Course Syllabus

1. *Course Number and Name*
   CE 493E: Construction Estimation

2. *Course Information*
   - Semester: Fall 2018
   - Schedule: MWF, 9:00 am – 9:50 am
   - Class Location: ESB-E207
   - Credit Hours: 3

3. *Instructor Information*
   - Name/Position: Fei Dai/Associate Professor
   - Office: ESB 535
   - Phone: 304-293-9940
   - Email: fei.dai@mail.wvu.edu
   - Office Hours: T, 10:00 am – 12:00 pm

4. *Course Description*
   A construction engineer evaluates engineering design and site situation in order to predict time and cost implications for "what if" scenarios and achieve safety, quality and efficiency in construction. This course will facilitate students to learn how to define, assess and analyze such "what-if" scenarios in construction with regards to *Design, Materials, Method, Quantity, Productivity, and Rate*.

   Lectures will be designed and delivered in the format of problem-solving seminars; in each seminar, students are expected to work out examples in part or whole, discuss problem definitions of the examples while critically reviewing model solutions. Industry professionals might be invited to share experience and insight on best practices and practical issues.

5. *Prerequisites*
   Consent

6. *Course Objectives*
   This course is expected to deliver systematic, logical, and analytical approaches to ***quantity takeoff*** and ***unit rate fixing*** based on engineering design, survey, and resource use subject to site conditions for safety, quality, and productivity. It will include lectures, labs, and presentations from industry if possible.

   This course is also intended to enhance the ***team-based learning*** experience through conducting labs. In those labs, students work in teams to develop skills in teambuilding, leadership, communication and cooperation, which are necessary to tackle challenges and complexities in construction estimating and planning in the real world. The labs revolve around solving practical problems by combining knowledge and skills taught in class.

7. *Expected Learning Outcomes* – Upon successful completion of this course students will have:

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Goals by Topic	Student Outcome
Apply Excel spreadsheet program to enhance the constructability of engineering design on earthworks projects (e.g. cut-fill balance for local-area site grading design).	A, E, G, K
Balance the provision of crew resources used in material handling and transportation processes; specifically, to represent design and site in the form of mass diagram to estimate earthmoving costs on highway projects.	A, E, K
Conduct critical path analysis under resource constraints and cost budgeting based on resource-loaded schedules.	A, E
Estimate construction costs by accounting for permanent and temporary design details, including formwork (columns), rebar (slab), concrete (placing methods), and CMU (concrete masonry unit).	E, K
Master applied statistics and Excel based Monte Carlo simulation in contingency estimating and account for uncertainties and risks inherent in design, site and productivity.	E, K
Access state-of-the-art 3D engineering design tools (Autodesk Revit for concrete structures and Autodesk Civil 3D for earthworks) to visualize and comprehend design details and to takeoff material quantities and crew efforts.	G, K

A: An ability to apply knowledge of mathematics, science and engineering.
E: An ability to identify, formulate, and solve engineering problems.
G: An ability to communicate effectively.
K: An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

8. Required Textbooks

- Robert Peurifoy, and Garold Oberlender. (2014). Estimating Construction Costs, 6th edition, McGraw-Hill Education, Columbus, OH.

  Note: **NOT REQUIRED**
- Additional reading material for selected topics in the course will be announced or posted in the WVU eCampus

9. Exams/Assignments/Quizzes

Performance will be evaluated based on exams, homework assignments, lab assignments, quizzes, and class participation. There are **three (3) CLOSED-BOOK exams** in this course. The exams will test the individual student's understanding of the principal concepts and knowledge covered in the course. The exams cover material discussed in the lectures, labs, or included in the assigned readings up to the time of the exam. There are **five (5) assignments** to be completed individually. All students will be expected to make a reasonable effort to find answers on their own and hand in assignments in time. Collaboration among the students is encouraged, as long as the integrity of the student's individual work and contribution is maintained (i.e., copying and plagiarism will be severely penalized). There will be **three (3) lab assignments for group works**, based on the course material delivered and class progression. **CLOSED-BOOK in-class quizzes** will be conducted in a random manner without announcement in

advance for examining the ongoing performance and attendance.

Note: Delayed submission of the assignments will be scored with a 20% deduction. Under no circumstances will make-up exams be administered if students miss exams/quizzes. If students miss exams/quizzes due to authorized excused absences (e.g., medical or other similar hardships, family events restricted to wedding and funeral, and job interviews), the opportunity to take make-up exams will be given to the students at an alternate time. It is the student's obligation to contact the instructor before the examination so that appropriate arrangement may be made.

10. Grading Policy

The breakdown of the final grade is:

In-Class Quizzes	5%
Homework Assignments	25%
Lab Assignments	30%
Exam No. 1	10%
Exam No. 2	10%
Final Exam	20%
Total	**100%**

There will be **no curve** for the final grade, only straight averages. The ranges for grades are as follows: **[Above 90.00/ A]; [80.00 – 89.99/ B]; [70.00 – 79.99/ C]; [60.00 – 69.99/ D]; [Below 60/ F]**

11. Attendance Policy

There is **no attendance policy obligating students to attend all classes**. However, I strongly encourage you to show up to all classes to completely understand the lecture topics that this course will be discussing during the class. Also, you would benefit from attending the classes as the class provides incomplete lecture notes and makes important notices of assignments, quizzes, and exams which I will not post in the eCampus.

12. Social Justice Statement

The West Virginia University community is committed to creating and fostering a positive learning and working environment based on open communication, mutual respect, and inclusion. If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise me and make appropriate arrangements with the Office of Disability Services (293-6700). For more information on West Virginia University's Diversity, Equity, and Inclusion initiatives, please see http://diversity.wvu.edu.

13. Academic Integrity/Honesty

The integrity of the classes offered by any academic institution solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. Therefore, I will enforce rigorous standards of academic integrity in all aspects and assignments of this course. For the detailed policy of West Virginia University regarding the definitions of acts considered to fall under academic dishonesty

and possible ensuing sanctions, please see the Student Conduct Code http://studentlife.wvu.edu/office_of_student_conduct/student_conduct_code. Should you have any questions about possibly improper research citations or references, or any other activity that may be interpreted as an attempt at academic dishonesty, please see me before the assignment is due to discuss the matter.

14. *Adverse Weather Commitment*

In the event of inclement or threatening weather, everyone should use his or her best judgment regarding travel to and from campus. Safety should be the main concern. If you cannot get to class because of adverse weather conditions, you should contact me as soon as possible. Similarly, if I am unable to reach our class location, I will notify you of any cancellation or change before class starts via your MIX emails to prevent you from embarking on any unnecessary travel. If you cannot get to class because of weather conditions, I will make allowances relative to required attendance policies, as well as any scheduled tests, quizzes, or other assessments.

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Tentative Course Schedule

Week	Topic	Assignment	Lab Session
1 8/15 – 8/17	Course Introduction; Introduction to Construction Estimating		
2 8/20 – 8/24	Review of Organization and Cost Breakdowns; Unbalanced Bidding; AON Design; Resource Links	A1	
3 8/27 – 8/31	Earthworks Estimating: Mass Diagram; Cut Fill Balancing		
4 9/5 – 9/7	Earthworks Estimating: Cycle Time and Fleet Balancing	A2	L1
5 9/10 – 9/14	Earthworks Estimating: Excel & Solver Demo		
6 9/17 – 9/21	Rebar Takeoff: Concrete Waste		
7 9/24 – 9/28	Rebar Takeoff: Slab Rebar	A3	L2
8 10/1 – 10/5	Rebar Takeoff: Columns Formwork Case		
9 10/8 – 10/12	Labor/Equipment Hourly Rate	A4	
10 10/15 – 10/19	Contingency Estimating: Monte Carlo Excel as Simulation Tool		
11 10/22 – 10/26	Contingency Estimating: Simulation for Planning and Scheduling		
12 10/29 – 11/2	Contingency Estimating: Piling Construction	A5	
13 11/5 – 11/9	Cost Control		
14 11/12 – 11/16	3D Design: Building Information Models		L3
15 11/19 – 11/23	Fall Recess		
16 11/26 – 11/30	3D Design: Building Information Models		
17 12/3 – 12/5	Review and Discussion		