

Course Syllabus

Fluid Dynamics - ESCI 3200 - M01 Fall 2016

General information

Course Reference Number	16174
Credit hours	3
Prerequisites	Concurrent with ESCI 2100 & MATH 2530/244
Class	16:00 – 17:15, MON & WED, Padre Arrupe Hall 24
Add/Drop period	Last day to drop w/o a W and/or add: Sep. 14 Last day to drop w/ a W: Oct. 28

Instructor information

Name	Javier Oliva Quecedo, Ph.D. Civil Engineering
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Phone	91 554 58 58
Office location	1 st Floor Padre Arrupe Hall
Office hours	18:45 – 19:45, WED (*)

(*) You can also contact me via e-mail to solve questions.

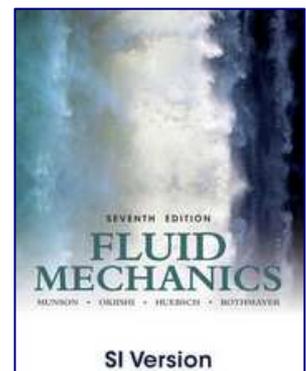
Javier lectures at SLU-Madrid since 2014, prior to that he taught at UPM (Universidad Politécnica de Madrid) for five years. Besides teaching he works as a project engineer in a private company specialized in the design of bridges and singular structures.

Textbook

Fluid Mechanics *SI Version* (7th Edition), Bruce R. Munson et al., Wiley.

This book is extremely appropriate for the course; therefore students are strongly encouraged to buy it.

Most affordable copies can be found on Amazon.



Course Description

Fluid Mechanics is concerned with the behavior of liquids and gases at rest or in motion. The number of applications is huge: airplanes, cars, ships, missiles, submarines, pumps, turbines, pipes, engines, filters, bridges... Fluid Mechanics is not only applied to devices created by the human being, it is also useful to study natural phenomena as breathing, blood flow, wind, rivers, sea...

Engineering Program Learning Outcomes (PLOs)

- (a) an ability to apply knowledge of mathematics, science, and engineering
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- (d) an ability to function on multidisciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- (i) a recognition of the need for, and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues.
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Student Learning Outcomes in this course (SLOs)

PLOs	Student Learning Outcomes	Assessment Method
A	A.1. Understand fluid properties and how they impact fluid behavior A.2. Use hydrostatics to solve a variety of problems with forces on submerged surfaces, such as gates and dams, and objects A.3. Apply Bernoulli's equation to determine fluid pressure and velocity A.4. Understand the control volume principle and apply the continuity equation to fluid flow problems A.5. Employ the Momentum equation to determine the forces exerted by flowing fluids A.6. Apply Differential Analysis to describe and solve flow problems A.7. Be able to solve pipe flow problems including frictional and local head losses and head of pumps and turbines A.8. Understand and estimate lift and drag forces	<ul style="list-style-type: none"> • Midterms and Final Exam • Homework • Detailed analysis of work • Classroom observations
C	C.1. Learn basic concepts for designing engineering systems involving fluids to be efficient and safe using minimal resources	<ul style="list-style-type: none"> • Midterms and Final Exam • Homework • Detailed analysis of work • Classroom observations
E	E.1. Be able to understand design procedures for different systems involving fluids E.2. Be capable of making smart decisions in fluid analysis and design E.3. Understand the behavior of different fluid flows	<ul style="list-style-type: none"> • Midterms and Final Exam • Homework • Detailed analysis of work • Classroom observations
F	F.1. Learn why a good understanding of the involved concepts is important for a professional and ethical work	<ul style="list-style-type: none"> • Not directly assessed
J	J.1. Discussing contemporary systems	<ul style="list-style-type: none"> • Not directly assessed
K	K.1. All the concepts learnt in this course are used in modern engineering	<ul style="list-style-type: none"> • Not directly assessed

Grading System

The grade will be obtained from the following areas:

Homework: 5 %

Midterm 1: 25 %

Midterm 2: 25 %

Final exam: 45 %

Grading scale will be as follows:

Grading scale	
A	90-100 %
A-	87-89 %
B+	84-86 %
B	80-83 %
B-	77-79 %
C+	74-76 %
C	70-73 %
C-	66-69 %
D	60-65 %
F	< 60 %

Homework

Sets of homework will be handed out and graded. Homework is expected to be handed in on time. Late submissions will be penalized with a 10 % grade reduction if handed in the first class after the deadline.

Homework exercises are intended to help the student to understand the material. That is why it is important that you do this work independently. There is typically a strong correlation between effort on the homework and exam scores. Solutions will be provided for you to check your work.

Homework Guidelines have to be observed in every submittal.

Exams

There will be two mid-term exams and a final exam. All the exams are comprehensive:

- **Midterm 1:** Date TBA (Class hour).
- **Midterm 2:** Date TBA (Class hour).
- **Final Exam:** Friday 16 Dec 2016 (**15:30**). *According to SLU-Madrid Final Exam Schedule.*

Course Outline

1. Introduction and Basic Concepts
2. Fluid Statics
3. Elementary Fluid Dynamics
4. Control Volume Analysis
5. Differential Analysis
6. Pipe Flow (Internal flow)
7. Flow Past Immersed Bodies (External flow)
8. Potential Flow (Irrotational flow)

Note that the course schedule may be subject to change depending on the class progress.

Course Policies

1. Students are encouraged to participate in class discussions and to ask questions at any moment in order to improve the understanding of explanations.
2. Announcements may be made during the semester.
3. Students are expected to be on time unless a reasonable excuse is given.
4. Students are expected to attend all classes unless a reasonable excuse is given. Any unexcused absences in excess of 3 will result in a lowered grade and even in automatic failure in the course.
5. The use of laptops and mobile devices is not allowed in class.
6. Useful information for the course may be found on the SLU web.
7. Syllabus, reading and homework problems are subject to change.
8. Students are responsible for all lecture material, handouts, homework and assigned reading.
9. Make up exams are not given. Students who legitimately miss an exam, due to a doctor's visit or family emergency must provide written documentation of the circumstances. A letter from the university counselor is accepted. Exams that are missed illegitimately result in a score of F. Grades for these students will be based on the remaining exams. Missing more than one exam results in an F grade.

Academic Honesty and Plagiarism

Academic integrity is honest, truthful and responsible conduct in all academic endeavors. The mission of Saint Louis University is "the pursuit of truth for the greater glory of God and for the service of humanity." Accordingly, all acts of falsehood demean and compromise the corporate endeavors of teaching, research, health care and community service via which SLU embodies its mission. The University strives to prepare students for lives of personal and professional integrity, and therefore regards all breaches of academic integrity as matters of serious concern.

The governing University-level Academic Integrity Policy can be accessed on the Provost's Office website at

http://www.slu.edu/Documents/provost/academic_affairs/University-wide%20Academic%20Integrity%20Policy%20FINAL%20%206-26-15.pdf.

Additionally, SLU-Madrid has posted its academic integrity policy online: <http://www.slu.edu/madrid/academics>. As a member of the University community, you are expected to know and abide by these policies, which detail definitions of violations, processes for reporting violations, sanctions and appeals. The professor will review these policies during the first weeks of the term: please direct questions about any facet of academic integrity to your professor, the chair of the department of your academic program or the Academic Dean of the Madrid Campus.

Academic Accommodations and Learning Resources

In recognition that people learn in a variety of ways and that learning is influenced by multiple factors (e.g., prior experience, study skills, learning disability), resources to support student success are available on campus. Students who think they might benefit from these resources can find out more about:

- Course-level support (e.g., faculty member, departmental resources, etc.) by asking your course instructor.
- University-level support (e.g., tutoring/writing services, Disability Services) by visiting the Academic Dean's Office (San Ignacio Hall) or by going to <http://www.slu.edu/madrid/learning-resources>

Students with a documented disability who wish to request academic accommodations **must** contact Disability Services to discuss accommodation requests and eligibility requirements. Once successfully registered, the student also **must** notify the course instructor that they wish to access accommodations in the course. Please contact Disability Services at disabilityservices-madrid@slu.edu or +915 54 58 58, ext. 230 for an appointment. Confidentiality will be observed in all inquiries. Once approved, information about the student's eligibility for academic accommodations will be shared with course instructors via email from Disability Services. For more information about academic accommodations, see "Student Resources" on the SLU-Madrid webpage.

Note: Students who do not have a documented disability but who think they may have one are encouraged to contact to Disability Services.

Title IX statement

Saint Louis University and its faculty are committed to supporting our students and seeking an environment that is free of bias, discrimination, and harassment. If you have encountered any form of sexual misconduct (e.g. sexual assault, sexual harassment, stalking, domestic or dating violence), we encourage you to report this to the University. If you speak with a faculty member about an incident of misconduct, that faculty member must notify SLU's Title IX deputy coordinator, Marta Maruri, whose office is located on the ground floor of Padre Rubio Hall, Avenida del Valle, 28 (mmaruri@slu.edu; 915-54-5858 ext. 213) and share the basic fact of your experience with her. The Title IX deputy coordinator will then be available to assist you in understanding all of your options and in connecting you with all possible resources on and off campus.

If you wish to speak with a confidential source, you may contact the counselors at the SLU-Madrid's Counseling Services on the third floor of San Ignacio Hall (counselingcenter-madrid@slu.edu; 915-54-5858 ext. 230) or Sinews Multipletherapy Institute, the off-campus provider of counseling services for SLU-Madrid (www.sinews.es; 91-700-1979). To view SLU-Madrid's sexual misconduct policy and for resources, please visit the following web address: <http://www.slu.edu/Documents/Madrid/campus-life/SLUMadridSexualMisconductPolicy.pdf>

Collection of student work for assessment

In order to maintain quality academic offerings and to conform to accreditation requirements, SLU-Madrid regularly assesses its teaching, services and programs for evidence of student learning. For this purpose, SLU-Madrid keeps representative examples of student work from all courses and programs on file, including assignments, papers, exams, portfolios and results from student surveys, focus groups and reflective exercises. Copies of your work for this course may be kept on file for institutional research, assessment and accreditation purposes. If you prefer SLU-Madrid not to retain your work for this purpose, you must communicate this decision in writing to your professor.