian Little	Arduino Virtual Lab
2	Tue Oct 5			Basics of programming Languages; python and Arduino's C+		Rpi CPU Monitor
3	Thu Oct 7			Basics of Data Recording and Analysis		Display Rpi's IP on LCD
4	Tue Oct 12			Basics of Automation		Reflection
4	Thu Oct 14	Ms. Dava Jondall	Career Development	Internship procedures/ Creating LinkedIn and Handshake profiles for internships	Ms. Jondall	Create a Handshake account, find three internship postings, complete VT reflection by Oct 24
1	Tue Oct 19	Dr. Jeong-Yeol Yoon	Biosensors	Hands-on Activity	Dr. Yoon	Read of "A review of biosensor technologies for blood biomarkers" Paper and take quiz
2	Thu Oct 21			Lecture	Dr. Yoon	
3	Tue Oct 26			Guest Lecturer	TBD	Provide Module Reflection
1	Thu Oct 28	Dr. Tamimi	Internship Videos/Posters	Dr. Kitt's Internship Presentations	Dr. Tamimi	View and Reflect
1	Tue Nov 2	Dr. Tamimi	Renewable Energy: Treatment and Reuse of Organic Residuals	In Class Activity - Groups: different types of renewable energy	Dr. Tamimi	Group Report-Types of renewable energy
2	Thu Nov 4			Anaerobic Digestion and Methane Gas	Dr. Tamimi	Read "Sources of microbial pathogens in municipal solid waste in the United States of America" and Take Quiz
3	Tue Nov 9			Organic and Inorganic Sludges	Dr. Tamimi	Read "Biosolids Application for Barley Production" and Take quiz
	<b>Thu Nov 11</b>	<b>Veterans Day, No Classes</b>				
1	Tue Nov 16	Dr. Murat Kacira	Controlled Environment Agriculture	CEA presentation	Dr. Kacira	Review E. Tamimi et. Al 2013
2	Thu Nov 18			Hands-on Activity	Dr. Kacira	View Presentation
3	Tue Nov 23			CEA company rep/alumni	TBD	CEA Quiz
0	<b>Thu Nov 25</b>	<b>Thanksgiving Day, No Classes</b>				
4	Tue Nov 30	Dr. Tamimi	Renewable Energy: Treatment and Reuse of Organic Residuals	Water-Solids Separation Technologies; FEW Nexus: Food, Energy and Water	Dr. Tamimi	Read "Innovations for Long Term Resilience and Sustainable Nexus of Food, Energy and Water System" and Take Quiz; provide Module Reflection
5	Thu Dec 2	Ms. Dava Jondall	Career Development	Final: Careers and Professional Development Video Reflection	Ms. Dava Jondall	Video Presentation Assignment (upload link) Final Video Reflection: Starts 8-31; Ends Dec. 2.
	Tue Dec 7	Dr. Akrum Tamimi	End of Semester	Wrap-up, Evaluation, What's next	Dr. Tamimi	
	<b>Thu Dec 9</b>	<b>Reading Day, No Classes</b>				

All information presented in the table shown above will be presented in D2L with details.

## 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.