

DEPARTMENT OF CIVIL ENGINEERING TECHNOLOGY

COURSE SYLLABUS

| | |
|---|--|
| COURSE TITLE: Wastewater Collection and Treatment | TERM: Fall |
| | YEAR: 2013 |
| COURSE: CET 3320 & CET 3320L | TIME: <i>Lecture</i> MW 11:00 – 11:50 am |
| SECTION NOS.: 001 & 070 | <i>Lab</i> F 10:00 – 12:50 pm |
| | PLACE: L-121 & L-136 |
| INSTRUCTOR: Dr. M. A. Karim, P.E. | OFFICE LOCATION: M 162B |
| OFFICE HOURS: MW 01:00-03:00 pm R 04:15-06:00 pm *Other hours by appointment | OFFICE PHONE: (678) 915-3026 HOME PHONE: (804) 482-3674 E-MAILS: mkarim@spsu.edu makarim@juno.com |
| DEPARTMENTAL PHONE: (678) 915-7261; | MY WEBSITE: http://educate.spsu.edu/mkarim |
| NUMBER OF CREDIT HOURS: 2-3-3 (Lecture-Lab-Total) | |
| PREREQUISITS: CET 3310 and MATH 2360 | COREQUISITS: None |

COURSE DESCRIPTION: Application of hydraulics in the design of wastewater collection systems and ancillary structures. This course also includes hydraulic analysis of equalization tanks, the study of the metabolic processes and its application in wastewater treatment, design of conventional and individual wastewater treatment processes.

REQUIRED or ELECTIVE: Required for CET Students.

REQUIRED TEXT:

CET 3320 – None

CET 3320L – Laboratory Manual for Environmental Engineering by M. A. Karim, Tavenner Publishing Company, First Edition, July 2013, ISBN: 978-1-937435-64-6.

REFERENCES:

- Environmental Engineering** by Howard S. Peavy, Donald R. Rowe, and George Tchobanoglous, McGraw-Hill Book Company, Current Edition.
- Introduction to Environmental Engineering** by Mackenzie L. Davis and David A. Cornwell, McGraw-Hill Book Company, Current Edition (Fourth Edition, 2008; ISBN: 978-0-7-242411-9).

3. **Wastewater Engineering Treatment and Reuse** by Metcalf & Eddy, Inc., McGraw-Hill Book Company, Current Edition (Fourth Edition, 2003, ISBN-13: 978-0-07-041878-3, ISBN-10: 0-07-041878-0).
4. **Chemistry for Environmental Engineering and Science** by Clair N. Sawyer, Perry L. McCarty, and Gene F. Parkin, McGraw-Hill Book Company, Current Edition (Fifth Edition, 2003; ISBN: 978-0-07-248066-5).
5. **Standard Method for Examination of Water and Wastewater**, by American Public Health Association (APHA), American Water Works Association (AWWA), and Water Pollution Control Federation (WPCF), 16th Edition, 1985.

OTHER MATERIALS: Handouts may be provided as needed. It is recommended that students take notes in a three ring binder since they may be receiving handouts throughout the semester. **SPSU email** and **GeorgiaView Desire 2 Learn (D2L)** systems will be used for messages and content delivery, respectively. Students should access these sites regularly.

COURSE LEARNING OUTCOMES: Upon successful completion of this course, students shall be able to:

1. Identify the most important regulations concerning water quality/wastewater reclamation;
2. Calculate wastewater flow rates;
3. Estimate pipe sizes, slope, and elevations;
4. Estimate oxygen depletion on surface waters;
5. Identify major objectives of wastewater treatment; and
6. Size major components of conventional activated sludge plants.

COURSE REQUIREMENTS:

1. **Attendance:** Students are expected to attend class. Advance notice of an absence should be provided whenever possible. Makeup exams, quizzes, and acceptance of late assignments will be considered only for documented medical reasons, emergency circumstances, or other university sponsored activities.
2. **Homework/Quiz:** Occasional homework and quiz may be assigned for this course. Homework/quiz assignments must be submitted in the next class following the class in which the topic is discussed/finished and/or a different date assigned by the instructor. Late homework/project WILL NOT be accepted. Exceptions may be considered in case of illness, serious emergencies, or other university sponsored activities. However, appropriate evidence must be presented in order to qualify for exceptions. All projects must be submitted on 8½"x11" white paper or on engineering design paper with a cover page (preferably typed and computer printed). Cover page should include student's name, course number and name, assignment number, assignment date, and due date. Show the detail works for full credit. Graded homework/project will be returned to students; however, students need to preserve them until the grades are finalized and show them to the instructor if there are any disputes in grades.

3. **Exams:** All exams are closed books and notes unless advised otherwise. NO make-up exams will be given. Exceptions may be considered in case of illness, serious emergencies, or other university sponsored activities. However, appropriate evidence must be presented in order to qualify for exceptions. Graded exams will be returned to students; however, students need to preserve them until the grades are finalized and show them to the instructor if there are any disputes in grades.
4. **Cheating:** Cheating on assignment and particularly on the examinations will not be tolerated. If you are caught cheating, you will get zero on the exam. You will be asked to move if you are caught looking at another student's work. The instructor reserves the right to remove any student from the class if the student's behavior is of a disruptive nature or if there is an evidence of academic dishonesty.
5. **Term Paper/Project/Presentation:** No term paper will be assigned for this course. However, group project will be assigned, as necessary, for any design works. The group design works need to be presented using PowerPoint presentations in the class for grades.
6. **Laboratory Report:** Laboratory report formats have been outlined in the Lab Manual that must be followed very closely. Laboratory reports must be submitted in the next class following the class in which the experiment is performed or any other assigned date by the instructor. Laboratory safety procedures must be followed and failure to do so may result in disciplinary action and a failing grade. Informational questions and design problems may be included. Late report WILL NOT be accepted. Exceptions may be considered in case of illness, serious emergencies, or other university sponsored activities. However, appropriate evidence must be presented in order to qualify for exceptions. All reports must be printed and submitted on 8½"x11" white paper. NO hand-written report will be accepted.
7. **Laboratory Datasheet:** Each student will keep a record of data in the Laboratory Manual Datasheet. Notes in the lab datasheet must be made with a pen and must be made during the laboratory (i.e. not copied a day after you leave). Notes should never be erased. If a mistake is made, cross out the error. Never tear datasheet pages out of your laboratory manual. Although neatness is important, it is not the most important aspect of collecting data since it is sometimes impossible to write neatly when actively performing an experiment. The following information should be included in your laboratory notebook for each laboratory topic:
 - (1) Date
 - (2) Your name and your partner's name
 - (3) Title of topic/Name of the Experiment
 - (4) The collected data/Data sheet
 - (5) Comments and observations

Data are items of information necessary to identify and analyze the case under investigation. Data could be as simple as a drawing of the experimental setup or a list of collected measurements. To understand why a certain item of information needs to be recorded, you need to have a thorough understanding of the problem you are trying to study. Therefore, read about the method BEFORE coming to lab. There are many items of information, the importance of which may not be too clear to you until it comes time to analyze the data. A good example is temperature. The pH of a water sample will vary depending on the

temperature. Another example is the age of your sample. The BOD₅ of a wastewater sample will vary depending on its age. While your primary concern in the lab will be to collect measurements, you should not forget to measure and record the not-so-obviously-needed items of information such as temperature and age of sample.

Make sure you have measured and recorded all the information you need before turning off a machine or leaving the lab. In most cases, once you leave the lab, you may not be able to go back and determine something you should have determined while the test was being conducted. Finally, examine and understand the range and accuracy of the instruments you are using to collect the data. If a lab partner reads a weight of 1.0035 g from an instrument that only reads to 1/1000 g, your partner is making a mistake. Check the data yourself, and always question data that seems unreasonable. ***Laboratory datasheet needs to be signed by the instructor in-charge before you leave the lab. Laboratory datasheets need to be submitted/shown to the instructor at the end of the semester to get the points assigned for the datasheet.***

7. **Class Decorum:** No cell phone use, checking emails, eating, and/or multitasking are allowed during the class. For emergency, cell phone can be operated in vibration mode; however, students can receive an emergency call only stepping out of the class room. No feet on the table and/or on the nearby chair are allowed during the class. It is also encouraged not to bring any foods in the class.
8. **Honor Code:** SPSU has an Honor Code and a procedure for handling cases when academic misconduct is alleged. All students should be aware of them. Information about the Honor Code and the misconduct procedure may be found at <http://www.spsu.edu/honorcode/>.
9. **Grade Dispute/Appeal:** Final grade dispute/appeal must be submitted within a week of the final exam. The procedure has been outlined in the SPSU website that can be accessed via the link at http://www.spsu.edu/business/faq_suggestions/gafaq.htm.
10. **ADA Provisions:** “Students with disabilities, as defined by the Americans with Disabilities Act (ADA) of 1990, should contact the instructor during the first week of the semester regarding the accommodations necessary to complete the requirements of this course. The instructor, with the help of SPSU, will make reasonable adjustments to take into consideration the specific handicap of each student covered under the ADA.” The students can also contact SPSU ADA coordinator at 678-915-7244 for additional help.”
11. **Communications, Grading, and Response Timeframe:** The best way to communicate with me is by SPSU email or D2L email, then by telephone. Grading of homeworks/assignments may take up to a week. I will try to respond to any comments/questions within 24 hours. However, I may not be available during the weekend.
12. **Contacts to get Help:**
 - For D2L Technical Support, go to <http://spsu.edu/d2l>
 - For Wimba Technical Support, go to <http://www.wimba.com/services/support/>
 - SPSU Help Desk Phone Number: (678) 915-HELP(4357).

GRADING POLICY: All exams, quizzes, and assignments must be completed satisfactorily in order to pass the course. The evaluation process described below is subject to change by the instructor. The changes will be announced in the class.

Class Work:

- 1. Homework - 10%
- 2. Quiz - 10%
- 3. Design Projects
 - ✓ Project Submission - 15%
 - ✓ Project Presentation - 05%
- 4. Midterm - 20%
- 5. Lab Experiment + Lab Quiz - 15%
- 6. Final Exam - 25%

Total Grade:

Scale, Letter Grade, and GPA

| | | |
|------------|----|-----------------------------------|
| 90% - 100% | A | 4.0 (Excellent) |
| 80% - 90% | B | 3.0 (Good) |
| 70% - 80% | C | 2.0 (Satisfactory) |
| 60% - 70% | D | 1.0 (Passing) |
| < 60% | F | 0.0 (Failure) |
| -- -- | WF | 0.0 (Withdrawn after deadline) |

TOTAL - 100%

The following symbols are approved for use in the cases indicated, but will not be included in the determination of the grade point average.

"I" This symbol indicates that the student was doing satisfactory work but, for non-academic reasons beyond his control, was unable to meet the full requirements of the course. The requirements for removal of an "I" are left to the respective institutions; however, if an "I" is not satisfactorily removed after three quarters of residence, the symbol "I" will be changed to the grade "F" by the appropriate official. (See Southern Tech policy - Removal of an Incomplete "I", on page 2).

"W" This symbol indicates that a student was permitted to withdraw without penalty. Withdrawals without penalty will not be permitted after the mid-point of the total grading period (including final examinations) except in cases of hardship as determined by the appropriate official of the respective institution.

"V" This symbol indicates that a student was given permission to audit this course. Students may not transfer from audit to credit status or vice versa.

"K" This symbol indicates that a student was given credit for the course via a credit by examination program approved by the respective institution's faculty (CLEP, AP, Proficiency, etc.)

CET 3320.001 SCHEDULE: Two 50-minute classes or 1-100 minute class per week.

TENTATIVE LECTURE TOPIC/OUTLINE: The following lecture topics/outlines are subject to change by the instructor. The changes will be announced in the class.

| Class/Week | Tentative Lecture Topic/Outline | Chapter |
|-------------------|--|----------------|
| Week 1 | Topic 1: Regulations and Mass Balance - water quality and wastewater management regulations, mass balance, etc. | Handouts |
| Week 2 – 5 | Topic 2: Wastewater Collection System – types of collection systems, types of sewers, collection system appurtenances, basic considerations for design of sewers, design of sanitary sewers, preparation of contract drawings and specifications, and construction of sewers. | Handouts |

| Class/Week | Tentative Lecture Topic/Outline | Chapter |
|--------------|--|----------|
| Week 6 – 8 | Topic 3: Water Quality Management – definition and uses of biochemical oxygen demand (BOD) and chemical oxygen demand (COD), determination of BOD rate constant (k), and development of dissolved oxygen (DO) sag curve using Streeter Phelps' equation for a stretch of stream/river. | Handouts |
| Week 8 | Mid Term Exam 1 | --- |
| Week 9 | Topic 4: WWTP Design Considerations – introduction, initial & design year, service area, site selection, design population, regulatory controls & effluent limitations, characteristics of wastewater, degree of treatment, choice of treatment process, equipment selection, plant layout & hydraulic profile, energy & resource requirements, plant economics, and environmental impact assessment. | Handouts |
| Week 10 - 14 | Topic 5: Wastewater Treatment – wastewater microbiology, characteristics of wastewater, physical, chemical and biological treatment of wastewater such as unit operations of pretreatment, primary treatment, unit processes of secondary treatment (activated sludge), tertiary/advanced treatment, disinfection, various options for wastewater disposal and reuse. | Handouts |
| Week 15 -16 | Topic 6: Sludge Management – sludge generation and treatment, design of units for sludge treatment, dewatering, and disposal. | Handouts |
| Week 17 | Final Exam - Comprehensive | --- |

CET 3320L.070 SCHEDULE: One 150-minute class per week

TENTATIVE LABORATORY EXPERIMENTS/ACTIVITIES: The following laboratory experiments/activities are subject to change by the instructor. Changes will be announced in the class.

| Class/Week | Name of the Experiment/Activity | Comments |
|------------|---|------------|
| Week 1 | Introduction - Orientation, introduction, lab safety, sampling techniques & sample preservation | Lab Manual |
| Week 2 | Experiment No. 1: Determination of pH of Water Experiment No. 2: Determination of Color of Water Experiment No. 3: Determination of Turbidity of Water | Lab Manual |
| Week 3 | Experiment No. 4: Determination of Solids of Water Experiment No. 5: Determination of Carbon Dioxide of Water | Lab Manual |
| Week 4 | Experiment No. 6: Determination of Alkalinity of Water Experiment No. 7: Determination of Hardness of Water | Lab Manual |
| Week 5 | Experiment No. 8: Determination of Chloride of Water Experiment No. 9: Determination of Metal (Iron or Others) of Water | Lab Manual |

| Class/Week | Name of the Experiment/Activity | Comments |
|---------------------|--|-----------------|
| Week 6 | Midterm Exam/Quiz 1 | --- |
| Week 7 | Experiment No. 10: Determination of Coagulant Dose - Jar Test | Lab Manual |
| Week 8 | Experiment No. 11: Determination of Break Point Chlorination | Lab Manual |
| Week 9 | No Lab | --- |
| Week 10 | Experiment No. 12: Determination of Chemical Oxygen Demand | Lab Manual |
| Week 11 | Experiment No. 13: Determination of Biochemical Oxygen Demand | Lab Manual |
| Week 12 - 13 | Students' Experiment/Project – Experiment/Project Selected & Designed by the Students | --- |
| Week 14 | Visit to a Local Wastewater Treatment Plant & Laboratory | --- |
| Week 15 | Final Exam/Quiz - Comprehensive | --- |