

Transportation Technologies

Syllabus

» Course Overview

This course introduces students to the newest and most cutting edge futuristic transportation technologies out there. Students gain familiarity with the history of transportation development and understand a framework with which to evaluate new transportation modes. Then the course dives into 10 different technologies on the horizon. Students examine the technologies, the pros and cons of each mode, and explore potential career paths in these emerging fields.

» Course Outline by Module

Module 1	Introduction to the Future of Transportation	Module 7	Jetpacks
Module 2	Flying Cars	Module 8	Supersonic Jets
Module 3	Driverless Car Technology	Module 9	Personal Rapid Transit
Module 4	Driverless Cars in Society	Module 10	Supercavitation
Module 5	Drones	Module 11	Space Travel
Module 6	Hyperloop	Module 12	Interstellar Travel

» Module Overview and Learning Objectives

| Module 1. Introduction to the Future of Transportation

How different would your life be if your only alternative to walking to your destination was to saddle up a horse and ride there? Before steam engines, when horse transportation was your best option, people probably didn't give it much thought. People saddled up their horses or jumped in their wagons. That was just life! It's only because we now know the convenience of cars and airplanes that the idea of only being able to take a horse seems painfully slow, horribly uncomfortable, and woefully inefficient. What will people 100 years from now say about the transportation of our era? How much more speedy, efficient and safe will transportation be then?

This module aims to answer those questions. It will start by reviewing the history of transportation and how key inventions of transportation modes led to big changes in society. It takes a look at where we stand today, including problems with our current infrastructure and transportation systems. Finally, the module introduces some of the newest emerging transportation technologies like flying cars, hyperloop, and driverless cars, just to name a few.

Learning Objectives: In this module, students will:

- Outline the history of transportation and contrast past technological changes with current opportunities
- Define ubiquity and discuss adoption of previous technologies such as the telephone
- Analyze the technology adoption curve and relate it to the adoption of future transportation technologies
- Describe limitations with current transportation modes and how future technologies can help solve some of these problems
- Match future transportation modes with their definition
- Evaluate a framework to evaluate futuristic transportation technologies

| Module 2. Flying Cars

From fiberglass cars with wings strapped to the top of vehicles looking like they came straight out of a science fiction movie, the concept of flying cars has evolved with time and technology. In this module, we will explore and understand what a Vertical Takeoff and Landing (“VTOL”) vehicle is, the history of flying cars, current flying car projects, the pros and cons of such vehicles, and careers in the field of VTOL technology.

Learning Objectives: In this module, students will:

- Define what a Vertical Take-Off and Landing vehicle is and how it is different from existing modes of transportation
- Identify historical attempts at building flying cars and technological advances that have contributed to the emergence of flying cars
- Predict when they will ride in a flying car and justify their prediction
- Examine existing companies that develop flying cars and match a project name with each company
- Describe current prototypes and demonstrate a basic understanding of their underlying technologies
- Compare the pros and cons of flying cars on the economy, society, the environment, and safety
- Appraise future career opportunities and pathways in the flying car industry

| Module 3. Driverless Car Technology

Self-driving cars are coming. In fact, in some places, they are already on the streets. In this module, we are going to examine the technology behind self-driving cars. We will examine how sensors in cars “see” an object and respond accordingly, as well as how fleets of driverless cars learn from each other, through a process called machine learning, by driving millions of miles on the road. And finally, we will investigate what the future might hold for those considering a career in the industry.

Transportation Technologies

Syllabus

Learning Objectives: In this module, students will:

- Describe the 6 levels of autonomous driving
- Classify a driving feature into one of the 6 levels of autonomous driving
- Identify key technologies that enable self-driving cars
- Define algorithm and explain how algorithms allow self-driving cars to operate
- Identify career opportunities in self-driving cars and educational paths to enter those careers
- Examine technologies that enable self-driving trucks

| Module 4. Driverless Cars in Society

Self-driving car technology is advancing quickly. In some cities, there are already self-driving cars on the streets. But do we really need self-driving cars? Is society ready for self-driving cars? In this module, we will start by outlining the need for driverless vehicles by explaining some of the problems and drawbacks of the current human-operated world we currently live in. Then we are going to examine the pros and cons of driverless cars. We will look at the benefits and risks of several aspects of driverless cars, including safety, cybersecurity, mobility, cities, and jobs. We will examine social dilemmas and privacy issues associated with self-driving cars in society. By the end of this module, you will be able to examine both sides of the issue of self-driving cars.

Learning Objectives: In this module, students will:

- Examine the risks and costs of human operated cars
- Evaluate the risks and benefits of self-driving cars
- Discuss ethical dilemmas in driverless car engineering and operation
- Choose an aspect of society that will be impacted by self-driving cars (such as parking, traffic, accidents, jobs, mobility) and argue for or against self-driving cars
- Interview a parent, teacher, or other adult about self-driving cars and hypothesize about the acceptance of self-driving cars in society

| Module 5. Drones

This module will explain what drones are and how they are different from other aircraft. It will provide an introduction to how drones fly, are controlled, and operate autonomously. The module will examine the impact drones have on jobs today and future jobs involving drones. We will examine some of the current uses for drones and their safety. By the end of the module, you will be able to formulate an opinion about drone use, and explain whether or not you think they do more harm or good for the world.

Learning Objectives: In this module, students will:

- Define drones and distinguish drones from other types of aerial technology and transportation
- Describe technologies that allow drones to fly, be controlled remotely, and operate autonomously
- Determine the impact of drone delivery on jobs and the environment
- Identify how drones are used to deliver food, healthcare supplies, and packages
- Assess the safety of drone delivery
- Predict when they will receive their first package delivered by drone
- Identify career opportunities in drones and educational paths to enter those careers

| Module 6. Hyperloop

This module is all about the proposed Hyperloop and vactrain concept. Starting with the technology, the module will explain what a vactrain is and a bit about the physics behind it. Second, it will investigate whether the concept of Hyperloop is actually practical, given costs and the current state of technology. Third, the module will examine the risks associated with such a system. After having looked at the technology and hurdles behind the system, the module will take a look at the current state of Hyperloop development and what the future holds. Finally, the module goes over careers and opportunities in the vactrain sector.

Learning Objectives: In this module, students will:

- Define key technological and engineering aspects of a vactrain
- Examine the historical development of the vactrain concept
- Debate whether Hyperloop is practical given costs and current technologies
- Discuss risks of the Hyperloop system, such as system failures or susceptibility to terrorism or natural disasters such as earthquakes
- Predict when the Hyperloop or another vactrain will be operational and open to the public
- Identify career opportunities in vactrain technology and educational paths to enter those careers

| Module 7. Jetpacks

This module will define what a “jetpack” is and how it differs from other forms of technology. Second, it will identify technological advances that have contributed to the emergence of jetpacks. Third, the module will look at historical creations as well as modern jetpacks and how they operate. Next we will discuss the risks and limitations associated with jetpacks. This will bring us to a discussion about whether or not jetpacks will be used as a regular means of transportation. Finally, we will examine an existing company that develops jetpacks.

Learning Objectives: In this module, students will:

- Describe what a jetpack is and how it is different from existing modes of transportation
- Identify technological advances that have contributed to the emergence of jetpacks
- Describe historical and current prototypes and demonstrate an understanding of their underlying technologies
- Discuss the risks involved in wearing and operating a jetpack
- Predict whether jetpacks will be used as a regular means of transportation
- Examine an existing company that develops jetpacks

| Module 8. Supersonic Jets

This module will look at supersonic travel technology. It will examine how supersonic jets differ from traditional jet liners. Then the module will explain the “sonic boom” phenomenon. With this foundation, the module will then look at the technology, costs, operations, and demise of the Concorde. Next it will examine the pros and cons of supersonic jets in general and whether or not it is realistic to expect supersonic intercontinental flights. Finally, the module concludes with a look at companies developing supersonic jets as well as career opportunities within the aerospace industry.

Learning Objectives: In this module, students will:

- Define key technological terms related to supersonic jets and airplane flight
- Differentiate between supersonic jets and regular jet airliners
- Summarize the Concorde supersonic jet program, including its technology, cost, operations, and shortcomings
- Discuss the noise problem of a sonic boom created by supersonic jets
- Identify both pros and cons of supersonic jets, including safety considerations
- Predict when supersonic jets will be used regularly for intercontinental flight
- Examine an existing company that is developing supersonic jets
- Identify career opportunities in aerospace and educational paths to enter those careers

| Module 9. Personal Rapid Transit

This module will define and explain PRTs, as well as related terms. Then the module will discuss the similarities and differences between the PRT systems and existing modes of transportation. Next, the module will explore personal transporters and how they might fit in to the world of transportation. Finally, it will end with a look at how crossing a motorcycle with a car could, potentially, offer a solution to many transportation issues.

Transportation Technologies

Syllabus

Learning Objectives: In this module, students will:

- Describe Personal Rapid Transit Systems (PRTs) and various forms of Podcars or personal vehicles
- Define key vocabulary words and concepts related to PRTs and podcars
- Compare PRT Systems with existing transport systems and infrastructure
- Examine an existing company that is developing PRTs
- Discuss impediments to building PRTs and evaluate how PRTs' inability to gain mass adoption might impact other future transportation technologies
- Differentiate between fixed-track PRT systems and personal transportation vehicles

| Module 10. Supercavitation

In this module, we will get in the water and examine some of the futuristic transportation ideas in the sea. The focus of the module will be on the concept of supercavitation, which is a technology that has been around for decades, but has been sparsely used and has some serious challenges. Scientists are figuring out solutions to some of these challenges, which may lead to a resurgence in the use of this unique technology. In the final section, we will also review some other marine transportation modes that incorporate ideas that include autonomous control and clean energy.

Learning Objectives: In this module, students will:

- Define density, drag, cavitation and supercavitation
- Differentiate between vaporous and artificial cavitation
- Identify historical and future use cases for supercavitation
- Discuss problems associated with supercavitation and potential solutions
- Identify and describe other futuristic marine transportation such as autonomous and fuel-efficient ships
- Create a business plan for a company that utilizes supercavitation

| Module 11. Space Travel

In this module we will briefly discuss the history of space exploration and the benefits and cost associated. We'll also define words and terms related to rockets and space travel. Then we'll take a closer look at reusable rockets- how they would benefit the space industry and what challenges go into creating one. Next, we'll discuss companies that are developing commercial space travel. Finally, we'll explore careers in the space travel industry.

Learning Objectives: In this module, students will:

- Review the history of rocket use and space exploration
- Compare the benefits gained from space travel with the challenges and costs
- Define key vocab words related to rockets and space travel
- Describe the challenge of creating reusable rockets
- Examine an existing company that is developing commercial space travel
- Identify career opportunities in space travel and educational paths to enter those careers

| Module 12. Interstellar Travel

This module will identify the challenges to interstellar travel. It will explain need-to-know terms such as astronomical units, light speed, propulsion, and g-force. Then it will describe theories and the pros and cons of each theory in achieving interstellar travel. Then it will discuss the feasibility of an interstellar mission. By the end, you will be able to make an informed prediction as to when, if ever, interstellar travel will be launched.

Learning Objectives: In this module, students will:

- Predict when, if ever, an interstellar voyage will be launched and justify the prediction
- Identify challenges to interstellar travel based on today's technologies
- Define astronomical units, light speed, propulsion, and gravity units (G-force)
- Describe theories for interstellar travel possible
- Compare pros and cons of proposed methods to achieve interstellar travel
- Discuss feasibility of an interstellar mission given energy requirements and risks