Approved Innovative Course

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Texas Education Agency

Course: Spatial Technology and Remote Sensing
PEIMS Code: N1302807
Abbreviation: SPATECRS
Grade Level(s): 10-12
Number of Credits: 1.0

Course description:

This course is designed to provide students with instruction in Geographic Information Systems (GIS) and Remote Sensing (RS) technology. Students will receive instruction in standard geospatial extension software and geospatial tools, including global positioning systems (GPS), and continued training in GIS project management and problem solving. Each student will participate in applied learning activities with emphasis placed on planning, conducting, and presenting special projects dealing with the use of GIS/RS tools and data.

Essential knowledge and skills:

(a) General requirements. This course is recommended for students in Grades 10-12. Recommended prerequisites: Geographic Information Systems and Raster-Based GIS. Students shall be awarded one credit for successful completion of this course.

(b) Introduction

    (1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

    (2) The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.

    (3) In Spatial Technology and Remote Sensing, students will receive instruction in industry standard geospatial extension software and geospatial tools, including global positioning systems (GPS), and continued training in GIS project management and problem solving.

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(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(c) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected:

    (A) employ advanced reading and writing skills;

    (B) employ advanced verbal and nonverbal communication skills;

    (C) demonstrate knowledge of how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession and work site;

    (D) cooperate, contribute, and collaborate as a member of a group to attain agreement and achieve a collective outcome;

    (E) demonstrate effective use of time-management skills in prioritizing tasks, following schedules, and tending to goal relevant activities in a way that optimizes efficiency and results;

    (F) consistently demonstrate punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks with little or no direction; and

    (G) identify and demonstrate appropriate actions and identify consequences related to discrimination, harassment, and inequality in the workplace.

(2) The student demonstrates knowledge of the GIS field and GIS-related careers. The student is expected to:

    (A) identify employment and career opportunities in GIS-related fields, including spatial technology;

    (B) explore or participate in career preparation learning experiences, including job shadowing, mentoring, apprenticeship training; and preparation programs;

    (C) identify industry certifications for GIS related careers, including careers that use or benefit from spatial technology; and

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(D) evaluate ethical issues related to spatial technology and remote sensing and technology and incorporate proper ethics in submitted projects.

(3) The student applies basic GIS software knowledge and skills to explore the use of various geographic projections in GIS software. The student is expected to:

(A) use and identify Mercator map projection;

(B) use and identify Albers conic map projection; and

(C) evaluate the evolution of and need for different map projections.

(4) The student applies the application of global positioning system (GPS) technology. The student is expected to:

(A) identify and use data terminology related to GPS;

(B) identify and use appropriately GPS receiver components;

(C) propose potential applications of GPS coordinates such as locating fire hydrants, extinguishers, lighting, and parking lots; and

(D) appraise the accuracy of GPS coordinates from different receivers such as smartphones, tablets, and GPS handheld devices.

(5) The student demonstrates knowledge and understanding of the types and components of unmanned remote sensing platforms. The student is expected to:

(A) identify major components of aerial, terrestrial, and submersible remote sensing platforms;

(B) evaluate conditions for using one type of platform over another;

(C) differentiate the types of sensing systems used by each type of platform, including active, passive, spectrometer, radar, LiDAR, scatterometer, and laser altimeter, and

(D) compare and contrast situations in which different platforms and sensing systems might be used.

(6) The student demonstrates skills related to GIS data analysis. The student is expected to:

(A) apply critical thinking skills to evaluate findings and potential problems using GIS data;

(B) create models that represent collected data

(C) create, query, map, and analyze cell-based raster data; and

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(D)   analyze density, distance, and proximity of various data points using spatial analyst tools.

(7)   The student analyzes geospatial socioeconomic data to create three-dimensional maps to demonstrate findings.   The student is expected to:

    (A)   identify key sources of and gather and organize geospatial socioeconomic data;

    (B)   plan, organize, and create two-dimensional themes;

    (C)   convert two- dimensional themes to a three- dimensional map to demonstrate features, distributions, and themes; and

    (D)   generate summaries, generalizations, or thesis statements to interpret, draw conclusions about, and justify findings.

(8)   The student uses spatial technology to develop and analyze a location map. The student is expected to:

    (A)   identify and collect data using GPS and/or unmanned systems and identify the boundaries and topography of the location;

    (B)   analyze how the location of a community impacts the resources and hardships such as jobs or traffic in the community;

    (C)   create a map of a location that includes buildings and facilities, adjacent streets, and transportation sites, using GIS software; and

    (D)   develop and include categories for a facility's features such as restrooms, spaces allocated for core activities, emergency equipment, and excavation routes.

(9)   The student documents technical knowledge and skills. The student is expected to:

    (A)   create a portfolio to include information such as:

        (i)   attainment of technical skill competencies related to spatial technology and remote sensing; and

        (ii)   samples of work such as location maps and spatial technology and remote sensing-based reports; and

    (B)   present a portfolio to peers or interested stakeholders.

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Description of specific student needs this course is designed to meet:

Spatial Technology and Remote Sensing is a new emerging technology r which many career pathways such as engineering, transportation systems, city planning, community development, environmental sciences, technology, space sciences, marketing, natural resources planning, law enforcement, cartography, real estate development, geology, and architecture are using to better serve their industry. The course is designed to build students' job skills in advanced concepts in Remote Sensing, Global Positioning and Geospatial Networks & Routing and Geographic Information Systems through hands on instruction.

Major resources and materials:

A project-based learning instructional design is recommended for this course. Students should be provided the opportunity to use industry standard tools and equipment and access to data from public and private databases to complete their projects. The following is a list of resources and equipment are recommended for the course.
- (1) Computer lab
- (2) Spatial, Image, and 3-D Analyst software
- (3) GPS equipment
- (4) Internet Access
- (5) Unmanned systems - aerial, terrestrial, and/or submersible for data collection

Recommended course activities:

Students master spatial technology and remote sensing concepts through the use of GIS software, unmanned systems, and satellite data to solve a local problem.
> **Sample Projects:**
> **1. Develop a map of the school campus.**
>
> Students use handheld GPS devices or remote sensors and collect data on the campus boundaries, buildings, ball fields, parking lot locations, lights, and fire hydrants. The students use spatial technology and remote sensing equipment to collect data and create a map to present to the campus administration**.**
>
> **2. Plan a project related to the community.**
>
> Students visit a local park, lake or pond, or hiking/biking trail. Using GPS devices, students collect the spatial data for the location. Taking pictures of scenic views, locations of historical significance or where damage or other events of interest have occurred, the students create a map and visual record of the area to present to community leaders or interested stakeholders.

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Suggested methods for evaluating student outcomes:

(1) Tests, projects, and presentations.
(2) Group participation.
(3) Presentations and written reports

Teacher qualifications:

(1) Any business or office education certificate.
(2) Business and Finance: Grades 6-12.
(3) Business Education: Grades 6-12.
(4) Secondary Industrial Arts (Grades 6-12).
(5) Secondary Industrial Technology (Grades 6-12).
(6) Technology Education: Grades 6-12.
(7) Technology Applications: Early Childhood-Grade 12.
(8) Technology Applications: Grades 8-12.
(9) Trade and Industrial Education: Grades 6-12. This assignment requires appropriate work approval.
(10) Trade and Industrial Education: Grades 8-12. This assignment requires appropriate work approval.
(11) Vocational Trades and Industry. This assignment requires appropriate work approval.
(12) Computer Science: Grades 8-12.
(13) Secondary Computer Information Systems (Grades 6-12)

Additional information: