EBS241: Precision irrigation management  
Fall Quarter 2021

Location: TBC  
Time: MW 10:00 – 11:20

Instructor: Andre Daccache, Biological & Ag. Engineering Department  
Office: 3052 Bainer Hall  
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Office Hours: Thursday 10:00 to 11:00 am  
CRN: 53528

Course Description:
Lecture—3 hours. Introduction to precision agriculture; GPS: Principles and applications in modern agriculture; GIS application in Agriculture; Principles of remote and proximal sensing, Soil and plant based sensors; Electrical conductivity and soil spectroscopy; Crop spatial variability; hydraulic and economic considerations for variable rate irrigation; Weather stations, temporal and spatial measurements of evapotranspiration, data analysis and interpretation.

Field and practical work:
Most of the fieldwork will be conducted at the experimental sites of UC Davis (Campbell tract) and this include:
- Soil scanning using Veris U series system
- Conduct soil spectroscopy on soil samples taken from the field
- Surveying point measurements and ground control points using RTK GPS
- UAV Flight planning, mission control and image processing (With Agisoft) for RGB, multispectral and thermal imagery
- Hands-on instrumentations:
  - Soil sensors: TDR, capacitance and matric potential sensors
  - Plant based sensors: stomatal conductance, pressure chamber, ceptometer. Students will build and operate a system of sapflow, dendrometers, leafmonitors, IR radiometers.
  - Students will build and operate a complete weather station with all sensors needed to calculate ETa using eddy covariance and surface renewal methods. They will also install and collect data from all in one weather stations (Arable and Atmos 41)
  - Dataloggers: CR300; CR1000X and Zentra ZL6

Textbooks:
For this course there is no specific textbook but the instructor recommends the following books in addition to a list of specific papers that will be used as reading materials and in the classroom discussion:
Grading:

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<th>Component</th>
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<td>Homework</td>
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<td>Midterm Exam</td>
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<td>Practical work</td>
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<td>Final Exam</td>
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*P/NP will be considered

Lecture Topics

- Week 1: Introduction to Precision Agriculture: Definitions and Scope; challenges and opportunities; status and future trends.
- Week 2: Global Positioning system: Fundamentals of satellite navigation; factors affecting GPS accuracy, Hardware, differential correction.
- Week 3: GIS application in agriculture: Principles of GIS; coordinate systems; georeferencing; geospatial analysis and classification
- Week 4: Soil spatial variability: Mapping methods, soil spectroscopy and homogeneous management zones delineation
- Week 5: Morphological and biophysical crop monitoring using UAV and satellite imagery
- Week 6: Bio meteorological instrumentation and weather stations
- Week 7: Satellite and UAV based evapotranspiration mapping
- Week 7: On the ground sensors used in precision irrigation: Soil and plant based sensors
- Week 8: Data interpretation, logging and transmission systems
- Week 9: Irrigation systems and variable rate application
- Week 10: Precision irrigation economics and adoption

Academic Conduct:
All students are expected to adhere to the Code of Academic Conduct: sja.ucdavis.edu/files/ca.pdf

EBS241 web page is located on CANVAS.