COURSE DESCRIPTION

WASTEWATER TREATMENT 303 CEU TRAINING COURSE – 20 HRs

This CEU course is a review of wastewater treatment methods and related subjects. This course is general in nature and is not state specific, but contains different wastewater treatment methods, policies, and ideas.

The target audience for this course includes wastewater treatment operators, pretreatment and industrial waste inspectors, the person interested in working in a wastewater treatment or pretreatment/industrial wastewater facility, and those wishing to maintain CEUs for a certification license, wanting to learn how to perform their job safely and effectively, and/or to meet education needs for promotion. There are no prerequisites, and no other materials are needed for this course.

General Objectives

To provide awareness in effective and efficient wastewater WAS/RAS- activated sludge methods and generally accepted wastewater treatment methods.

Course Goals

1. Wastewater treatment characteristics, processes and regulations.
2. Wastewater treatment operation, filtering components, clarifiers and digesters.
3. Activated sludge processes.
4. Clarifier, filter, digester and related conventional wastewater treatment processes problems and measures.
5. Wastewater treatment related microorganisms.
6. Wastewater treatment lab procedures.

Intended Audience

This CEU course is intended for Wastewater Treatment, Collections and Pretreatment/Industrial Waste Inspectors. The target audience for this course is the person interested in working in a wastewater treatment or collections facility and wishing to maintain CEUs for a certification license or to learn how to do the job safely and effectively, and/or to meet education needs for promotion.

Prerequisites: None

Required Texts

The Wastewater Treatment 303 CEU course CEU training course comes complete, no other materials are necessary.

Learning Objectives and Timed Outcomes

1. The student will understand and describe wastewater treatment characteristics, processes and regulations. – 320 minutes.
   a. Describe the purpose of activated sludge.
   b. Describe the seven basic components of wastewater.
   c. Evaluate the basic stages of treatment.
   d. Examine the impact of the Clean Water Act on the environment.
   e. Explain the importance of wastewater treatment plants in regards to the Clean Water Act.
   f. Identify other important characteristics of wastewater.

2. The student will understand and describe wastewater treatment operation, filtering components, clarifiers and digesters. – 275 minutes.
   a. Define and explain BOD.
   b. Define flights and chains.
   c. Describe the different types of blowers and their uses.
   d. Discuss the two functions of secondary clarifiers.
   e. Evaluate the purpose of aeration.
   f. Examine the usefulness of mechanical aeration.
   g. Explain RBC technology.
   h. Explain the function of diffusers.

3. The student will understand and describe Activated sludge processes. – 315 minutes.
   a. Compare the different aeration tank designs and how they function.
   b. Describe the four groups of bugs and their purpose in activated sludge processes.
   c. Differentiate between nitrification/denitrification and explain the purpose of each.
   d. Evaluate the purpose and usefulness of floc.
   e. Explain F/M and MCRT processes.
   f. Identify and explain the two steps in the activated sludge process.
   g. Name and describe the basic system components.
   h. Define RAS and WAS and explain their purpose and components.

4. The student will understand and describe corrective clarifier, filter, digester and related conventional wastewater treatment processes problems and measures. – 245 minutes.
   a. Differentiate between Thiothrix I and II and usefulness.
   b. Evaluate the presence of Microthrix and possible controls.
   c. Explain the different causes and controls for filamentous bacteria.
   d. Identify different process indicators and what their presence signifies.
   e. Summarize the usefulness of PAX in Microthrix control.

5. The student will understand and describe analysis of common wastewater treatment related microorganisms. – 325 minutes.
   a. Compare anaerobic and aerobic bacteria.
   b. Compare the advantages and disadvantages of filamentous bacteria.
   c. Describe decomposers and their functions.
   d. Discuss the purpose of photosynthetic organisms in activated sludge.
   e. Evaluate the different types of algae and the significance of their presence.
   f. Explain how to identify filamentous bacteria.
   g. Explain the concept of dispersed growth.
   h. Explain the usefulness of facultative bacteria.
   i. Identify nitrifying organisms and their purposes.
   j. Identify protozoans and metazoans and explain their characteristics and the three significant roles they play in activated sludge.

6. The student will understand and describe wastewater treatment lab procedures. – 100 minutes.
   a. Describe apparatus, procedures, and calculations for suspended matter for mixed liquor.
   b. Explain apparatus, procedures, and calculations for settleability labs.
   c. Explain SVI and calculations.

Accreditation Formula for Figuring CEU Credit
The results of beta-testing were used in conjunction with a formula to determine average student time for accreditation purposes for intended audiences. This formula may not work for unintended audiences.

1 page of text = 2 minutes of student time.
1 word practice problem = 1 minute of student time.
1 word quiz/exam question = 1 minute of student time.

**CEU was awarded based on guidelines established by the International Association of Continuing Education and Training (IACET).

630 pages (Including the Assignment) times 2 equals 1260 divided by 60 minutes = 21 hours
400 questions equals 8.3 hours
We are asking for 20 hours of credit.

Specific Course Goals and Timed Outcomes (Beta Testing)
Thirty seven successful students were tested and the average time necessary to complete each task was recorded in the above objectives and timed outcome section. In the above timed outcome section area, the tasks were measured using times spent on each specific objective goal and final assignment grading of 70% and higher. Originally seventy five wastewater students were given a task assignment survey in which to track their times on the above learning objectives (course content) and utilized a multiple choice style answer sheet to complete their final assignment. All students were given 30 days to complete this assignment and survey. Rusty Randall, Proctor October 2011 MACI.

Beta Testing Group Statistics
Originally seventy five were selected for this assignment. All the students held wastewater treatment certification type of position. None of the test group received credit for their assignment. The average educational age of the students was the tenth grade with eighteen months average experience in wastewater treatment or pretreatment. The average completion times were based upon the outcome of thirty seven successful students with an average completion time of 20.3 hours with an average passing score of 83 percent. Seventeen students did not complete the reading assignment and twenty seven failed the course. Our best professional judgment is that this is an easily completable course for the intermediate level of wastewater treatment certified operator.

2014 Beta Testing Breakdown
Seventy percent of successful students performed at or above the *Basic* level in 2014. Twenty one percent of successful students performed at or above the *Proficient* level, demonstrating their competency over challenging wastewater content. Seven percent of successful students performed at the *Advanced* level in 2014 beta testing.

Course Training/Assessment Needs Methodology
Technical Learning College identified training/assessment needs by placing identifying them in two categories; internal and external.

1. The difficulty of your course.
   Very Easy 0 1 2 3 4 5 Very Difficult

2. Please rate the difficulty of the testing process.
   Very Easy 0 1 2 3 4 5 Very Difficult

3. Please rate the subject matter on the exam to your actual field or work.
   Very Similar 0 1 2 3 4 5 Very Different

Internal Methods include:
- ✓ Observation
- ✓ Interviews
- ✓ Instruments: Perception instruments and Knowledge based assessments
- ✓ Student records and reports
- ✓ Group problem analysis (Classroom or Seminars)
- ✓ Performance or Survey appraisals

External Methods include:
- ✓ Outside consultants (Completion)
- ✓ Government Certification Reviews (Training Needs)
- ✓ Records and reports from other agencies

The needs assessment/survey maintains our training and education materials criteria. Assessments and changes are performed based on changes in technology, evaluations of the participants and regulatory changes. Materials are assed yearly or as needed to insure no significant changes are made. If this has occurred, the course would be re-evaluated.

Task Analysis and Training Needs Assessment Process Information Gathering
Task Analysis and Training Needs Assessments have been conducted to determine or set Needs-To-Know for the basis of TLC's continuing education courses. The following is a listing of some of those who have conducted extensive valid studies from which TLC has based the continuing education program upon: the Environmental Protection Agency (EPA), the Arizona Department of Environmental Quality (ADEQ), the Texas Commission of Environmental Quality (TCEQ), Pennsylvania Depart of Environmental Protection (PDEP) and the Association of Boards of Certification (ABC).

TLC has primary used Training Provider Manual for the Pennsylvania Water and Wastewater System Operator Training Program for course goal setting and learning objectives for all three training formats; conventional classroom, distance paper based and web based training.

The titles or names of subjects (Learning Objectives) may be changed for readability purposes. Some of the terms used in this document may be part of a copyrighted adult learning assessment process and in these cases, we utilize generic terminology. The needs assessment/survey maintains our training and education materials criteria.

Assessments and changes are performed based on changes in technology, evaluations of the students, regulatory changes and editorial corrections. Most of this information is considered intellectual property and may not be owned by TLC but by third –parties. All of TLC's information is proprietary.

Assessment Implications
Core tasks have been statistically analyzed then reviewed and edited by the Advisory Committee, SME Experts. These tasks now form a distinct definition of the course and assessment content. The emphasis for most of the levels of operation would be found in the duty/functions discussion below. To recap, bodies of knowledge and concepts that support the understanding and valid performance of the following duty/functions should be taught first. Based on the job-task survey data and beta-testing, the most useful parts of the course are beneficial for the following:

ADDIE
TLC utilizes a five-phase instructional design model consisting of Analysis, Design, Development, Implementation, and Evaluation for our continuing education courses. Each course design step has an outcome that feeds into the next step in the sequence. The five phases of ADDIE are as follows:

ANALYSIS
During the Training Needs Assessment Process Information Gathering Analysis phase, the course designer(s)(see Subject Matter Experts and Contributing Editors) identifies the learning need, the goals and objectives, the student's needs, existing knowledge, Course Statement of Need**,** and any other relevant characteristics (State or Federal Need-to-Know) and to ensure that students are learning what is relevant for their job**.**

DESIGN
This is the systematic process of specifying learning objectives from the Training Needs with a focus on Bloom's Taxonomy. A detailed storyboard following the Needs Assessment/Survey and/or Course Statement of Need will determine the course content.

DEVELOPMENT
The actual creation (production) of the training content will begin based upon the Design phase using Bloom's Taxonomy. At this time, a decision is make to proceed or table the course.

IMPLEMENTATION
During implementation, the Alpha testing plan is put into action and a procedure for course and/or assessment revision is implemented. These course materials and assessments are delivered or distributed to the student group. After delivery, the effectiveness of the training materials is evaluated in Beta testing phase. All of our courses have extensive Alpha and Beta testing to ensure job relevancy, correct information and course learning objectives are met.

EVALUATION
This phase consists of (1) formative and (2) summative evaluation from Alpha and Beta testing. Formative evaluation is present in each stage of the ADDIE process. Summative evaluation consists of tests designed for criterion-related referenced items and providing opportunities for feedback from the students and proctor. Administrative and instructional staff will collect all student concerns (verbal, written and surveys) and distribute these to TLC Administrative personnel for evaluation and course corrections. Course and/or Assessment revisions are made as necessary.

Course Author
Melissa Durbin
This course was co-authored by Melissa Durbin; she has over 20 years of wastewater treatment teaching experience as a college instructor. Melissa has written the several nationally accepted wastewater treatment manuals since 2001. This course has been accepted in most States for continuing education credit. Melissa has taught approximately 10,000 students about wastewater treatment and related classes. She will be available to answer questions relating this course.

Extensive Academic Research
Technical Learning College's (TLC's) continuing education course material development was based upon several factors; field experience working in the water quality field, extensive academic research (teaching in the community college system), advice from subject matter experts(State officials and industry leaders), data analysis, task analysis and training needs assessment process information gathered from other states.

Both Melissa and Jeff Durbin are the two primary Instructors, Subject Mater Experts and Technical Writers have trained and/or certified more than ten thousand students. These two Instructors teach on a daily basis in a classroom setting throughout Arizona and on-line to students nationwide. See below for more information.

Advice from Subject Matter Experts
Both Melissa and Jeff Durbin are professional trainers and have been educated in current trends in professional education and continuing education needs.

Contributing Editors
James L. Six Received a Bachelor of Science Degree in Civil Engineering from the University of Akron in June of 1976, Registered Professional Engineer in the State of Ohio, Number 45031 (Retired), Class IV Water Supply Operator issued by Ohio EPA, Number WS4-1012914-08, Class II Wastewater Collection System Operator issued by Ohio EPA, Number WC2-1012914-94

Joseph Camerata has a BS in Management with honors (magna cum laude). He retired as a Chemist in 2006 having worked in the field of chemical, environmental, and industrial hygiene sampling and analysis for 40 years. He has been a professional presenter at an EPA analytical conference at the Biosphere in Arizona and a presenter at an AWWA conference in Mesa, Arizona. He also taught safety classes at the Honeywell and City of Phoenix, and is a motivational/inspirational speaker nationally and internationally.

James Bevan, Water Quality Inspector S.M.E. Twenty years of experience in the environmental field dealing with all aspects of water regulations on the federal, state, and local levels. Experience in the water/wastewater industry includes operation of a wastewater facility, industrial pretreatment program compliance sampling, cross-connection control program management, storm water management, industrial and commercial facility inspections, writing inspection reports for industry, and technical reports per EPA permit requirements. Teacher and Proctor in Charge for Backflow Certification Testing at the ASETT Center in Tucson for the past 15 years and I possess an Arizona Community College, Special Teaching Certificate in Environmental Studies. Extensive knowledge and experience in college course and assignment/assessment writing.

Dr. Pete Greer S.M.E., Retired biology instructor, chemistry and biological review.

Jack White, Environmental, Health, Safety expert, City of Phoenix. Art Credits

Ongoing Course Evaluation

Administrative and instructional staff will collect all student concerns (verbal, written and surveys) and distribute these to the Course Editor or Copyeditors for evaluation and course corrections. Administrative and instructional staff will collect all student concerns (verbal, written and surveys) and distribute these to TLC Administrative personnel for evaluation and course corrections. Course and/or Assessment revisions are made as necessary.

Editor's Discretion

The Course Editor may change the course assessment (assignment), course text, objective, artwork and topical order as necessary for security, corrective, printing, readability or typesetting purposes. The assessment may be rotated for security purposes and the course material may be updated to reflect any regulatory updates and/or corrections. The overall course objective or topic guide may be in a different order than the course manual for the reason of typesetting or copy-editing purposes. Course materials, charts and artwork amendments, adjustments, modifications may be performed to reflect regulatory/safety text/artwork updates, Bloom's taxonomy changes, error adjustments and comprehension. These changes generally do not reflect major course material changes, but are minor in nature.

Course Registration and Support

TLC offers complete registration and support services for all correspondence courses via e-mail, Web site, telephone, fax, and mail. TLC will attempt to provide immediate, prompt service.

When a student registers for a distance or correspondence course, he/she is assigned a “start date” and an “end date.” It is the student's responsibility to note dates for assignments and keep up with the course work. If a student falls behind, he/she must contact TLC and request an end date extension in order to complete the course. It is the prerogative of TLC to decide whether or not to grant the request.

Students have 90 days from receipt of this manual to complete the assignments in order to receive their continuing education units (CEUs) or professional development hours (PDHs). A score of 70% or better is necessary to pass this course. If students need any assistance, they should e-mail or call TLC with their concerns.

In the interest of privacy, students’ social security numbers are not used for tracking. Instead, a unique, alternate number is assigned to each student.

Instructions for Written Assignments

The Wastewater Treatment 303 training correspondence course uses multiple choice and true/false questions. Answers may be written in this manual or typed out on a separate answer sheet. TLC prefers that students type out and e-mail their answer sheets to info@tlch2o.com, but they may be faxed to (928) 468-0675.

Required Texts

This course comes complete and does not require any other materials.

Feedback Mechanism (Examination Procedures)

A feedback form is included in the front of each study packet.

Security and Integrity

We expect every student to produce his/her original, independent work. Lesson sheets and final exams are not returned to the students, to discourage sharing of answers. If any fraud or deceit is discovered, the student will forfeit all fees, and the appropriate agency will be notified.

Any student whose work indicates a violation of the Academic Misconduct Policy (cheating and/or plagiarism) can expect penalties as specified in the Student Handbook, which is available through Student Services; contact them at (928) 468-0665.

Environmental Terms, Abbreviations, and Acronyms

TLC provides a glossary that defines, in non-technical language, commonly used environmental terms appearing in publications and materials, as well as abbreviations and acronyms used throughout the EPA and other governmental agencies. You can find the Glossary and Appendix at *http://www.abctlc.com/downloads/PDF/WWTGlossary.pdf*

Record Keeping and Reporting Practices

TLC keeps all student records for a minimum of five years. It is the student’s responsibility to give the completion certificate to the appropriate agencies.

ADA Compliance
TLC will make reasonable accommodations for persons with documented disabilities. Students should notify TLC and their instructors of any special needs. Course content may vary from this outline to meet the needs of these particular students.

Note to Students
Keep a copy of everything that you submit! If your work is lost, you can submit your copy for grading. If you do not receive your certificate of completion or other results within two to three weeks after submitting it, please contact your instructor.

Grading Criteria
TLC will offer the student either pass/fail or a standard letter grading assignment. If TLC is not notified, you will only receive a pass/fail notice. For security purposes, please fax or e-mail a copy of your driver's license and always call us to confirm we've received your assignment and to confirm your identity. TLC offers students the option of either pass/fail or assignment of a standard letter grade. If a standard letter grade is not requested, a pass/fail notice will be issued. Final course grades are based on the total number of possible points. The grading scale is administered equally to all students in the course. Do not expect to receive a grade higher than that merited by your total points. No point adjustments will be made for class participation or other subjective factors.

If TLC is not notified, you will only receive a pass/fail notice. In order to pass your final assignment, you are required to obtain a minimum score of 70% on your assignment.

Timed Averages
Student have reported the following time burden for successful completion of this distance learning course to be estimated to average of 10 hours per response per completed assignment or final examination. The timed burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing of the final assignment and passing the assignment with a score of 70% or better.

Forfeiture of Certificate (Cheating)
If a student is found to have cheated on an examination, the penalty may include--but is not limited to--expulsion; foreclosure from future classes for a specified period; forfeiture of certificate for course/courses enrolled in at TLC; or all of the above in accordance with TLC's Student Manual. A letter notifying the student's sponsoring organization (State Agency) of the individual's misconduct will be sent by the appropriate official at TLC. No refund will be given for paid courses. An investigation of all other students that have taken the same assignment within 60 day period of the discovery will be re-examined for fraud or cheating.

At the end of the course, the student will be able to...
Understand and describe effective and efficient wastewater treatment methods, activated sludge and laboratory procedures/sampling methods.

Student is required to submit the following information for assignment grading…
1. **DRIVER'S LICENSE**
2. **SCHEDULE OF TIME WORKED ON ASSIGNMENT**
3. **AFFIDAVIT OF EXAM COMPLETION**
4. **PROCTOR CERTIFICATION**
5. **TELEPHONE CONFIRMATION**

Educational Mission
The educational mission of TLC is:
To provide TLC students with comprehensive and ongoing training in the theory and skills needed for the environmental education field,

To provide TLC students with opportunities to apply and understand the theory and skills needed for operator certification,

To provide opportunities for TLC students to learn and practice environmental educational skills with members of the community for the purpose of sharing diverse perspectives and experience,

To provide a forum in which students can exchange experiences and ideas related to environmental education,

To provide a forum for the collection and dissemination of current information related to environmental education, and to maintain an environment that nurtures academic and personal growth.

CUSTOMER SERVICE RESPONSE CARD

NAME: _____

E-MAIL_____PHONE_____

PLEASE COMPLETE THIS FORM BY CIRCLING THE NUMBER OF THE APPROPRIATE ANSWER IN THE AREA BELOW.

1. Please rate the difficulty of your course.
   Very Easy 0 1 2 3 4 5 Very Difficult

2. Please rate the difficulty of the testing process.
   Very Easy 0 1 2 3 4 5 Very Difficult

3. Please rate the subject matter on the exam to your actual field or work.
   Very Similar 0 1 2 3 4 5 Very Different

4. How did you hear about this Course? _____

5. What would you do to improve the Course?

_____

How about the price of the course?

Poor_____ Fair ____ Average ____ Good____ Great_____

How was your customer service?

Poor___ Fair ____ Average ____ Good _____ Great_____

Any other concerns or comments.
