Clackamas Community College

Online Course/Outline Submission System

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Section #1 General Course Information

Department: Engineering Science

Submitter

First Name: Matt
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Course Prefix and Number: MTH - 082C

 # Credits: 1

Contact hours

Lecture (# of hours): 11
Lec/lab (# of hours):
Lab (# of hours):
Total course hours: 11

For each credit, the student will be expected to spend, on average, 3 hours per week in combination of in-class and out-of-class activity.

Course Title: Wastewater Math II

Course Description:

Quantitative component to understanding analysis and operations of secondary wastewater systems. Flow rate, chemical dosage, treatment plant loading, treatment process efficiency, unit conversion and process control.

Type of Course: Developmental Education

Can this course be repeated for credit in a degree?

No

Are there prerequisites to this course?

Yes

Pre-reqs: MTH-065 or instructor consent

Have you consulted with the appropriate chair if the pre-req is in another program?

No

Are there corequisites to this course?

Yes

Co-reqs:WET-120

Are there any requirements or recommendations for students taken this course?

Yes

Recommendations: Completion of WET-110 and MTH-082A or instructor consent.

Requirements: None.

Will this class use library resources?

No

Is there any other potential impact on another department?

No

Does this course belong on the Related Instruction list?

No

GRADING METHOD:

A-F or Pass/No Pass

Audit:Yes

When do you plan to offer this course?

✓ Winter

Will this course appear in the college catalog?

Yes

Will this course appear in the schedule?

Yes

Student Learning Outcomes:

Upon successful completion of this course, students should be able to:

1. solve wastewater math problems equivalent to those exam questions administered by the Associated Boards of Certification (ABC) through the State of Oregon Department of Environmental Quality (DEQ) at an Operator 1

(Provisional License) performance level,
2. display proficiency in basic wastewater secondary process calculations to include velocities, detention times, particle settling, pounds and mass flux;
3. develop skills in manipulating addition, subtraction, multiplication and division of both fractions and decimals. Use industry standards for rounding off;
4. demonstrate basic geometries used in the wastewater industry such as the circle and the rectangle, emphasize develop the formulae for areas and volumes that accompany these shapes and their impact to surface overflow rates and weir overflow rates;
5. develop skills in the formulae that express the day-to-day operation of secondary treatment processes to include lagoons, trickling filters, RBCs, and the activated-sludge process with its modifications;
6. develop skills in the Scientific Calculator and in the Scientific Method to maintain unit integrity of mathematical conversions,
7. show how laboratory testing (Mixed Liquor, BOD, Solids Profile) results impact process control calculations and waste removal efficiencies.

This course does not include assessable General Education outcomes.

Major Topic Outline:

1. Ponds and Lagoons.
a. Mass Solids & Organic Pond Loading Rates with TSS and BOD.
b. Flowrate Pond loading rates with Q (MGD) per A (Acres), then expressed in terms of inches of “new” water added each day.
c. Pond Area & Volume Calculations:
c1. Average Area versus Top Area.
c2. Volume using Both Top and Bottom Areas (averaged).
d. Efficiency of “pollutant” removals for Ponds and Lagoons.
2. Trickling Filters.
a. Areas and Volumes of Trickling Filters.
b. Hydraulic & Organic Loading Rates onto Trickling Filters.
c. Recirculation Ratio: RR=QR/QI.
d. Applied Flowrate: QA=QR+QI.
e. Efficiency of “pollutant” removals for Trickling Filters.
3. Rotating Biological Contactors (RBDs) & the Aerated (ARBC) option.
a. Surface Area calculations for Plastic RBC units.
b. Hydraulic & Organic Loading Rates onto RBC units.
c. Efficiency of “pollutant” removals for RBC units.
4. Activated Sludge (A-S) & Modifications to the Activated Sludge Process.
a. Raw Laboratory Data turned into Concentrations.
b. A-S Process Loading Rates, both Organic and Solids.
c. A-S Process Operational Strategies.
c1. F/M.
c2. MCRT.
c3. SVI & SDI.
d. Efficiency of “pollutant” removals for RBC units.
5. General Flowrate (Q), Area & Volume (A & V), and Concentration Discussions that lead to general analysis for all Secondary Treatment Processes.
a. Two Normal Equation where concentration times volume or flowrate (mass) always equals the same mass regardless of its concentration or volume or flowrate.
a1. N1V1=N2V2.
b. Three Normal Equation where mass plus mass always equals resulting mass.
b1. N1V1 + N2V2 = N3V3.

Does the content of this class relate to job skills in any of the following areas:

1. Increased energy efficiency	**No**
2. Produce renewable energy	**No**
3. Prevent environmental degradation	**Yes**

4. Clean up natural environment	**Yes**
5. Supports green services	**No**

Percent of course:100%

First term to be offered:

Next available term after approval
: