Old Dominion University
College of Engineering and Technology
Department of Engineering Technology

MET 330 **Spring 2022**

FLUID MECHANICS

Lecture Hours:	Tuesdays and Thursdays 11:00 am – 12:15 pm
Locations:	BATTEN ARTS & LETTERS – Room 2066
Dates:	Jan 08th, 2022 - Apr 25th, 2022

1. Instructor Contact Information

Instructor:	Dr. Orlando Ayala
Office Location:	111-A Kaufman Hall
Office Hours:	Tuesdays and Thursdays from 9am to 11am or by appointment
Email Address:	oayala@odu.edu
Telephone Number:	(757) 683-4467

2. Course Textbook

Name:	Applied Fluid Mechanics 7th Edition
Author:	Robert L. Mott & Joseph Untener
Publisher:	Pearson Education
ISBN:	978-0-13-255892-1

3. Course Overview

Credits:	3
Pre- or Co-requisites:	MET 310 Dynamics
Official Description:	The Study of fluid statics and dynamics, including momentum, energy, Bernoulli's equation, laminar and turbulent fluid flow and friction in pipes, fluid machinery and open-channel flow.

4. Course Objectives and Expectations

At the end of the course, the student will be able to identify, analyze, and solve broad engineering problems on the field of fluid mechanics by selecting and applying the knowledge, techniques, and skills taught in the course.

4.1. Course Objectives

After completing this course, the student should be able to:

- Describe the nature of fluids and define different fluid properties such as viscosity and pressure;
- Compute pressure and the forces (magnitude, location, and direction) associate with it in a stagnant fluid;
- Discuss what buoyancy is and determine object stability while floating or submerged in a fluid;
- Explain the fluid dynamics in pipes and fittings;

- Apply the principles of conservation of energy (Bernoulli's equation) and mass to fluid flow systems;
- Compute friction losses in pipes for a variety of configurations (series, parallel, network, etc.);
- Identify and solve for different very specific industrial problems, such as, open-channel flow, cavitation, water hammer, drag, lift, forces in pipes, and learn about different instruments to measure fluid flow quantities (such as, pressure, fluid velocity, flow velocity, etc.);
- Explain how fluid-machinery work (focused on pumps);
- Compute and select the appropriate pump for different pipe system configurations.

4.2. Course ABET student outcomes:

After completing this course, the student is expected to know and be able to do the following learned capabilities:

(1) an ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems appropriate to the discipline;

(2) an ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems appropriate to the discipline;

(3) an ability to apply written, oral, and graphical communication in broadly-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature;

(5) an ability to function effectively as a member as well as a leader on technical teams.

4.3. Course Expectations

This 3-credit course requires 2.5 hours of classroom or direct faculty instruction and *three hours of out-of-class student work each week per credit hour* (this means approximately 9 additional hours, this means at least a full day of work!) for approximately 15 weeks.
Out-of-class work includes but is not limited to: required reading, library research, written assignments, studying for exams, and work on a semester-long project.
By the way, no assignment will be accepted late so be sure to stay on schedule and ask for help if you begin to get stuck and fall behind.

4.4. Contact Policy

If you find that you have any trouble keeping up with assignments or other aspects of the course, make sure you let your instructor know as early as possible. Make sure that you are proactive in informing your instructor when difficulties arise during the semester so that he can help you find a solution.

5. Statement of Writing

In this class you will also learn to effectively communicate using technical writing. This is an important practice because after your graduation from ODU you will be forced to communicate in writing. I want to force you to do it right now what you will be anyway forced to do later in your professional life. The advantage of doing it right now is that I will guide you through the process and any issue you might have now with your written communication skills will not hurt your professional credibility and reputation. As a professional engineer, you will be involved in engineering design work, which, indeed, require calculations (what we like!) but it also requires oral and written communication. It does not matter how good your design is if you do not effectively communicate your results.

Let us learn that art together. I am still learning, as it is a non-stop process. To that end, in this class I will ask you to give written details of the whole solving process you use in every single problem. We will follow the attached general rubric to grade this. We will also have a semester-long final project that has to be well structured and articulated in both calculation process and writing.

6. Grading Criteria

1st test (including HW)	25%
2nd test (including HW)	25%
3rd test (including HW)	25%
Semester-long course project	25%

All items are going to be based on 100 points.

TESTS

The 3 tests will be **take-home tests**. You will have 5 days to work on them.

There are pre-test activities that you should consider getting involved with. If you decide to work on them, they will be an integral part of the final grade of each of the take-home tests. The pre-test activities are just the **homework assignments**. These HWs will be worked in groups, the same group for the semester-long course project. It is up to the whole group to work on these pre-test activities or not. If as a group you decide to work on them, the HW will count as 10 points of the corresponding test. The other 90 points will come from solving the actual problems of the test. It is important to note that failure to turn in the HW assignments ON TIME will affect the grade of the corresponding test (see schedule). By the way, as a group, for every test, you can change your mind on whether your group decides to work or not on the pre-test activities.

Regardless of whether your group decides to work or not on the pre-test activities, it is important you realize that this class will require you to work many problems in order to fully grasp the material. I assign several problems every week from each section of each chapter as homework assignments for you to work on. The solutions will be supplied after you turn them in. These problem assignments are to be turned in on the specified date (see schedule) before midnight. You should work on them (and even more) because the lectures and examples done in class will not fully prepare you for the exams.

As far as grading the 90 points of each test, 10 points will come following the attached rubric to measure whether you follow the basis of the technical writing structure when posting the solution of ALL the problems. The other 80 points will come from the actual procedure, but I also take into consideration the final result. Let us take an example. One test might have 2 problems to solve; each problem is worth 80/2(=40) points. Now, each problem is graded based on successfully achieved steps (procedure). I divide the problem into different steps you should accomplish to successfully solve the problem. A problem might be divided in 5 different steps and I include a "6th step" to include for correct numerical results. If you solve correctly the whole problem, you have a fraction of 6/6 of the 80/2 points of the problem. This is, 40 points, (6/6)*(80/2)=40.

COURSE PROJECT

You will be assigned a semester-long project where your creativity, knowledge of fluid mechanics concepts, and skills to work with people from other disciplines will be tested. The company "Engineering is for all" is interested on designing and developing learning products for kids in 4th or 5th grades in the Hampton Roads area. They require the help and skills from engineers like you to develop them. They want the products to follow a similar (BUT NOT THE SAME) idea as the one developed by the Museum of Science in Boston (https://www.eie.org). They need you to pick a fluid mechanics topic, develop a hands-on demonstration activity on the topic, and a lesson plan that can be used by an elementary school teacher on his/her own. For this project you will be required to work in a group of 5, 3 engineering students and 2 education students. The group members will be assigned at the very beginning of the semester. The students from the College of Education will make sure your learning product is an effective one. You will have the opportunity to meet elementary school students to learn from them their preferences and pre-test your product in a "dress-rehearsal" in front of experts in the area of education and science. Your final product will be tested by you teaching the developed learning product/lesson in front of elementary schoolers.

The benefits of this project are countless. Just to name a few:

1) Working in teams is a healthy habit for our careers. This will look really good in your resume as potential employers seek not only for knowledgeable people but also for people who knows how to group in such teams.
2) This project is to train you on how to effectively communicate written and orally to others, and even others in other fields. You will be in charge to explain engineering concepts to students from the education field. Then, you will partner with them to teach those engineering concepts to 4th or 5th graders.
3) The other benefit is that I would like to flourish your entrepreneurial mind while getting you involved in a hands-on activity. You should attack this project with an entrepreneurial mindset and for that we will follow the KEEN program. Under this view, you will exercise curiosity, make connections, and create value (more on this during the lectures).
4) In addition, there has been studies that have proved that the learning process of new concepts go to deeper levels when the person needs to explain them to others. As the famous French writer Joseph Joubert said: "To teach is to learn twice."
5) Finally, this project increases your confidence in solving open-ended problems.

Please read carefully the assignment prompts that we will provide. As it was mentioned, this will be a semester-long project with deliverables along the whole semester. You will be given the different short assignment prompts as we move along the semester and the activities are as follows:

ACTIVITY	

1. Post Bio on Google Site, Complete FE test and Content test	2.5%
2. Team Charter and Tasks - Signed 4 consent forms	2.5%
3. School visit power point draft	5.0%
4. **School visit** reflection & power point presentation	10.0%
5. Presentation Draft of Engineering Concepts	5.0%
6. a) Engineering Lesson material, b) 5E's evidence of Learning, c) Brainstorm on 5E's & Eng Activities for kids	10.0%
7. CATME Mid-term evaluation	2.5%
8. Draft Engineering Lesson/Dress Rehearsal	5.0%
9. Dress Rehearsal Engineering Lesson	10.0%
10. Feedback on dress rehearsal to peers	2.5%
11. Final Engineering Lesson	20.0%
12. Project reflection / Complete FE test / CATME post-project evaluation / Project Surveys	10.0%
13. Small Engineering Project	15.0%

There are 4 main events for this project: 1) Visit to an elementary school, 2) Cross-disciplinary teaching/learning where engineers teach science to educators and educators teach pedagogy to engineers, 3) Dress rehearsal where your product will be presented in front of experts, and 4) The actual final testing of the product in front of elementary schoolers. Please look at the schedule to know exactly when those main events are taking place.

A couple of important notes are in order:

a. We have made arrangements so part of the project could be completed during class time, however, you will need to MEET OUTSIDE OF CLASS, as needed, to develop a successful lesson for your elementary students. You have the option to meet face-to-face or online, this will be up to you.
b. For the 4 main events above, you will have to setup Zoom meetings. More on that will be provided to you as the semester goes along. Attendance to those 4 main events is mandatory. The events will take place during our regular class time but some of them will spill over into activity hour. Please begin making any arrangements NOW to be able to participate during those times (again, see schedule).

Finally, if you would like a LeADERS designation on your academic transcript, this course will satisfy the service-learning component. Please, also note that the project will improve your skills related to the industry required ABET student outcomes.

ADDITIONAL POINTS:

A. There will be an optional **post-test activity**, which consist of two short activities.

1) Soon after the test submission deadline, the solutions to the test will be available. This short post-test activity is to compare your test against the available solutions and to write a brief **reflection statement** containing:
    a. Statement on the mistakes you made and what you will do next time to avoid making same mistakes. Please point out exactly where you made the mistake, say why you made the mistake, and how you should have done it.
    b. Give yourself a grade based on the writing rubric provided in the test and the correctness of your solution.
    c. The answer to the following: if you had the opportunity to go back in time and take the test again, what advice would you give yourself to ensure that you had a better grade on the test?
    d. A short discussion of what you have learned and where you think engineers use those concepts (provide specific examples).

    For more details on how to write the test reflection, read the ePortfolio assignment prompt.

2) Update an **ePortfolio** archive you will create and an **ePortfolio** showcase (website). After every test you will upload your test and your test reflection to your ODU google drive and make it available in your personal website. At the end of the semester, your **ePortfolio** archive and showcase will contain the final project and all tests you worked on during the class with their corresponding reflections. For instructions on how to create your ePortfolio archive and how to update your website, read the corresponding ePortfolio assignment prompt.

You should email me the link to your ePortfolio showcase where you uploaded your test and reflection not later than 48 hours after the due date of the test. The whole post-test activity will account for up to 5 additional points towards the **corresponding test**. Please note that there will be no reminders about this post-test activity as the points are optional.

B. **Final ePortfolio showcase and final course reflection**. By the end of the semester you will have the opportunity to get up to 3 extra points towards your **final grade**. Follow all the instructions in the ePortfolio assignment prompt. Please note that for those of you who worked towards the other additional points on the tests (test reflections), a lot of the work is already done.
The reason I offer to do this is because former students have told me that a key factor in their hiring process has been mentioning the experience they had with the project and class. There is no better way to show to the world your work and what you are capable of doing than through an ePortfolio showcase. Be mindful of the quality of what you put there as it is going to be seen by potential employers.

A last note, please note that if you work on extra activities A and B, you could get enough extra credit points towards your **final grade** that you could bump up your final letter grade!!

Finally, the following are the guidelines to assign the letter grades:

A	95-100
A-	90-95
B+	87-90
B	84-87
B-	80-84
C+	77-80
C	74-77
C-	70-74
D+	67-70
D	64-67
D-	60-64
F	< 60

7. Teaching and Learning Methods

7.1. Delivery Method
Some assignments require basic computing skills using standard software and browser applications (e-mail, Blackboard).

7.2. Instructional Approach
The course will be taught through direct and interactive instruction.

7.3. Course Interaction. Faculty-Student Communication System (FSCS)
Materials for the course will be available on Blackboard.odu.edu. Checking the course information is essential to ensure you have the most up to date information for the course (assignments, schedule changes, topic changes, instructor notes, etc.). It is the student's responsibility to check the site as part of preparation for the class period.

7.4. Electronic Devices Policy
All electronic devices, including laptop computers, cell phones, MP3 players, etc. must be turned off and put away during all classes.

7.5. Feedback
Course Final Evaluation
http://www.odu.edu/academics/courses-registration/studentopinionsurvey

You should really fill out the survey!

8. Schedule

CLASS SCHEDULE									ASSIGNMENTS SCHEDULE						
Week	**Day**		**Chap**	**Sect**	**LECTURE**	**HW problems to be assigned**			**Week**	**Day**		**HW (GROUP)**	**PROJECT (GROUP)**		**TESTS (INDIVIDUAL)**
1	T	11-Jan	1	1-11	Introduction - Nature of Fluids	Sign syllabus & Ch1: 48,58,63,76,92,107			1	T	11-Jan	Reflection on syllabus	Team Sign-up (CATME)		
	Th	13-Jan	2	1-6	Viscosity of Fluids	Ch2: 17,18,27,35,61				Th	13-Jan				
2	T	18-Jan	3	1-5	Pressure	Ch3: 6 to 10,11,13			2	T	18-Jan		Post Bio on Google Site, Complete FE test and Content test	2.5%	
	Th	20-Jan	3	6-9	Hydrostatic	Ch3: 41,62,83,90,94				Th	20-Jan	HW1.1			
3	**T**	**25-Jan**			**MEETING WITH GROUP PARTNERS (Why teamwork? Team building activities)**				3	T	25-Jan		Team Charter and Tasks - Signed 4 IRB consent forms	2.5%	
	Th	27-Jan	6	1-8	Navier-Stokes equation -> Bernoulli equation	Ch6: 79,82,91				Th	27-Jan	HW1.2			
4	T	1-Feb	7 / 6	1-7 / 9-11	Energy equation - Applications	Ch7: 11,16,22,30,35,42			4	T	1-Feb		School visit power point draft	5.0%	
	Th	3-Feb	9 / 8	1-5 / 1-8	Boundary Layer. Friction losses & minor losses in pipes **(*)**	Ch8:33,38,44,46,49,62/Ch10:20, 37,39,43,46,48/Review old test				Th	3-Feb	HW1.3			
5	T	8-Feb	14	1-10	Open channel flow	Ch14: 6,15,21,36,42			5	Th	10-Feb	HW1.4	Virtual school visit reflection & power point presentation	10.0%	
	Th	10-Feb			**SCHOOL VISIT**					Sat	12-Feb				Submit 1st test procedure & questions
6	T	15-Feb	4	1-11	Forces due to static fluids	Ch4: 2,10,17, 28,42,54			6	T	15-Feb				1st test
	Th	17-Feb	5	1-6	Buoyancy and Stability	Ch5: 8,24,41,61				Th	17-Feb				
7	T	22-Feb	17	1-8	Drag and Lift	Ch17: 11,14,16,26,30			7	T	22-Feb				eP assignment (OPTIONAL)
	Th	24-Feb	16	1-8	Impulse theorem	Ch16: 6,11,20,29				Th	24-Feb	HW2.1 & HW2.2	Presentation Draft of Engineering Concepts	5.0%	
8	**T**	**1-Mar**			**MEETING WITH GROUP PARTNERS (Teaching Ed students Eng Concepts)**				8	T	1-Mar		a) Engineering Lesson material, b) 5E's evidence of Learning, c) Brainstorm on 5E's & Eng Activities for kids	10.0%	
	Th	3-Mar	15	1-13	Instrumentation	Ch15: 4,9,15 / Review old test				Th	3-Mar	HW2.3			
9	T	8-Mar			**SPRING BREAK**				9	T	8-Mar				

	Th	10-Mar			**SPRING BREAK**				Th	10-Mar				
10	T	15-Mar	…	…	Water hammer & Cavitation **(*)**	Selected problems (OPTIONAL)		10	Th	17-Mar		Draft Engineering Lesson Plan and Presentation for Dress Rehearsal & PROVIDE LIST OF SUPPLIES	5.0%	
	Th	17-Mar	11	1-6	Series pipeline systems	Ch11: 5, 13, 20			Sat	19-Mar				Submit 2nd test procedure & questions
11	T	22-Mar	11	1-6	Series pipeline systems	Ch11: 22 to 24		11	T	22-Mar		CATME Mid-term evaluation	2.5%	2nd test
	Th	24-Mar	11	1-6	Series/Parallel pipeline systems	Ch12: 3,4,5,6			Th	24-Mar				eP assignment (OPTIONAL)
12	T	29-Mar	12	1-3	Parallel pipeline systems	Review old test		12	T	29-Mar				
	Th	31-Mar	12	1-3	Parallel pipeline systems **(*)**				Th	31-Mar	HW3.1 & HW3.2			
13	T	5-Apr	13	…	Turbomachinery - Pumps			13	Th	7-Apr				Submit 3rd test procedure & questions
	Th	7-Apr	13	…	Pumps – NPSH	Ch13: 22,23,25,34(only 2 of this prob), 17,19.			Sun	10-Apr				3rd test
14	T	12-Apr	13	…	Pumps – Affinity Laws	Ch13: 55,65, Design Problem 3.		14	T	12-Apr				eP assignment (OPTIONAL)
	Th	14-Apr			**MEETING WITH GROUP PARTNERS (Dress rehearsal)**				Th	14-Apr		Dress Rehearsal Engineering Lesson / Feedback on dress rehearsal by peers	12.5%	
15	T	19-Apr	13	…	Positive displacement pumps			15	T	19-Apr	HW3.3			
	Th	21-Apr			**Final Engineering Lesson**				Th	21-Apr		Final Engineering Lesson	20.0%	
16	T	26-Apr						16	T	26-Apr				
	Th	28-Apr							Th	28-Apr		Project reflection / Complete FE test / CATME post-project evaluation / Project Surveys	10.0%	
17	T	3-May						17	T	3-May		Small Engineering Project (FE test result affect grade) + Focus Groups/Interview	15.0%	eP assignment with course reflection (OPTIONAL)

(*) The test content will be up to that topic

Note: this schedule is tentative and might change during the semester according to how the course evolves. The content is subject to change as well, depending on students' interests and progress. Changes will be announced in class and the modified syllabus will be posted in Blackboard.

NOTE: In case of weather-related class cancelation, I will provide a recorded lecture that I will ask you to watch at home at the exact class time.

9. Student Responsibilities

9.1. Understanding the Syllabus Requirements

In this course, you are highly encouraged to:

1. Think and plan your individual learning process;
2. Clarify and set your own goals;
3. Monitor and assess your own progress;
4. Establish criteria for judging your own performance;
5. Work alone and collaborate with other students as appropriate.

9.2. Utilizing Online Components

Utilizing online components where applicable. Checking email and blackboard

9.3. Statement on Learning

Learning is a shared responsibility. As the instructor and as a student in this class, it is our shared responsibility to develop and maintain a positive learning environment for everyone.

Students are asked to respect the learning needs of their classmates and assist the instructor in achieving this critical goal. It is the instructor's responsibility to present learning opportunities through the course syllabus, lectures, discussions, activities, in-class and out-of-class assignments. It is the student's responsibility to do the learning by completing the readings, by attending class (through face-to-face or through video streaming) and by participating in class discussions and assignments. A variety of assignments will be used to help the students to achieve the course goals (mastery of course content and skills) outlined in the syllabus.

9.4. Online Learning (Video streamers)

Online learning requires a significant amount of self-discipline and sometimes creative scheduling. All students are expected to participate actively, showing evidence of logging into the course at least twice each week (or contacting directly the instructor at least weekly) and actively engaging in Forum, Activity, and Assignment postings. However in the event that you are not able to participate during a week, please let your professor knows with as much advance notice as possible.

10. Course Policies

10.1. Attendance

As per university policy, students are expected to attend Classes. For classes meeting twice a week, students missing more than 15% may be failed. Therefore, students who miss more than four class meetings are subject to automatic failure.

10.2. Participation

- I like you to share your experiences and knowledge with your peers in course discussions.
- I am looking for active participation and commitment to your learning experience.
- I expect you to communicate professionally with your professor about your progress in this course.
- I understand you expect prompt and qualitative feedback that will foster learning.
- I understand you expect to apply what you are learning in your personal and

professional lives. Trust me, you will.

10.3. HW Assignments, Tests and Make-ups

I will allow you to make-up ONLY ONE TEST. You will make-up the exam the week prior to finals week. I fully suggest you to avoid making-up test since you will be doing it in the busiest time of the semester. However, I understand that every now and then there are circumstances you cannot avoid. The only exception to this make-up policy is the last test; I will not allow make-ups for this one.

There will be no extension in the due date, neither make-ups for HW assignments. HW assignments will be done in groups.

Please mark your calendars with the dates indicated in the schedule of activities.

10.4. Course Disclaimer

Every attempt is made to provide a syllabus that is complete and that provides an accurate overview of the course. However, circumstances and events may make it necessary for the instructor to modify the syllabus during the semester. This may depend, in part, on the progress, needs, and experiences of the students.

10.5. Accommodation

Students are encouraged to self-disclose disabilities that have been verified by the Office of Educational Accessibility by providing Accommodation Letters to their instructors early in the semester in order to start receiving accommodations as needed. Accommodations will not be made until the Accommodation Letters are provided to instructors each semester. However, I must point out that most of the assignments (HW, tests, etc.) are take-home. The amount of time assigned for each one is excessive. I do it to give the students freedom on when to actually work on the assignment in case the student work or have other commitments, or the student has any type of disability.

11. University Policies

11.1. College Classroom Conduct

The following standards are intended to define acceptable classroom behavior that preserves academic integrity and ensures that students have optimum environmental conditions for effective learning.

1. Students must turn off cell phones and pagers during class or have them set to vibrate mode. Instructors may require that cell phones and other electronic devices be left on their desks during tests or examinations.
2. Classes are expected to begin on time, and students will respect the time boundaries established by the professor. If classroom doors are locked, students may not knock or seek entrance in other ways.
3. Students should notify instructors in advance when a class will be missed. In the event of an emergency that causes a class to be missed, instructors must be notified as soon as possible.
4. Students must not engage in extraneous conversations during classes. Such acts are considered to be violations of the Code of Student Conduct.
5. Students will activate their Old Dominion email accounts and check them before

each class. If the student chooses to have his/her messages forwarded to another account, it is the student's responsibility to take the necessary steps to have them forwarded.
6. Offensive language, gestures and the like are disrespectful and disruptive to the teaching-learning process. [http://studentservices.odu.edu/osja/ccc_pamphlet.pdf]

11.2. Honor Pledge
"I pledge to support the honor system of Old Dominion University. I will refrain from any form of academic dishonesty or deception, such as cheating or plagiarism. I am aware that as a member if the academic community, it is my responsibility to turn in all suspected violators of the honor system. I will report to Honor Council hearings if summoned."
(By attending Old Dominion University you have accepted the responsibility to abide by this code. This is an institutional policy approved by the Board of Visitors. For more information please visit Honor Council).

For your clarification, part of the Honor Code says:

IX. PROHIBITED CONDUCT
A. Academic Integrity violations, including:
1. *Cheating*: Using unauthorized assistance, materials, study aids, or other information in any academic exercise (Examples of cheating include, but are not limited to, the following: using unapproved resources or assistance to complete an assignment, paper, project, quiz or exam; collaborating in violation of a faculty member's instructions; and submitting the same, or substantially the same, paper to more than one course for academic credit without first obtaining the approval of faculty).

IMPORTANT NOTE: You will NOT be allowed to use ANY Internet source while taking the tests, except by ODU related.

11.3 Special Needs
Old Dominion University is committed to achieving equal educational opportunity and full participation for persons with disabilities. It is the university's policy that no qualified person be excluded from participation in any university program or activity, be denied the benefits of any university program or activity, or otherwise be subjected to discrimination with regard to any university program or activity. This policy derives from the university's commitment to non-discrimination for all persons in employment, access to facilities, student programs, activities and services. You may view the policy online: Old Dominion University Policies and Procedures 4500 - Accommodation of Students with Disabilities (pdf). For additional information visit the Office of Educational Accessibility online or at 1525 Webb Center.

11.4 University Email Policy
The Old Dominion University e-mail system is the official electronic mail system for distributing course-related Communications, policies, Announcements and other information. In addition, the University e-mail user ID and password are necessary for authentication and access to numerous electronic resources (online courses, faculty Web pages, etc.) For more information about the policy, please visit: Electronic Messaging Policy for Official University Community Policy 3506 (pdf). For more information about student email, please visit http://occs.odu.edu/accounts/studemail/

11.5 Withdrawal
A syllabus constitutes an agreement between the student and the course instructor about course requirements. Participation in this course indicates your acceptance of its teaching focus, requirements, and policies. Please review the syllabus and the course requirements as soon as possible. If you believe that the nature of this course does not meet your interests, needs or expectations, if you are not prepared for the amount of work involved - or if you anticipate that the class meetings, assignment deadlines or abiding by the course policies will constitute an unacceptable hardship for you - you should drop the class by the drop/add deadline, which is located in the ODU Schedule of Classes. For more information, please visit the Office of the University Registrar.

12. Student Help Resources

12.1 Online Student Orientation: http://www.clt.odu.edu/oso
12.2 Blackboard Support Website: http://www.clt.odu.edu/bb
12.3 Technical Support Center: http://occs.odu.edu/, occshelp@odu.edu, 757-683-3192
12.4 Study Guides Strategies: http://www.studygs.net/
12.5 Papers Citation Styles: MLA, APA, Chicago & CBE:
http://www.dianahacker.com/resdoc
12.6 Student Acknowledgement

I, _____, have completely read the whole syllabus and understand and agree to the course requirements indicated in the syllabus.

_____.
Signature

Problem solution rubric

	Exceeds Standard	Meets Standard	Approaches Standard	Needs Attention
	10 points	**7 points**	**5 points**	**2 points**
1. Purpose **5%**	The purpose of the section to be answered is clearly identified and stated.	The purpose of the section to be answered is identified, but is stated in a somewhat unclear manner.	The purpose of the section to be answered is partially identified, and is stated in a somewhat unclear manner.	The purpose of the section to be answered is erroneous or irrelevant.
2. Drawings & Diagrams **10%**	Clear and accurate diagrams are included and make the section easier to understand. Diagrams are labeled neatly and accurately.	Diagrams are included and are labeled neatly and accurately.	Diagrams are included and are labeled.	Needed diagrams are missing OR are missing important labels.
3. Sources **5%**	Several reputable background sources were used and cited correctly.	A few reputable background sources are used and cited correctly.	A few background sources are used and cited correctly, but some are not reputable sources.	Background sources are cited incorrectly.
4. Design considerations (assumptions, safety, cost, etc) **10%**	Design is carried out with applicable assumptions and full attention to safety and cost, etc.	Design is generally carried out with assumptions and attention to safety, cost, etc.	Design is carried out with some assumptions and some attention to safety, cost, etc.	Assumptions, safety and cost were ignored in the design.
5. Data and variables **5%**	All data and variables are clearly described with all relevant details.	All data and variables are clearly described with most relevant details.	Most data and variables are clearly described with most relevant details.	Data and variables are not described OR the majority lack sufficient detail.
6. Procedure **25%**	Procedure is described in clear steps. The step description is in a complete and easy to understand short paragraph.	Procedure is described in clear steps but the step description is not in a complete short paragraph.	Procedure is described in clear steps. The step description is in a complete short paragraph but it is difficult to understand.	Procedure is not described in clear steps at all.
7. Calculations **20%**	All calculations are shown and the results are correct and labeled appropriately. The units of all values are shown.	Some calculations are shown and the results are correct and labeled appropriately.	Some calculations are shown and the results labeled appropriately.	No calculations are shown OR results are inaccurate or mislabeled.
8. Summary **5%**	Summary describes the design, the relevant information and some future implications.	Summary describes the design and some relevant information.	Summary describes the design.	No summary is written.
9. Materials **5%**	All materials used in the design are clearly and accurately described.	Almost all materials used in the design are clearly and accurately described.	Most of the materials used in the design are clearly and accurately described.	Many materials are described inaccurately OR are not described at all.
10. Analysis **10%**	The design is discussed and analyzed. Argumentative predictions are made about what might happen in case of change in the operation and how the design could be change.	The design is discussed and analyzed. Argumentative predictions are made about what might happen in case of change in the operation.	The design is discussed and analyzed. No argumentative predictions are made about what might happen in case of change in the operation and how the design could be change.	The design is not discussed and analyzed.