ENGINEERING ANALYSIS ENGS-200-A

Spring 2025

Meeting Space: Lucas 207 Time: Tuesdays 1:10 pm – 4:10 pm

Instructor: Dr. Okioga Office Location: Trexler 180

Email: okioga@roanoke.edu

Office Hours (By Appointment Only):

- Virtually: Mondays and Friday: 12:00-1:00pm
- In Person: Tuesdays: 4:10 pm – 5:10 pm

1. Course Overview and Specific Learning Outcomes:

This course is an introduction to the process of engineering design with an exploratory "hands-on" approach. The course explores the engineering design process, including planning, decision analysis/alternatives evaluation, conceptual design, modeling/prototyping, cost estimating/value engineering, and project and construction management. The focus of the course is experiential learning while supported by instruction and guided activities that highlight the underlying concepts in engineering design. Strength-based leadership, communication, teamwork, critical thinking, professionalism, and use of technology/application tools for engineering solutions are heavily emphasized.

Learning Outcomes: Upon completion of this course, successful students will be able to:

- Apply engineering design processes and various technologies and tools to produce a pre-selected, proposed community-oriented project
- Analyze, interpret and use existing engineering data for project development
- Recognize and apply personal and team strengths to achieve project goals
- Effectively communicate the project process through technical writing and technical presentations
- Interact with the larger community in a professional manner

Prerequisites: ENGS 191 - Engineering Foundations/192 - Engineering Analysis

2. Required Materials:

- **Laptop - Bring to each class!**
- Optional Text Book: Dym, Clive L. Cornerstone Engineering Design. Wiley & Sons Canada, Limited, John, 2013. ISBN: 9781118324585; ISBN10: 1118324587
- Software
    - AutoCAD (Lab Computers)
    - ArcGIS (Lab Computers)
    - EPANET (Downloadable from EPA website)
    - SWIMM (Downloadable from EPA website)

- SkyCIV (Available Online with Sign-in) or any other equivalent software that is based on ACI 360 R-10
- University of Maine EverFE: Software for the 3D Finite Element Analysis of Jointed Plain Concrete Pavements (Available in Inquire)

3. **Attendance:** Each student is expected to attend every class and is accountable for missed content and assignments. Attendance will be taken at the beginning of every class meeting. If you arrive late it is your responsibility to make sure you are not marked absent in my grade book. Your fourth and each additional absence will result in a 2-point reduction in your final course grade. You get three freebies so that I do not have to distinguish between excused and unexcused absences. College athletes will be afforded wiggle room; please come see me immediately if you are an athlete. If you should have an emergency that requires you to miss a large chunk of the course, please notify me ASAP. If you have a temperature of 100.4 or higher or other flu or COVID symptoms, don't come to class. Having a fever is a good reason for students to miss class. If you have exceeded your freebies and don't want to be penalized due to illnesses, be sure to have a note from your Doctor or from Student Health. Wearing a mask while out and about if you feel a bit ill is good for everybody.

4. **Grading:** Standard letter grades (A–F) are assigned according to the following scale for this course:

   "A" (91–100), "B" (81–90), "C" (71 - 80), "D" (60–70), "F" (< 60).

   Final grades will be based on the following course components:

   - 70% Project Execution, Delivery and Client Feedback : Technical Memorandums, Reports and Project Presentations
   - 30% Assignments/In-class Activities and Peer Feedback
   - Extra points participation in MCSP Conversation Series

5. **Testing:** Final examinations are scheduled at the times designated by the Registrar's office and as detailed in the Academic Calendar. As this course is focused on an engineering design end-product that students will work on throughout the semester, the final engineering design project report will be delivered by students during the scheduled examination day, in lieu of a written exam.

6. **Test make-up:** Late submission of work or make-ups due to absences will only be allowed for legitimate reasons that must be reported with appropriate documentation/certifications. Any make-up/late submission must be within one week of the missed submission deadline or within one week of returning to class if based on certified absences and as dictated by Roanoke College policies.

7. **Expected Number of Hours of Work per Week:** This course expects you to spend at least 12 hours of work each week inside and outside of class. A feedback survey at the end of each client milestone will provide the opportunity for each student to evaluate each of your team member's contributions. It is expected that you will offer consistent and honest feedback about the amount of work you and your team members contribute. Multiple negative feedback may reduce your overall score.

8. **Academic Integrity:** Roanoke College (RC) policies of academic integrity are enforced in all aspects of this course, and it is the responsibility of the student to be aware of these policies and to strictly adhere to them. Plagiarism and cheating are unacceptable and also violate RC policies. Being aware of others' such violations and not reporting it is also considered a contributing aspect of cheating. To avoid plagiarism, all source material must be properly cited using the MLA conventions, and paraphrased using your own words or otherwise using quotations when appropriate. Drafts must include citations. In addition to myself, the Writing Center can offer assistance and other resources for writing and presentation. Since an emphasis on the course work is based on analytical and critical thinking, you are discouraged from using AI tools to create reports in your work.

9. **Office Hours:** I will be available to meet virtually between 12 and 1pm on Mondays and Fridays. I will be able to meet in person on Tuesdays from 4:10 pm – 5:10 pm (after class). Appointments are required for all meetings. I will initiate and send meeting invitations and links for confirmed virtual appointments.

10. **MCSP Conversation Series:** Part of being a project team player is being a good listener, being open to others' points of views and also being able to reflect of those views and either support or present your arguments and alternative ideas clearly. You are encouraged to attend at least 2 of the several MCSP talks offered throughout the semester and write a ½ page paper on your reflections of the talk. The reflection papers are due within one week of the talk. MCSP credits will be factored in while determining the final grade. This particularly helps students who are on the cusp of a letter grade.

11. **Class Disruption:** All students are entitled to a professional learning environment. Students should not act in a manner which will distract and disrupt the class learning experience. Such practices will not be tolerated. Cell-phones or any other electronic communication/entertainment devices, except for tablets/laptops used for taking notes, must be either turned off or silenced at all times during the lecture period.

12. **Project Execution and Design Assessment:** Students will be grouped into teams (subgroups). These teams will respond to a scope of work provided by a designated client. Project work will be assessed at different stages to ensure adequate progress of the project, both from individual and group perspectives. Student assessments will be based on whether the students have understood the client's goals and problem statements, applied appropriate engineering and science concepts and tools for the proposed solution; conducted feasibility studies or decision making analysis for proposed solutions, performed appropriate cost/value engineering, and completed and documented their design.

13. **Technical Writing and Reporting:** Effective project communication, including communicating design and development processes, is an important skillset required of all aspiring engineers. As such, technical writing and presentation delivery will be emphasized throughout the course. A design

report (compiling several technical memorandums) will be required to detail the design and decision-making process which led to the final outcome. The expected length for this report is approximately 10 – 20 pages, including the project background, problem statement, literature review, methodologies, results, and conclusions and recommendations. The page limit does not include large tables, figures and/or diagrams that would be included in an appendix. The final report will be a compilation of multiple technical memorandums (TMs) that are developed by subgroups. Each subgroup TM is therefore expected to be between 3 and 6 pages, assuming three sub-groups depending on student interest.

14. **Presentations**: Students are required to present their work as presentations to the class, clients and faculty, as well as some invited members of the community. Students are required to observe and provide feedback to their peers during practice presentations in preparation for the final presentation.

Schedule (See Addenda Documents for Schedule Changes)

Item	Task	Anticipated Date
1	**Topic 1: Class Intro, General Proposal Info. Group formations.**	**01/14/25**
	DISC Leadership Individual Assignments	
	Commitment Document Drafts	
	Proposal Issuance	
2	**Topic 2: Preliminary Site Work**	**01/21/25**
	Site Preparation Activities (List of questions for owner)	
3	**Topic 3: Site Visit**	**01/28/25**
	Pre-proposal Meeting – Site Visit and Q&A with Owner – Review of Owner Criteria and Performance Requirements	
	Final Team Commitment Documents Due if not yet Submitted	
	Modelling Review and presentation preparation before next class	
4	**Topic 4: Engineering Design Elements Class and Design Tools Presentations by Students**	**02/04/25**
	CAD and Structural Design Analysis Presentation by Groups A and B	
	ArcGIS and Hydraulic Modeling (EPANET, SWMM) Analysis by Group C	
5	**Topic 5: Engineering Design Process, Proposal Presentation Submittals Due**	02/11/25
	Proposal Due/Presentation Rehearsal	
6	**Topic 6: Proposal Presentation Delivery to Owner – Mid Term Grades**	**02/18/25**
7	Topic 7: Engineering Economic Analysis and Data Analysis and Forecasting	02/25/25
8	Topic 8: Engineering Decision Analysis	3/11/2025
9	Topic 9: Project Communication	3/18/2025
	Substantial Project Presentation Due/Presentation Rehearsal	
10	**Topic 10: Substantial Project Completion Presentation to Owner – Need to Move to 18th (Board Meeting)**	**3/25/2025**
8	Project Wrap-up and Rehearsal Presentations/Revisit Site	04/01/25 &04/08/25
9	**Final Project Presentation**	**04/15/25**
	Feedback forms Due	04/15/25
11	Final Project Completion (Reports)	Final Exam Day