Clackamas Community College

Online Course/Outline Submission System

Show changes since last approval in red Print Edit Delete Back
Reject Publish

Section #1 General Course Information

Department: Engineering Science

Submitter

First Name: Matt
Last Name: LaForce
Phone: 3148
Email: laforce

Course Prefix and Number:MTH - 082A

 # 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 I

Course Description:

Quantitative component to understanding wastewater operations. Simple unit conversions, fraction to decimal conversions and more complicated problem solving as applied to wastewater preliminary & primary treatment.

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: Pass 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-110

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

No

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?

✓ Fall

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. perform applied mathematical conversions (flow rate, temperature, etc) necessary to pass the OIT Water or Wastewater licensure exam;
2. calculate the area of a circle A=(0.785)(Diameter)(Diameter) and rectangle A=(L)(W) and understand the role of theses shapes in water and wastewater treatment processes,
3. calculate the volume of a cylinder/pipe V=(0.785)(Diameter)(Diameter)(H) and rectangular clarifier V=(L)(W)(H), where H=Side Water Depth (SWD);

4. determine Flowrate (Q, gpd) in a pipe using the continuity equation where Q (Flowrate)=(Velocity)(Area) and comprehend these relationships in water and wastewater collection and treatment operations,
5. determine the velocity of flow using the ratio of Distance/Time and focus on hydraulic detention times for treatment processes HDT = Volume, MG/Flowrate, MGD;
6. describe the multiple usages of the pounds formula (Mass & Mass Flux) in plant operation and control Mass is based on pounds held within a process, lbs=(C, mg/L)(8.34)(V, basin MG), Mass Flux is mass moved over time or ppd through a water body, ppd=(C, mg/L)(8.34)(Q, flowrate through the basin in MGD);
7. quantitatively assess all solids analysis measurements: Solids Concentration. C, in mg/L=(Final Weight, g–Initial Weight, g)(106)Volume of Water used in the Sample, mL);
8. describe the need for proper mathematical assessment of BOD in National Pollutant Discharge Elimination System (NPDES)permit compliance, BOD Conc. C, mg/L=(Initial Dissolved O2, mg/L–Final Dissolved O2, mg/L), (Volume of Sample Used, mL/Final Volume of Solution, mL);
9. assess pump and lift station detention times and pumping rates Time in the Wet Well. HDT, in min.=(Volume, gal)/(Flowrate, gpm)Pumping rates. Q, gpm=(MGD)(694.4gpm/MGD) and learn appropriate mathematical conversions and dimensional analysis;
10. describe headworks treatment as it applies to bar screens and bar racks, and grit channels, Flow Velocity. V, fps=(Length of Grit Channel, ft)/(Time of Travel, sec)Particle Settling Time. T, sec =(Distance of Fall, ft), Particle Settling Velocity, fps);
11. process Clarification and Loading in primary and secondary treatment using the formulas:
Clarifier Surface Overflow Rate. SOR,gpd/ft2 = Clarifier Loading Rate in gpd Surface Area, in ft2
Clarifier Weir Overflow Rate. WOR, in gpd/Weir Length, in lineal feet.

This course does not include assessable General Education outcomes.

Major Topic Outline:

1. Monitoring of Flowrates within the Collection System & through the Treatment Processes.
a. Palmer Bowlus Flume curves (specific example: 8”).
b. Flow Continuity: (Velocity of Flow) (Cross-Sectional Area of Approach), or Q=AV. Focus on circular and rectangular conduits.
c. Manning’s Equation (explain open channel flows, however, develop this proficiency both in WQT-122 Collection Systems with the graphic approach, and WQT-242 Hydraulics; algebraic approach).
2. Sanitary Wastewater Composition.
a. Solids Analysis.
a1. Solids Concentration, mg/L = (Final Weight, g – Initial Weight, g) (106) (Volume of Water used in the Sample, mL).
b. BOD Analysis. BOD Conc, mg/L = (Initial Dissolved O2, mg/L – Final Dissolved O2, mg/L(Volume of Sample Used, mL/Final Volume of Solution, mL) Where “Final Volume” is usually a 300mL BOD bottle (unless otherwise specified).
3. Pumping Stations.
a. Time in the Wet Well, HDT in min. = (Volume, gal)/(Flowrate, gpm).
b. Pumping rates, gpm = (MGD) (694.4 gpm/MGD) and learn “quick conversion."
4. Bar Screens and Bar Racks, and Grit Channels.
a. Flow Velocity, fps = (Length of Grit Channel, ft)/(Time of Travel, sec).
b. Particle Settling Time, sec = (Distance of Fall, ft)(Particle Settling Velocity, fps).
5. Process Clarification and Loading.
a. Clarifier Surface Overflow Rate, gpd/ft2 = Clarifier Loading Rate in gpd square area, in ft2.
c. Clarifier Weir Overflow Rate in gpd/lineal feet of weir length.
5. Mass & Mass Flux and the difference between the two.
a. Mass is based on pounds or kilograms held within a process.
a1. lbs = (C, mg/L)(8.34)(V, basin MG).
b. Mass Flux is mass moved over time or ppd, kg/d through a water body.
b1. ppd = (C, mg/L)(8.34)(Q, flowrate through the basin in MGD).
6. Flow and Contaminant Discussion, aka “Solution to Pollution is Dilution.”
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
: