

SOS 324: Sustainable Energy Technology and Systems

Class Number:

Credit Hours: 3

Semester and Year:

Prerequisite(s) Sustainability or Business (Sustainability) major; SOS 110 and SOS 111 (or PUP 190) with C or better OR Non-Sustainability major with 2 of the following courses: SOS 100, SOS 110, SOS 111 (or PUP 190), SOS 300 with C or better.

Instructor Information

Name:

Phone:

Office:

Office Hours:

Direct all communication through the Canvas Inbox. See Course Communication Policy below.

Course Textbook and Materials

Textbook

There are no textbooks required for this course. Each Module's content consists of articles and videos related to current topics and events.

New York Times

This course includes readings from New York Times.

Note that ASU offers all students a free subscription to the New York Times. Navigate to [Free Digital Access to News and Films](#) to activate your free, digital New York Times group pass.

Respondus LockDown Browser

This course uses Respondus LockDown Browser for quizzes and/or exams.

Course Description

A comprehensive survey of current and future energy systems; thermodynamics and energy analysis; environmental, economic and social impacts; resources, technologies and infrastructure for electricity and transportation.

Course Overview

This course is part of the sustainable energy, materials, and technology track in the undergraduate degrees in the School of Sustainability. It provides a comprehensive survey of current and future energy systems, including an analysis of their environmental, economic, and social impacts. The course has three focus areas:

- (1) Primer on physical, economic, and environmental metrics for energy, including how society uses energy, available energy resources, efficiency, economic costs, and environmental impacts
- (2) Survey of electricity systems and technologies, including gas, coal, nuclear, solar, wind, hydropower, geothermal, energy storage, and demand management
- (3) Survey of transportation systems and fuel/vehicle technologies, including petroleum, biofuels, electric vehicles, and hydrogen in passenger and freight modes of transportation.

Although the course has a strong technical and quantitative component, it also explores the human dimensions of energy systems. Choosing between alternative energy sources is complex, and this course teaches students to evaluate the trade-offs.

Course Outcomes

By the end of this course students will be able to:

- CO 1: Evaluate basic processes for energy production, conversion, distribution, and use in the electricity and transportation sectors.
- CO 2: Analyze economic, social, and environmental aspects of energy generation and utilization.
- CO 3: Propose solutions to challenges to transitioning to a more sustainable energy mix.

Course Schedule *(subject to change: see syllabus disclaimer)*

Module Topics and Objectives	Assignments Due
Course Information and Resources	- Course Readiness Confirmation - Student Honor Code
Module 1: Introduction to Energy Systems 1.1: Explain the use of energy in society by sector and source. 1.2: Relate current energy generation and usage to the state of the environment and economy in the US. 1.3: Evaluate the sufficiency of energy resources locally, nationally, and globally. 1.4: Calculate energy efficiency and discuss technical limits to efficiency.	- Mod. 1 Discussion: Introduce Yourself - Mod. 1 Discussion: Lowering My Energy Consumption - Problem Set 1: Exploring Energy Consumption and Efficiency - Mod. 1 Quiz: Physics of Energy
Module 2: Evaluation of Energy Options 2.1: Calculate payback on energy investments. 2.2: Calculate levelized cost of energy. 2.3: Calculate greenhouse gas emissions for an energy mix. 2.4: Describe the methodology and limitations of lifecycle analysis. 2.5: Explain fluctuation in grid supply and demand.	- Mod. 2 Small Group Discussion: Lifecycle Diagrams - Mod. 2 Discussion: Lifecycle Carbon Intensities - Mod. 2 Quiz: Environmental and Economic Assessment - Problem Set 2: Economic Evaluation
Module 3: Generating Electricity 3.1: Describe the process for creating electricity from conventional resources. 3.2: Compare costs, greenhouse emissions, and air quality. 3.3: Explain how electricity supply is managed in response to demand. 3.4: Identify environmental and social impacts of electricity systems.	- Mod. 3 Discussion: Cheap Natural Gas - Mod. 3 Quiz: Conventional Electricity - Problem Set 3: Conventional Electricity
Module 4: Renewable Electricity 4.1: Describe the process for creating electricity from renewable resources. 4.2: Compare costs, greenhouse emissions, and air quality. 4.3: Explain needed changes to management of electricity systems. 4.4: Identify environmental and social impacts of electricity systems. 4.5: Evaluate risks and benefits of different pathways of electricity generation.	- Mod. 4 Quiz: Renewable Electricity - Problem Set 4: Solar Power - Intermittent Renewables Essay
Module 5: Transportation Systems 5.1: Compare the amount of energy used in different modes of transportation. 5.2: Calculate the amount of energy used to move a vehicle. 5.3: Explain the mechanics of combustion engines.	- Mod. 5 Quiz: Conventional Vehicles - Problem Set 5: Road Load and Conventional Vehicles - Explaining Combustion Engines Presentation
Module 6: Social and Environmental Issues in Transportation Systems 6.1: Compare lifecycle greenhouse gas emissions from conventional, hybrid, and electric vehicles.	- Mod. 6 Discussion: Development Patterns and Energy Consumption - Mod. 6 Quiz: Alternative Fuels

6.2: Describe the generation of air pollution from vehicles and the technology for reducing pollution	• Problem Set 6: Alternative Fueled Vehicles • Electric Vehicles Analysis
6.3: Compare environmental impacts of different modes of transportation	
Module 7: Evaluation of Future Scenarios	• Mod. 7 Small Group Discussion: Debate • Debate Reflection • Policy Brief Part 1: Written Brief • Policy Brief Part 2: Presentation
7.1: Analyze an energy policy or energy investment decision incorporating multiple aspects of sustainability	
7.2: Explain barriers to a transition to a more sustainable energy system	

Grading Scale

This course will be graded on an A-E plus/minus scale.

%	Grade
97 to 100%	A+
93 to < 97%	A
90 to < 93%	A-
87 to < 90%	B+
83 to < 87%	B
80 to < 83%	B-
77 to < 80%	C+
70 to < 77%	C
60 to < 70%	D
Below 60%	E = Failing, participated in class
-	EN = Failing, never participated
-	EU = Failing, insufficient participation in class and did not complete
-	XE = Academic dishonesty

Math Resources

The course requires you to solve quantitative problems. If you need a refresher or extra help in solving these problems, there are optional resources available in the Module 1 Readings and Viewings.

Submitting Assignments

All time frames used in class follow Arizona Mountain Standard Time (MST). Arizona does not observe daylight saving time (DST) from March through November; therefore, the time in Arizona will not align with other places that are on MST for half the year. Use a [Time Converter](#) to ensure you account for the difference in Time Zones.

All assignments, unless otherwise announced, MUST be submitted to the designated area of Canvas. Do not submit an assignment via email (unless asked to do so).

Assignments and assessments will not be due on observed holidays; however, due to the accelerated nature of online courses, students should not count on taking time off from studying and working on coursework due to holidays.

Late or Missed Assignments

All assignments must be completed and submitted on time. No credit will be given for late assignments.

Attendance and Absences

Please follow the appropriate university policies to request absences or accommodations related to [ACD 304–04 Accommodation for Religious Practices](#) and [ACD 304–02 Missed Classes Due to University-Sanctioned Activities](#).

Course Delivery and Access

Students will participate in this course through Canvas. Course content will be delivered in Canvas through videos readings, discussion boards, quizzes, and assessments. Course content and assignments will be accessed online in Canvas, which can be accessed by both my.asu.edu.

Preparation for class means reading the assigned readings and reviewing all information required for that week. Attendance in an online course means logging into Canvas on a regular basis and participating in all the activities that are posted in the course.

Community of Care

The health of the Sun Devil community is a top priority. This situation has raised many questions. If you have an issue that is not addressed here, please call 1-855-278-5080 or use the live-chat option at uto.asu.edu/ExperienceCenter/chat

Review the ASU statement about face covering from 6/12/20:

“Effective immediately at Arizona State University, face coverings will be required for all employees, students and visitors while in buildings. Face coverings will also be required in outdoor community spaces where social distancing isn’t possible. Examples of outdoor community spaces include garages and parking lots, ASU shuttles, bicycle racks and sidewalks.”

- [Community of Care Refresher](#)
- [Live well, be well](#)

Studying and Preparation Time

The course requires you to spend time preparing and completing assignments. A three-credit course requires 135 hours of student work. Therefore, expect to spend approximately 20 hours a week preparing for and actively participating in this course.

Course Communication Policy

Three Before Me

This course uses a "three-before-me" policy regarding student/instructor communications. When course-related questions arise, please check these three sources for an answer before emailing the instructor with your question:

1. Course Syllabus
2. Canvas Announcements
3. Community Forum: This is a discussion forum in Canvas used for general questions about the course. You are encouraged to respond to your classmates' questions and comments.

Canvas Inbox

All student/instructor communication will be directed through the Canvas Inbox. This ensures the security, privacy, and record of the communication. Note: You must have your primary Canvas email address set as your asurite@asu.edu, not firstname.lastname@asu.edu or a personal email account.

Computer Requirements

A smartphone, iPad, Chromebook, etc. will not be sufficient for completing your work in online courses. While you will be able to access course content with mobile devices, you must use a computer for some assessments.

This course requires a computer with Internet access and the following:

- Web browsers ([Chrome](#), [Internet Explorer](#), [Mozilla Firefox](#), or [Safari](#))
- [Adobe Acrobat Reader](#) (free)
- A webcam, microphone, headset/earbuds, and speaker
- Microsoft Office ([Microsoft 365](#) is free for all currently-enrolled ASU students)
- Reliable broadband internet connection (DSL or cable) to stream video

See [Technology and time: Important factors for ASU Online students](#) for additional information.

Course Evaluations

Students are expected to complete the course evaluation. Feedback provides valuable information to the instructor and the college and is used to improve student learning. Students are notified when the online evaluation form is available and students can access it through myASU as well. See [Student FAQs](#) for more information.

Accessibility (Online)

All students should have equal technology opportunities in the classroom. For information about the resources offered by ASU and the technologies commonly used in ASU Online courses, consult the following resource: [ASU Online Student Accessibility](#).

Add/Drop/Withdrawals Deadline

ASU's [Academic Calendar](#) contains important dates by which you can add or drop this course without penalty called "Last Day to Drop/Add Without College Approval". After this date, if you choose to withdraw from the course, you may do so by the "Course Withdrawal Deadline," but will receive a 'W' on your official transcript. Consult with your advisor and notify your instructor if you have questions about [Drop/Add and Withdrawal](#).

ASU Course Policies (Online)

Consult [ASU Online Course Policies](#) for information on course time commitment, drop/add dates and withdrawals, photo ID, grade appeals, netiquette, prohibition of harassment, student conduct and academic integrity, Title IX, disability accommodations, inclusion, mental health, course evaluation, trigger warning, academic affairs manual and more.

Discrimination, Harassment, and Retaliation

[ACD-401 Prohibition against Discrimination, Harassment, and Retaliation](#), prohibits discrimination, harassment or retaliation on the basis of race, sex, gender identity, age, religion, national origin, disability, sexual orientation, and veteran status. Violations of this policy

may result in disciplinary action, including termination of employees or expulsion of students. Contact the Office of Student Rights and Responsibilities at (480) 965-6547, if you feel another student is harassing you based on any of the factors above; contact the Office of Equity and Inclusion at (480) 965-5057 if you feel an ASU employee is harassing you based on any of the factors above.

Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at <https://sexualviolenceprevention.asu.edu/faqs>.

As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. [ASU Counseling Services](#) is available if you wish to discuss any concerns confidentially and privately. ASU online students may access [360 Life Services](#).

Disruptive Student Behavior

Students are entitled to receive instruction free from interference by other members of the class. An instructor may withdraw a student from the course when the student's behavior disrupts the educational process per the [SSM 201-10 Instructor Withdrawal of a Student for Disruptive Classroom Behavior](#) and [SSM 104-02 Handling Disruptive, Threatening, or Violent Individuals on Campus](#) policies.

Appropriate online behavior (also known as netiquette) is defined by the instructor and includes keeping course discussion posts focused on the assigned topics. Students must maintain a cordial atmosphere and use tact in expressing differences of opinion. Inappropriate discussion board posts may be deleted by the instructor.

Email and Internet

You must have an active ASU email account and access to the Internet. ASU email is an [official means of communication](#) among students, faculty, and staff. Students are expected to read and act upon email in a timely fashion. Students bear the responsibility of missed messages and should check their ASU-assigned email regularly. All instructor correspondence will be sent to your ASU email account.

Emergency Evacuation Plan

Students should be aware of the evacuation route posted on the exit door of each classroom. Students who cannot walk up or down stairs should notify the instructors as early in the course as possible so the instructors can provide information regarding the location of a designated meeting area on each floor of the building.

Grade Appeals

Grade disputes must first be addressed by discussing the situation with the instructor. If the dispute is not resolved with the instructor, the student may appeal to the School of Sustainability per the [University Policy for Student Appeal Procedures on Grades](#). See additional instructions for [undergraduate SOS courses](#) and [graduate SOS courses](#) (under Grade Appeal).

How Long Students Should Wait for an Absent Instructor

In the event the instructor fails to indicate a time obligation, the time obligation will be 15 minutes for class sessions lasting 90 minutes or less, and 30 minutes for class sessions lasting more than 90 minutes. Students may be directed to wait longer by someone from the academic unit if they know the instructor will arrive shortly.

Power and System Outages

In the event of a power outage or other event affecting the ability of the University to deliver ground and online classes, any decision to cancel classes will be announced using the ASU emergency notification system for ground campus students. Ground campus students should register with the [ASU LiveSafe](#) mobile app. Additionally, ground campus and online students can learn about power and system outages on the [ASU System Health](#) site.

Prohibition of Commercial Note Taking Services

Course content, including lectures, are copyrighted materials. Students may not share outside the class, upload, sell, or distribute course content or notes taken during the conduct of the course (see [ACD 304-06 Commercial Note Taking Services](#) for more information).

Student Code of Conduct and Academic Integrity

Students have the responsibility to understand and follow ASU's [Student Code of Conduct](#) and [Academic Integrity Policy](#). You may face ethical decisions during your time as a student. If you're not sure whether or not something is permitted, it is your responsibility to ask questions or find out by doing more research using the links above. Any violations in this course are subject to sanctions and will be reported to the School of Sustainability and the college or school of your major.

The Office of Student Rights and Responsibilities accepts [incident reports](#) from students, faculty, staff, or other persons who believe that a student or a student organization may have violated the Student Code of Conduct.

Academic Integrity (also known as cheating, copying others' work, or even reusing your own work) falls under the Student Code of Conduct. Possible sanctions for violations include, but are not limited to, appropriate grade penalties, course failure (indicated on the transcript as a grade of E), course failure due to academic dishonesty (indicated on the transcript as a grade of XE), suspension, and expulsion.

Beware that some websites promote themselves as tutoring and educational resource sites, but may actually be sites that put you at risk for an academic integrity violation if you are using the services to submit work that is not your own or gain knowledge of what to expect on a quiz or exam.

Important: Students must refrain from uploading to any course shell, discussion board, or website used by the course instructor or other course forum, material that is not the student's original work, unless the students first comply with all applicable copyright laws; faculty members reserve the right to delete materials on grounds of suspected copyright infringement.

Students with Disabilities

ASU's Disability Resource Center (DRC) is the entity that provides services to students with disabilities. If you desire accommodation for this course, [contact the DRC](#) to establish your eligibility and make sure they can provide you with the services you will need for this course. Students with disabilities must meet the same standards, deadlines, etc. as any other student in the course.

Technical Support Contact Information

If you are experiencing technical issues, visit the [My ASU](#) "Service Center" tab for immediate support, to review answers to frequently asked questions, or to submit a request for service.

The number for immediate assistance is 1-855-278-5080 with staff available 24 hours/day, 7 days/week to help direct your call. Also see [ASU's Contact Us](#) page. Known issues and system outages will be shared on [ASU's System Health](#) site.

Students also have access to several [computing sites](#).

Additional Information and Resources

- [School of Sustainability](#) – this course is offered through the School of Sustainability at Arizona State University. Questions about the course should first be addressed with the instructor. If necessary, you can also contact the school at (480) 727-6963 or schoolofsustainability@asu.edu.
- [Career Services](#) – offers assistance to students in choosing their major, setting career goals, interviewing and job hunting strategies. Students pursuing a degree program through the School of Sustainability also have access to a [sustainability career advisor](#).

- [Counseling Services](#) – professional counseling and crisis services for students experiencing emotional concerns, problems in adjusting, and other factors that affect their ability to achieve their academic and personal goals. Support is available 24/7 between campus locations and EMPACT's 24-hour ASU-dedicated crisis hotline.
- [Financial Aid and Scholarship Services](#) – offers information and applications for student funding such as grants, loans, scholarships and student employment.
- [GPA Calculator](#) – students can use this calculator to project their GPA.
- [Health Services](#) – provides non-emergency medical health care to all ground campus ASU students regardless of insurance status. Most visits with a physician or nurse practitioner are free of charge, but fees will be incurred for x-rays, lab results, etc.,
- [Libraries](#) - offers 24/7 access to librarians through "Ask a Librarian" online chat and help by librarians in person at the Reference Desk during most hours the libraries are open.
- [ASU Online Students](#) – students pursuing fully online programs have access to success coaches and additional tips for success.
- [Sun Devil Fitness](#) – offers individual and group fitness opportunities, as well as information on nutrition and wellness, and massages. Use of the general facilities (weights, circuit training and cardio machines) are free, other services (yoga classes, massages) are fee-based.
- [Tutoring and Writing Centers](#) – provides students with academic support services such as tutoring, peer advising, computer assisted instruction, writing support, and supplemental instruction
- [Contact Arizona State University](#) – provides frequently asked question resources and contact information for new questions.

Syllabus Disclaimer

All syllabi are subject to minor changes to meet the needs of the instructor, school, or class. Every effort will be made to avoid changing the course schedule, but the possibility exists that unforeseen events will make syllabus changes necessary. The instructor reserves the right to make changes to the syllabus as deemed necessary. Students will be notified in a timely manner of any syllabus changes. Please check your ASU email and the Announcements on the course site often.

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