



CC APPROVAL: 10/04/2017
ACADEMIC SENATE APPROVAL: 10/11/2017
BOT APPROVAL: 11/13/2017
STATE ID:
EFFECTIVE TERM: Fall 2018

College of the Sequoias Course Outline of Record

SUBJECT AREA AND COURSE NUMBER: AGTC 220

COURSE TITLE: IRRIGATION WELLS AND PUMPS

UNITS/HOURS

Units: 3

Hours:

Lecture Hours Per Week: 3

Lab Hours Per Week: 1

Total Lecture Hours Per Semester: 52.5

Total Lab Hours Per Semester: 17.5

Activity Hours Per Week:

Total Activity Hours Per Semester:

Total Hours Per Week: 4

Total Contact Hours Per Semester: 70

TOP CODE: 0116.00 - Agricultural Power Equipment Technology*

SAM CODE: Clearly Occupational

Cross-Listed Courses:

CATALOG COURSE DESCRIPTION:

Management and evaluation of irrigation wells, pumps and their drive systems. Emphasis is placed on system hydraulics, pump curves and selection, efficient operation, management, energy conservation, setup, maintenance and repair.

REQUISITES:

NONE

FIELD TRIP REQUIREMENTS: Not Required

GRADING: -

REPEATABLE:

TRANSFERABLE:

Approved Course does not transfer

Not transferable

METHODS OF INSTRUCTION:

Methods of instruction may include, but are not limited to, the following:

* Laboratory

* Lecture and/or Discussion

METHODS OF EVALUATION:

A student's grade will be based on multiple measures of performance unless the course requires no grade. Multiple measures may include, but are not limited to, the following:

- Skill demonstrations
- Problem solving assignments or activities
- Multiple choice tests
- Short answer quizzes or exams
- Oral presentations
- Project
- Problem solving quizzes or exams

COURSE TOPICS:

1. Pump system types and components
 - A. Pump types
 - 1. Radial flow pumps
 - 2. Axial flow pumps
 - 3. Mixed flow pumps
 - B. System Components
 - 1. Drive Units
 - a. Electric motors
 - b. Gasoline and diesel engines
 - 2. Pump components
 - a. Discharge head
 - b. Shaft
 - c. Bearings
 - d. Column
 - e. Bowl
 - f. Impellers
 - i. Types
 - 1. Closed
 - 2. Open
 - 3. Semi open
 - ii. Material
 - 1. Cast Iron
 - 2. Steel
 - 3. Stainless steel
 - 4. Bronze
 - 5. Aluminum
 - iii. Oil lubrication systems
 - iv. Strainers
2. Pumping hydraulics and measurement
 - A. Friction loss
 - 1. Pipe loss
 - 2. Fitting loss
 - B. Total dynamic head and pressure
 - C. Flow
 - D. Net positive suction head
 - E. Static water level and suction lift
 - F. Drawdown
3. Drive units and measurement
 - A. Electric motors
 - 1. Voltage and amperage
 - 2. Wattage and horsepower
 - 3. Single phase and 3 phase
 - B. Engine driven units
 - 1. Horsepower
4. Pump curves and pump selection
 - A. Pressure vs flow
 - B. Pump efficiency
 - C. Impeller and bowl selection
 - D. NPSH factors and cavitation
 - E. Horsepower requirements
 - F. Drive unit selection
5. Pump Evaluation
 - A. Data Collection
 - 1. Flow
 - 2. Pressure
 - 3. Horsepower
 - B. Calculations and data evaluation
 - 1. Pressure and flow vs. efficiency
 - C. Well evaluation
 - D. Improvement recommendations
 - E. Pump installation
 - F. Infield maintenance and adjustments
 - G. Troubleshooting
6. Variable speed operation
 - A. Affinity laws
 - B. Variable frequency drives
 - 1. Selection and operation
7. Sump design

OUTCOMES:

Course Objectives

The main concepts for this course will ask students to...

1. Compare and contrast different pumping systems and discuss the advantage and disadvantage of each.
2. Identify various impeller styles and materials and discuss the advantage and disadvantages of each; select the best impeller for a given situation.
3. Analyze a specific pumping situation and specify an appropriate pump to meet crop needs.
4. Discuss the advantages and disadvantages of electrical frequency drives and specify an appropriate unit for a given scenario.
5. Identify different pump components and discuss their functions.
6. Use a manufacturer's pump curve to identify specific pump parameters and explain how each of the parameters affect overall pumping efficiency.
7. Use crop water requirement, pump efficiency and energy cost data, to calculate yearly pumping costs for both electric motor and engine driven units.
8. Provide a detailed estimate for an entire pumping station and include both equipment and installation costs.
9. Complete the documents required to obtain a government permit for the installation of a new well.

Assignments

Reading:

Weekly homework assignments that develop an understanding of the material taught during the lecture.

Writing:

Weekly lab reports

Homework:

Students will complete various irrigation pump projects from design and selection through implementation.

Lab Content:

Perform a pump evaluation study on specific irrigation system and provide recommendations to improve system efficiency.

Provide a cost estimate for both material and labor to implement the recommendations.

TEXTS AND SUPPLIES:

Textbooks may include, but are not limited to:

TEXTBOOKS:

1. Kumar. Ground Water and Well Drilling. 1st ed. CBS, 2014, ISBN: 978-8123924588

MANUALS:

PERIODICALS:

MATERIALS FEE: NO

OTHER:

Distance Ed

SLO: <http://cos.edu/CO318>

[SLOs AGTC 220](#)

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DATE: 06/20/2017