NRES-GEOG 427/827

INTRODUCTION TO THE GLOBAL POSITIONING SYSTEM

2021 SUMMER ONLINE COURSE

COURSE DESCRIPTION

Getting coordinates from a Global Positioning System (GPS) receiver is usually a matter of pushing buttons, but knowing what those coordinates are, and more importantly, what they aren't, is more difficult. This course is designed to help students with little or no GPS experience acquire the skills necessary to collect and use high-quality GPS data. Both the theory and application of GPS will be taught with emphasis toward applications. Much of the course will be "hands-on" with students using SNR's sub-meter differential GPS (DGPS) units.

PREREQUISITE

None, though students registering for this course should be in junior or higher standing; with general computer skills including office applications, data and file management.

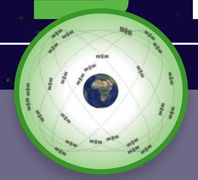
INSTRUCTOR

DR. GETACHEW DEMISSE
Address // Zoom meeting
Email // gdmisse2@unl.edu
Phone // 402-601-4260
About // go.unl.edu/kdmm

OFFICE HOURS

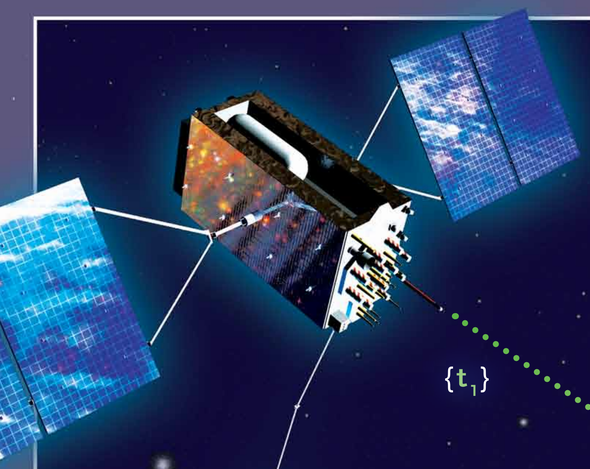
10 a.m. – 12 p.m. Tuesday & Thursday or by appointment.

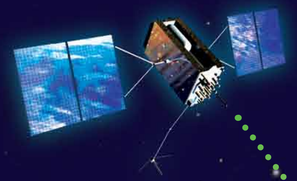
HOW GPS WORKS

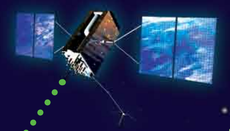


GPS

IS A CONSTELLATION OF 24 OR MORE SATELLITES FLYING 20,350 KM ABOVE THE SURFACE OF THE EARTH. EACH ONE CIRCLES THE PLANET TWICE A DAY IN ONE OF SIX ORBITS TO PROVIDE CONTINUOUS, WORLDWIDE COVERAGE.







{t_1}

1 GPS satellites broadcast radio signals providing their locations, status, and precise time {t_1} from on-board atomic clocks.

{c}

2 The GPS radio signals travel through space at the speed of light {c}, more than 299,792 km/second.

{t_2}

3 A GPS device receives the radio signals, noting their exact time of arrival {t_2}, and uses these to calculate its distance from each satellite in view.

To calculate its distance from a satellite, a GPS device applies this formula to the satellite's signal:

distance = rate x time

where **rate** is {c} and **time** is how long the signal traveled through space.

The signal's travel **time** is the difference between the time broadcast by the satellite {t_1} and the time the signal is received {t_2}.

The GPS Master Control Station tracks the satellites via a global monitoring network and manages their health on a daily basis.

Ground antennas around the world send data updates and operational commands to the satellites.

4 Once a GPS device knows its distance from at least four satellites, it can use geometry to determine its location on Earth in three dimensions.

The Air Force launches new satellites to replace aging ones when needed. The new satellites offer upgraded accuracy and reliability.

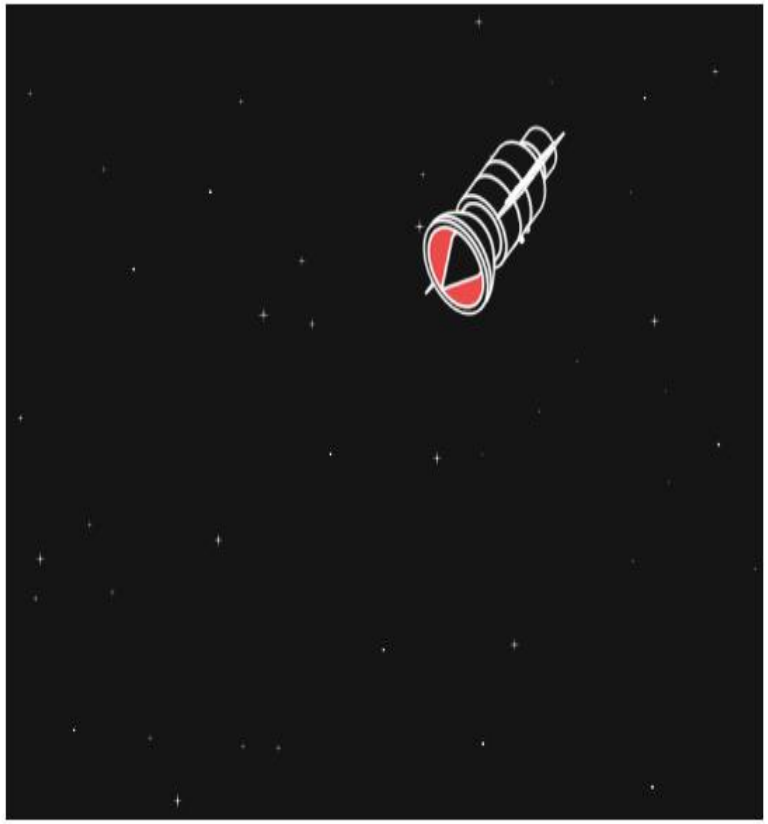
How does GPS help farmers? Learn more about the Global Positioning System and its many applications at

WWW.GPS.GOV

INSTRUCTOR INFORMATION

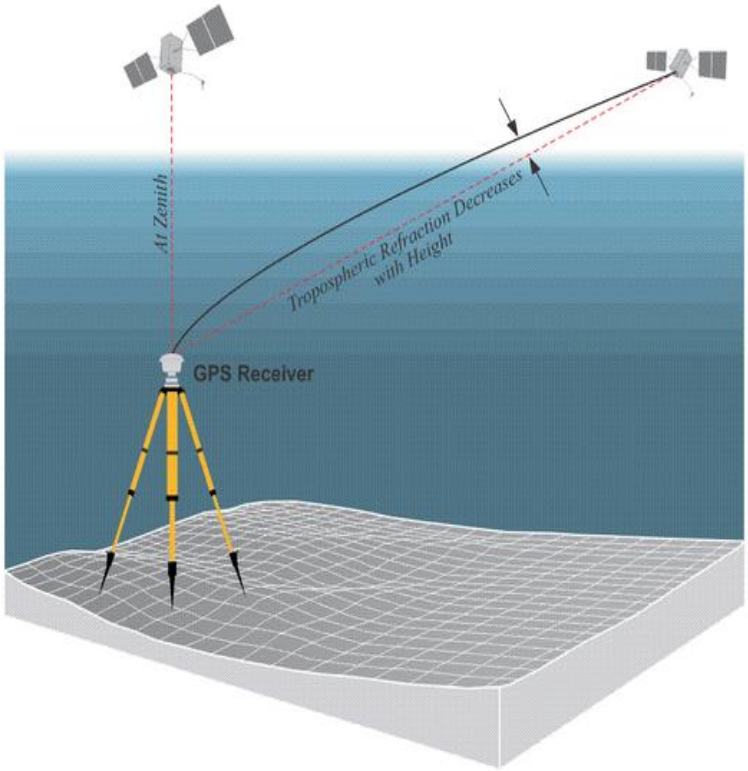
SYLLABUS

Introduction to Global Positioning Systems

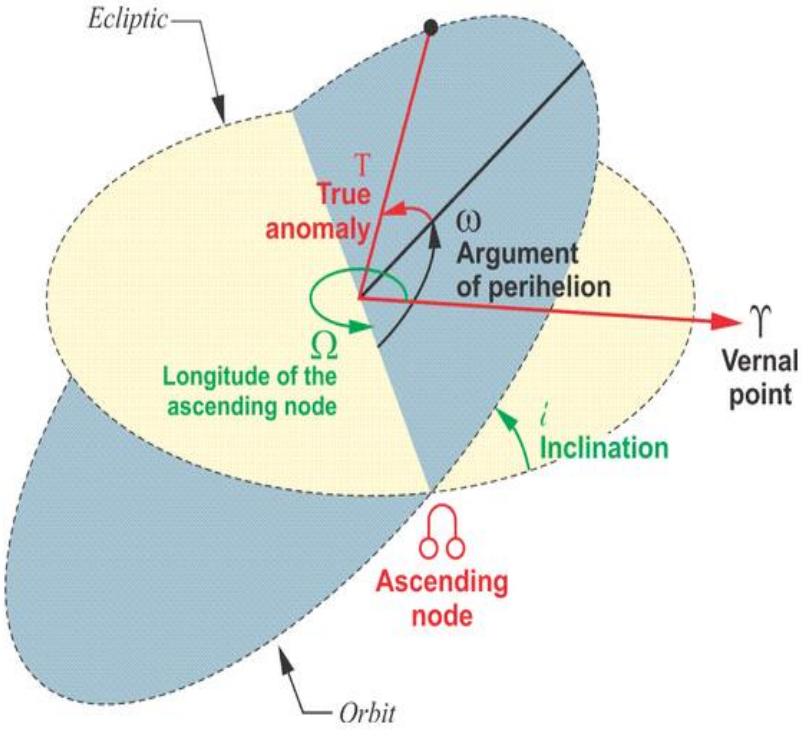


GPS Application to Natural Resources Survey

Global Positioning System Signal and Pseudoranging



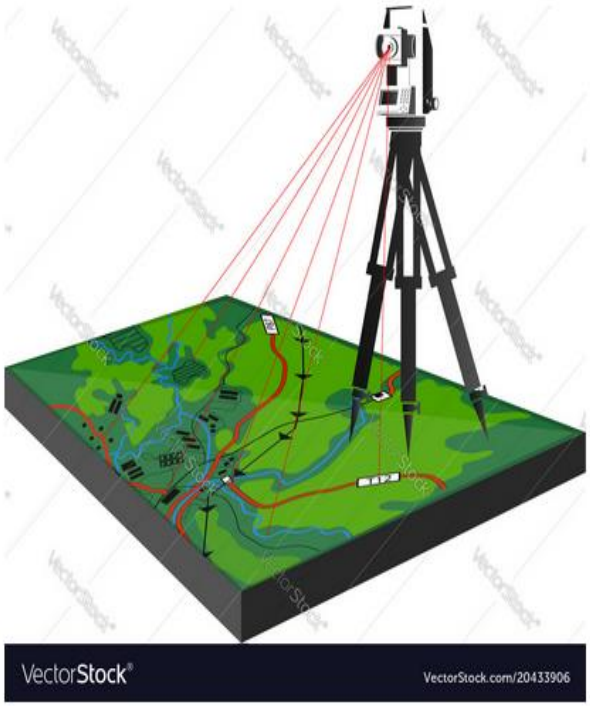
Biases and Solutions



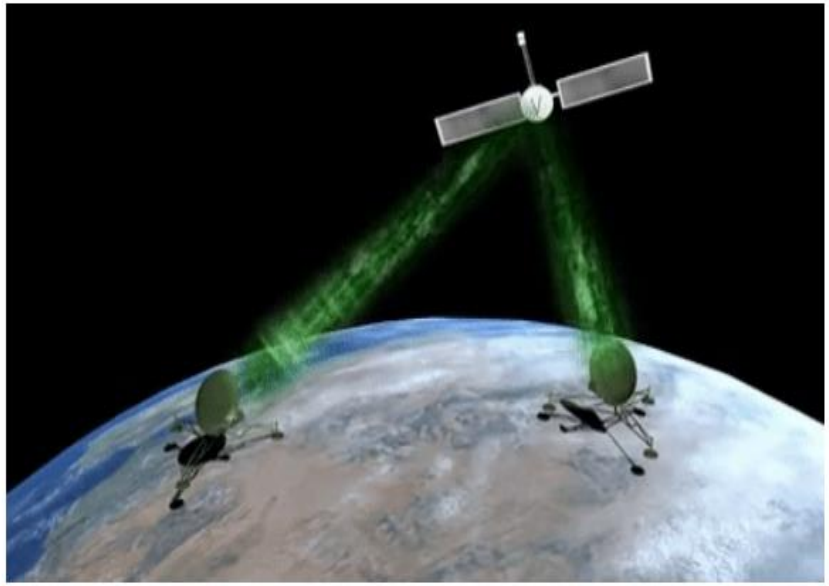
Receivers and Methods

Application of GPS in wild animal tracking

Geodetic Datums

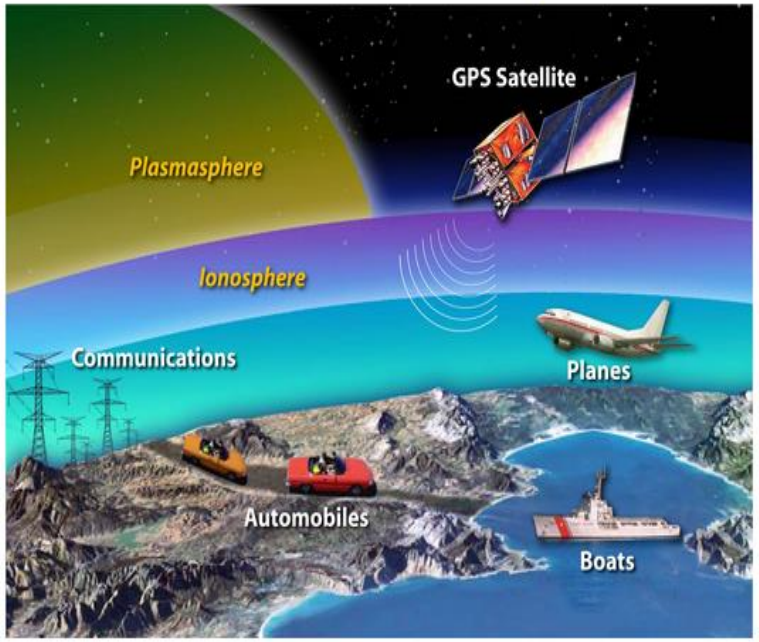


State Plane Coordinates



GPS modernization, GNSS, and the future

Student Course Project



NRES 427 / 827 - Introduction to Global Positioning System

NRES 427 / 827 is designed to help students with little or no GPS experience acquire the skills necessary to collect and use high-quality GPS data. Both the theory and application of GPS will be taught with emphasis toward applications. Much of the course will be "hands-on" with students using SNR's sub-meter differential GPS (DGPS) units.

When you take NRES 427 / 827, you will learn how to think spatially, interpret maps, and creatively use geospatial technologies answer questions and solve real world problems. NRES 427 / 827 will teach you the fundamentals of global positioning systems with an emphasis on natural resources applications. You will also learn and utilize ArcGIS software to develop practical, hands-on GIS skills.

NRES 427 / 827 is designed to match the Department of Labor's Geospatial Technology Competency Model (GTCM). This course is part of series of GTCM-aligned courses, taken together, meet the skills defined in the GTCM for an entry-level worker in the geospatial technology industry.

What is Geospatial Technology Competency Model?

The Geospatial Technology Competency Model framework was developed through a collaborative effort involving the Employment and Training Administration (ETA), the GeoTech Center, and industry experts (https://www.careeronestop.org/competencymodel/competency-models/geospatial-technology.aspx).