My exchange semester in the USA

California State University Long Beach

Florian Erb

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Contents

Abstract

My name is Florian Erb, and I am sharing my experiences from my exchange semester at California State University Long Beach (CSULB). I am a "Mechanical Engineering & Production" student at UAS Hamburg, and I embarked on this adventure during my sixth semester, the winter semester of 2024/2025. Being a dual student presented unique advantages and challenges, which I will discuss later.

This report provides valuable insights into the preparation and realization of an exchange semester. Even if you choose a different university for your time abroad, the information about obtaining a visa, managing finances, and selecting courses will help you prepare effectively for your journey.

For those applying to CSULB, I highly recommend reviewing the syllabi of potential courses. The brief course descriptions provided initially are often insufficient for making informed decisions, but the syllabi offer much more detailed and useful information.

Feel free to contact me directly via LinkedIn or email at florian.erb@haw-hamburg.de. I would be delighted to assist you on your journey or provide more detailed insights.

1 Why I chose the CSULB

During my exchange semester, I wanted to experience something completely new. I had never encountered mind-blowing differences when visiting European countries, which is why I chose the USA—specifically, California State University Long Beach (CSULB)—as my destination.

My primary reason for choosing CSULB was the range of courses it offered. This was the most important criterion in my search, as I didn't find enough suitable courses at the other partner universities of UAS Hamburg to fit my study plans.

Another major factor was the fantastic California weather. During my entire time in Los Angeles, it rained less than it typically does in a single week in Hamburg. However, every advantage has its downside, and in this case, it was the intense sunlight. The high UV index was a challenge; I couldn't attend the outdoor swimming course because my skin couldn't tolerate exposure to a UV index of 12 for over an hour.

2 Preperation of semester abroad

2.1 Visa

Soon after receiving confirmation from CSULB, I was sent the DS2019 form, which is required for obtaining a J-1 visa. With this form in hand, I had to pay the SEVIS fee and schedule an appointment at the embassy, which also required an additional fee. Prior to the appointment, I completed a detailed questionnaire about myself. This process took about one to two hours, and most of the questions focused on my intentions and whether I had any plans to commit crimes. It was pure bureaucracy, and here's a hint: if you're planning an illegal career abroad, you're not welcome. That's essentially the point of the questionnaire, but it's still time-consuming to complete.

It's important to note that electronic devices are not allowed inside the embassy. I recommend bringing someone with you who can hold onto your valuables. Just before the appointment, you'll be reminded to bring a biometric photo. I suggest getting this in advance of your trip to Berlin, but in a worst-case scenario, a photo from a nearby train station's machine should suffice. You are only allowed to enter the embassy up to 30 minutes before your appointment.

2.2 Module Registration

Module registration was probably one of the most tedious tasks I had to deal with. There's no comprehensive module handbook to consult in advance. The only way to learn about potential classes is through the CSULB course catalog, which provides very brief descriptions and outlines any necessary prerequisites.

For courses with prerequisites, I had to submit a permit request. This process was time-consuming and often frustratingly opaque, as many courses with identical names to those at UAS Hamburg were still not accepted. Permit requests that were initially denied wouldn't be reviewed again until about one month before the semester started. Even during the first week of classes, I didn't have all the permits I needed.

The only way I managed to secure the necessary permits was by speaking in person with a specific staff member, Panadda Marayong, who was incredibly helpful. If your permit requests are denied, don't give up. Email the professors in advance and attend their first lectures to discuss your situation with them. This approach worked for me in the end.

Keep in mind that you're only allowed to take three Kinesiology classes and must enroll in courses totaling at least 12 US credits. The courses are generally easier compared to Germany, but they come with a much higher workload, including weekly assignments and frequent projects. I recommend enrolling in one or two extra courses initially so you can drop any with an unmanageable workload.

Remember, you're here to experience America—its beautiful landscapes and friendly people—not to spend all your time studying in the library. However, it's crucial to pass at least 12 US credits without relying on Kinesiology classes to avoid repayment of the PROMOS scholarship. More on that later.

2.3 Accommodation

Application

During the semester, I stayed in the International House (I-House) dorms. Applying for a room required a non-refundable service fee of $275. If you're interested, rest assured—every international student I spoke to who applied for the dorms was accepted.

Be aware that additional vaccinations are required for residents, as well as a tuberculosis risk questionnaire. I downloaded a general form, which was sufficient. The required vaccinations include:

- Varicella
- Tetanus, Diphtheria, and Pertussis
- Meningococcal Serogroup B Vaccine

International House

Soon after my confirmation, a roommate selection phase began. This allowed me to contact potential roommates and select my suitemates.

The I-House is primarily home to international students, but a few Americans also live there. Suites accommodate four to six people, with two persons per room. The rooms are equipped with essentials like a mini-fridge, microwave, and desk, but no blankets or pillows are provided. At 16 m^2, the rooms are fairly small, but the I-House has a spacious common room with a ping-pong table and TV, providing ample space to socialize.

Move-In

The official move-in date was August 22, with the first mandatory event also scheduled for that day. As a result, I had to stay in a motel beforehand. An early move-in on August 21 was available for an additional $50.

Meal Plan

As a resident, you must choose a meal plan for the dining halls. Options include a 10, 19, or 210-meal plan. I opted for the 210-meal plan, which provides 210 meals per semester. This plan is sufficient if you travel frequently and typically eat in the dining hall twice daily.

With the 10 or 19-meal plans, you're limited to one meal per breakfast, lunch, and dinner. The 210-meal plan, however, allows flexibility to use your meals anytime with anyone until they're exhausted.

Meals are served three times on weekdays and twice daily on weekends. The dining hall offers an all-you-can-eat setup with a deli bar, salad bar, and 2–3 rotating main courses. The food is decent, though much of it is highly processed.

2.4 Finances

The total cost of the exchange semester ranges from $12,000–$15,000, which is quite high. I began saving about a year in advance, which was just enough since I participated in a dual studies program and continued to receive a salary during my semester abroad. By February, I had to provide proof of sufficient financial resources ($10,664).

Scholarships and sponsorships can help cover these costs. I received the PROMOS scholarship, totaling €3,000, split into a one-time payment of €1,275 and monthly payments of €450. I also applied for the Fulbright and DAAD scholarships.

3 My course selection

In this section, I will outline the contents of the courses I took. The syllabi for each course are provided in Appendices A to E. For a quick overview, I have included table 1 with the most important information upfront.

Table 1: Overview of Course Information and Evaluation Criteria

Code	**Credits**	**Recognized as ... in Germany**	**Evaluation Criteria**
MAE300	2	"Integrationsfach"	• Laboratory: 50% • Homework: 10% • Attendance: 5% • Midterm: 15% • Final Exam: 20%
MAE305	3	Numerical Mathematics	• Three Midterms: 20% each • Final Exam: 20% • Five Projects, Homework, and Quizzes: 20%
MAE334	3	Aerodynamics I with Laboratory	• Homework: 25% • Quizzes: 5% • Two Midterms: 20% each • Final Exam: 30%
MAE365	3	Lightweight Design	• Attendance: 10% • Two Midterms: 30% each • Final Exam: 30%
MAE409A	3	Finite Element Methods	• Attendance: 10% • First Midterm: 15% • Second and Third Midterms: 30% each • Final Exam: 15%

3.1 KIN124A - Surfing I - Phillip Poppler

Taking Coach Pepi's surfing class was one of my favorite experiences during my exchange years. This course is all about getting out there and catching as many waves as possible.

During the first lesson, you receive instructions at the local surf shop, "Inflight Surf Shop," about the course and necessary equipment. The shop also offers great deals on surfing gear: you can either rent a new board for $100 or buy a used one for the same price. The seller of the used board even offers to buy it back from international students for around $50 after the class. Additionally, American students often offer rides to the beach.

Coach Pepi teaches the basics of technique and sea life during the first few classes. After that, he remains available for one-on-one discussions to help improve your surfing skills. His enthusiasm and passion for surfing are truly inspiring. While the course costs around $300, I **strongly recommend it**.

3.2 MAE300 - Engineering Instrumentation & Measurement - Huy Hoang

The MAE300 course covers everything needed to write a scientific report for experiments. Topics include standard deviation, Gaussian functions, measurement errors, and curve fitting. A laboratory is required for this course, and lab reports make up 50% of the final grade. Labs typically take 30–60 minutes.

I **strongly recommend not taking** this course with Huy Hoang. His slides are disorganized and primarily consist of poorly chosen textbook screenshots. He reads formulas aloud without explaining them, and his heavy accent further complicates understanding. The workload, which includes six full laboratory reports and weekly homework, is excessive for a two-credit course.

This course is credited as an "Integrationskurs" in my Mechanical Engineering studies.

3.3 MAE305 - Numerical Methods in MAE - Chang Kim

Numerical Methods in MAE provides a broad overview of various techniques for solving problems such as:

- Roots of equations of a single variable
- Solving systems of equations
- Curve fitting and interpolation
- Numerical differentiation and integration
- Initial-value problems

While some methods are derived, others are only applied. Although these methods are unlikely to be directly used in practice (as they are usually built into software applications), it is fascinating to understand how computers solve problems beyond human capability. I **recommend taking**

this class with Professor Ramin S. Esfandiari, who incorporates practical applications into his teaching.

The course includes several projects that require MATLAB, and the open-book exams feature simple hand calculations. Exercises in the textbook cover all relevant material, but there is limited time to learn during the exams. *Tip: Familiarize yourself with your calculator's functions.* Some calculators can generate tables or sum values, saving time and reducing errors.

3.4 MAE334 - Aerodynamics I - Jingyi Zeng

My **favorite class this semester** was Aerodynamics with Jingyi Zeng. She is an excellent professor who encourages students to truly understand the material. Weekly homework assignments involve deriving equations discussed in class. Although challenging, this was the course where I learned the most. Note that her strong accent can make her lectures difficult to follow at times.

The course covers lift, drag, pitching moments, and the performance of airfoils and wings at low speeds. Topics include thin airfoil theory and finite wings, enabling you to calculate the lift generated by an airfoil's shape. While the exams are challenging, they are fair, and homework (25% of the final grade) allows for some flexibility.

3.5 MAE365 - Aerospace Structures I - Jian Juei Wang

MAE365 focuses on analyzing the properties of thin-walled structures under different loading conditions. Students learn to analyze open and closed stringer-stiffened thin-walled section beams subjected to transverse shear and torsion loads.

The professor explains concepts well, although his accent can be challenging. He also shares insights from his time at Boeing. Exams are straightforward if you prepare the exercises provided. This course is credited as "Lightweight Design" in my studies. **It is a decent course** and a good option if you want a lighter workload during your exchange semester.

3.6 MAE409A - Finite Element Methods I - Ali Momeni

Ali Momeni does an excellent job deriving the fundamental equations of finite element methods (FEM). However, the course focuses solely on deriving stiffness matrices for bar, beam, and constant-strain triangular elements. Students only use the FEM program Risa-2D to solve truss problems.

For those interested in theory, this course is a good choice. However, be aware that **you will not gain practical experience with FEM software** by taking this class.

4 Life on the campus

Living in the dorms is a great opportunity to take advantage of the vast variety of on-campus activities. Since it is just a 15-minute walk to every building on campus, I was able to attend many events without wasting too much time commuting. Some of the events organized by the university include:

- Welcome Week, featuring all the clubs introducing themselves
- Casino Night
- Carnival
- Water polo, soccer, basketball, and volleyball games
- Salsa dancing events

The Welcome Week is a fantastic opportunity to learn about the various clubs. Starting with the *AI Research Club*, passing by the *Salsa Club*, and ending at *Zeta Beta Tau*, a fraternity, there's a lot to explore. While you might not have enough time to get deeply involved in one of the engineering clubs, it is definitely worth considering sports or dancing clubs to make new friends.

Casino Night was an entertaining evening where we got to play games like poker, blackjack, and roulette. At the end of the night, all the chips could be exchanged for raffle tickets to win high-value items. Most events on campus, including this one, offered free food and drinks.

For the Carnival event, an entire parking lot was transformed into a *Kirmes* with numerous activities. There was even a Ferris wheel and an attraction that closely resembled a rollercoaster. All the rides were free, with only the major attractions having long lines. Activities like silent discos, making wax hands, or creating your own soap added to the fun.

Sports are another major attraction at American universities. Unfortunately, CSULB does not have an American football team, but many other sports matches are open to the public and free of charge for students. While the women's volleyball team is one of the best in the state, the men's volleyball team is among the best in the country. You can watch their matches in the *Walter Pyramid*, right on campus.

Another excellent way to spend your time is by visiting the massive gym at CSULB. During the exchange semester, it is completely free to use, and it offers various facilities, including fitness courses, a climbing wall, a beach volleyball court, a swimming pool, and a hot tub. The outdoor pools, thanks to heated water, are available year-round.

5 Traveling in the USA

Figure 1: San Francisco Streetcar

Unlike in Germany, you will be highly dependent on a car to travel within the United States. Locally, bus connections are often sufficient to get everywhere, provided you have enough time. However, there is no way around renting a car if you want to explore nature.

Renting a car is quite expensive but absolutely worth the experience. As a reference: I paid approximately $300 for an SUV over a weekend, including two drivers below the age of 25. On another occasion, I paid approximately $2000 for 23 days with an SUV and one driver under 25. Both times, a young driver fee of around $23/day was charged.

In and around Long Beach, there are many things to do. Below, I've listed some of my favorite spots for day or weekend trips:

- **Naples Canals**: A must-see during Halloween and Christmas.
- **Santa Catalina Island**: Avalon for touristic adventures and Two Harbors for outdoor adventures.
- **Rock and Outdoor Adventures**: Sign up for hiking, climbing, or camping trips at the gym.
- **Los Angeles**: A great experience with many museums to visit.

Road trips are a must for anyone visiting the United States. Not only do they allow you to see the most, but they also give you a chance to experience the vast, endless landscapes. Frequently, I drove straight for hours, passing by nothing but deserts or plains. It is incredible to follow a single interstate for over 1,500 miles and witness the seasons change—from summer in California to fall in Utah, and then to snowy winter in Wyoming.

For your road trip, consider these destinations:

- **Zion National Park**: Arguably the most beautiful place on earth.
- **San Francisco**: Experience an autonomous car ride for the price of a taxi.
- **Yosemite National Park**: Visit before November to avoid most of the park being closed.
- **Death Valley**: Who wouldn't want to visit the hottest place on earth?

6 Costs of exchange year

The cost of an exchange semester abroad in America should not be underestimated. It will likely be the most costly investment you will make during your studies, but I can say it is worth every cent. Those memories will last a lifetime, and if not now, when will you ever have the opportunity to step out of your life and start all over in a new country? You should consider Table 2 as a bare minimum. While it gives you a good estimate of what you will need to sustain yourself in America, you will pay much more to see what you want. I ended up paying about **$15000** to afford the traveling and other activities I did during my exchange.

Table 2: Overview of costs (1€ = 0.91$)

Type of cost	**Costs per month** [$]	**Costs per semester** [$]
Visa		
Sevis fee	-	220
Embassy appointment	-	190
Accommodation & train tickets Berlin	-	110
Porto passport return	-	27.5
Travel to the USA and back		
ICE-Tickets	-	66
Plane tickets	-	980
Living in the USA		
Service fee Accomondation	-	275
Accommondation	1220	4880
19 Meal plan	645	2580
JBC health insurance	-	750
Mint Mobile Unlimited Data	15	90
Additional living cost	500	2000
Additional costs		
DAAD English certificate	-	55
International drivers licence	-	18
Total cost		12,296.5

7 Conclusion

It is totally worth it! Considering the huge bureaucracy and effort required in advance, as well as the courage to step out of your comfort zone, it was not an easy decision to make. It is highly likely that you will get tired of all the necessary effort it takes to get to America, but you will thank yourself immensely afterward. In the end, it doesn't matter whether you end up in Alabama, California, or Virginia. Each state university will offer its unique experiences that you will cherish for a lifetime.

Gather all your patience and take a shot at this great opportunity. The moment you develop an interest in the adventure of an exchange semester, you should start saving. In the end, it should not fail due to financial reasons.

A Syllabus MAE300

MAE 300, Engineering Instrumentation& Measurement, Fall 2024

Instructor: Huy Hoang

Mode of delivery: Face-to-Face on-campus

Email: Huy.Hoang@csulb.edu

Course: MAE 300 Section 1 and 2

Term: Fall 2024

Office Hours: EN4-126 Monday: 11:30 AM-12:30 PM Friday: 12:15 -12:55 PM	**Virtual Office Hours:** By Appointment via Zoom
Class Days/Times: Monday 8:00-8:50 AM	**Class Location**: **VEC-201**
Lab Days/Times: TBA-Monday 9:00-11:45 AM	**Lab Location**: **VEC 132**

Course Description: Statistical analysis of experimental data, uncertainty analysis, various statistical distributions and test of goodness of fit, correlation coefficient and multivariable regression. Engineering instrumentation include types of passive/active transducers, electronics for instrumentation, computer-based data acquisition, and experiments on pressure, temperature, force measurements.

Letter grade only (A-F). (Lecture-problems 1 hour, Laboratory 3 hours)

Units: 2

Prerequisites: **MATH 224**; **PHYS 152** **, and PHYS 151 or** **EE 210** **and** **EE 210L**, **all with a grade of "C" or better.**

Required Textbook: Available on **MAE 300 Canvas** for all enrolled students to access or download.

Instrumentation and Measurements, H. R. Rahai
MAE 300 Laboratory Experiments
MAE 300 Laboratory Report Format

Additional References:

Thomas G. Beckwith, Roy D. Marangoni, and John H. Lienhard V, Mechanical Measurements, Pearson, 6th edition, 2006.

Richard S. Figliola and Donald E. Beasley, Theory and Design for Mechanical Measurements, Wiley, 6th edition, 2014.

ABET Student Outcomes:

The course satisfies following ABET student outcomes:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Course Objectives

To familiarize students with laboratory equipment and statistical analysis for experimental data. By the end of the course, students will be expected to have mastery in the following areas:

1. Statistical analysis of experimental data, uncertainty analysis, various statistical distributions and test of goodness of fit, correlation coefficient and multivariable regression.

2. An understanding of the basic principles of several engineering instrumentations including different types of passive and active transducers, electronics for instrumentation, computer-based data acquisition systems, and experiments on pressure, temperature and force measurements

Course Structure and Delivery Mode

This course is conducted in person, when possible, but will have a virtual classroom setup. You will access the course material and activities on Canvas and are required to attend in person; however. in the even classes cannot be held in person, participation through synchronous class meetings via Zoom is required. If you need technical assistance at any time during the course or need to report a problem with Canvas, please contact the Technology Help Desk by phone at (562) 985-4959.

Safety Training & Quiz

***MANDATORY*:** All students must review Lab Safety Guidelines and complete the Lab Safety Quiz on Canvas lecture section with a perfect score by the second week of classes.

It is your responsibility to be knowledgeable in the safety-related matters associated with this course and to abide by the safety policies and procedures presented by the instructor. Part of the evaluation of your performance in this laboratory will be based upon your strict attention to these safety policies. Failure to meet these requirements may result in expulsion.

No student shall direct another to take action in the laboratory in a manner that might cause body injury to her/himself or to others. All equipment or conditions appearing to be unsafe should be reported immediately to the instructor by the observing student(s).

Course Communication

We will use Canvas to **make announcements,** communicate information, post assignments and corresponding due dates, and discuss course-related topics. **Please note, it is your responsibility to check** Canvas's dashboard **regularly, as** it will contain **important information about upcoming class assignments, activities, or concerns.**

Tentative Course Schedule (Subjected to be changed)

Week 1-5:	Introduction, experimental uncertainty, statistical methods for engineers,
1	Lab meeting VEC 132: Safety orientation and COE quiz **(required)**
3	Lab meeting VEC 132: Experiment No. 1**(In-person at VEC 132)**
5	Lab meeting VEC 132: Experiment No. 2 **(In-person at VEC 132)**
6-16	Active and passive transducers. Temperature/Fluid flow measurement
7	Lab meeting VEC 132: Experiment No. 3 **(In-person at VEC 132)**
9	Lab meeting VEC 132: Experiment No. 4 **(In-person at VEC 132)**
8-11	Exam I (**subject to be announced ahead of time**)
12	Lab meeting VEC 132: Experiment No. 5 **(In-person at VEC 132)**
17	Exam II **(Final exam week)**

Course Policies:

- Lab reports can be done in a group of 2-3 students.
- **Lab reports are due at the beginning of the lab, two weeks after experimentation. Late lab report will be subjected to 5 % penalty for every day passed due date.**

B Syllabus MAE305

CLASS (MAE305-03), Numerical Methods, Fall 2024

Objectives:
1. Find roots of linear and nonlinear equations using iterative methods and MATLAB functions
2. Numerically solve systems of algebraic equations via direct and indirect methods
3. Numerically solve systems of nonlinear equations
4. Interpolate a set of data using polynomials and splines
5. Curve fit using least-squares regression
6. Perform numerical differentiation and integration
7. Numerically solve initial- and boundary-value problems
8. Iteratively approximate eigenvalues of a matrix

Textbook: (Required) Numerical Methods for Engineers and Scientists Using MATLAB®, by R.S. Esfandiari, 3rd Ed.

Instructor: Dr. Chang H. Kim Email: Chang.Kim@csulb.edu
Office Hours: VEC219, W 4:45~5:45pm, TH 6:15~7:15pm, or By Appointment

Week	Chapter	Topic
1-5	1	Introduction to MATLAB (Ch.1)
	2	Introduction to Numerical Methods (Ch. 2)
	3	Numerical Solution of Equations of a Single Variable (Ch. 3)
		Test 1 (20%)
6-10	4	Numerical Solution of systems of Equations (Ch. 4)
	5	Curve Fitting and Interpolation (Ch. 5)
		Test2 (20%)
11-15	6	Numerical differentiation and Integration (Ch. 6)
	7	Numerical Solution of Initial-Value Problems (Ch. 7)
		Test3 (20%)
	8	Numerical Solution of Boundary-Value Problems (Ch. 8)
	9, 10	Chapter 9 and Section 10.1 – if time allows
16		Final Exam (20%)

Note: "Zero Tolerance" for Cheating/Plagiarism.

Grading: Three midterm (60%), One final (20%)
Five Projects, Homework if any, Quiz, Notebook, (20%)

ABET Student Outcomes (please select all that apply, keep numbering and do not re-number, and eliminate the others-consult with the course coordinator or the ABET coordinator):

The course satisfies following ABET student outcomes:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Course Objectives

See above

Course Structure and Delivery Mode

This course is conducted entirely online(or in the hybrid format) . You will access the course material and activities on BeachBoard and are required to participate in synchronous class meetings via Zoom.
If you need technical assistance at any time during the course or need to report a problem with BeachBoard, please contact the Technology Help Desk using their online form, by phone at (562) 985-4959.

Course Communication

We will use BeachBoard to **make announcements,** communicate information, post assignments and corresponding due dates, and discuss course-related topics. **Please note, it is your responsibility to check** BeachBoard's dashboard **regularly, as** it will contain **important information about upcoming class assignments, activities, or concerns.**
Add additional info as needed.

Tentative Course Schedule

- See above

C Syllabus MAE334

MAE 334-01(3050): Aerodynamics I
Fall 2024

Instructor Information

Name: Dr. Jingyi Zeng
Office: ECS - 633
Email: Jingyi.Zeng@csulb.edu
Office Hours: TuTh 5:00 pm – 06:30 pm

Class Information

Dates: Aug 26, 2024 – Dec 11 , 2024
Time: TuTh 11:00 am – 12:15 pm
Classroom: ECS - 210

Course Description

Bernoulli equation. Incompressible inviscid flow. Flow around circular cylinders, flow around thin airfoils. Panel method. Incompressible flow about wings of finite span. Vortex lattice method.
Prerequisites: MAE 333: Engineering Fluid Dynamics.

Course Units

3 units.

Course Objectives

After this course, you should be able to. . .

- Understand how lift, drag and pitching moment are generated and the performance of airfoils and wings at low speed.
- Compute potential flows by superposition of elementary solutions.
- Calculate flows around airfoils by the use of thin airfoil theory and panel method.
- Understand the model of finite wings and calculate the lift and induced drag by the use of lifting line theory and vortex lattice method.
- Develop capabilities to apply fundamental aerodynamic principles to formulate and solve engineering problems.

Textbook, Calculators, & Software

Textbook: John D. Anderson, "Fundamentals of Aerodynamics," McGraw-Hill, 2015. *6th Edition*.
Calculator: You will need a calculator to do the computations that will arise throughout the course.

No specific calculator is required.

References:
1. J. J. Bertin & M. L. Smith, "Aerodynamics for Engineers," Prentice Hall, *4th edition*, 2002.
2. Joseph Katz & A. Plotkin, "Low-Speed Aerodynamics," Cambridge University Press, *2nd edition*, 2001.

Course Communication

Classes will be conducted in person twice a week. **Lecture recordings are strictly prohibited**. Canvas will be used to make announcements, post assignments and corresponding due dates, and discuss course-related information. Please note, it is your responsibility to check Canvas's dashboard regularly, as it will contain important information about upcoming class assignments, activities, or other class materials.
If you need technical assistance at any time during the course or need to report a problem with Canvas, please contact the Technology Help Desk using their online form, by email at canvas@csulb.edu, or by phone at (562) 985-4530.

Grading

The course grade is determined by the following components:

Evaluation Components	Weight
Homework	25%
Quizzes	5%
Midterm Exam 1	20%
Midterm Exam 2	20%
Final Exam	30%

Grade Scale

Final grades will be assigned according to the following scale:

Letter Grade	Curved Percentage
A	90% – 100%
B	80% – 89%
C	70% – 79%
D	60% – 69%
F	59% and below

Tentative Course Schedule

Topics may be added/removed to ensure the best learning outcome for the students.

Week	Date	Topic
1	Aug 27	Introductory Thoughts and Thermodynamics review
	Aug 29	Aerodynamic Forces and Moments. Center of Pressure
2	Sep 03	Dimensional Analysis. Flow Similarity
	Sep 05	Importance of Lift and Drag Coefficients. Fluid Statics
3	Sep 10	Types of Flow
	Sep 12	Viscous Flow. Boundary Layers
4	Sep 17	Review of Vector Relations. Substantial Derivative
	Sep 19	Continuity Equation. Momentum Equation
5	Sep 24	Momentum Equation. Energy Equation
	Sep 26	Vorticity. Circulation. Stream Function. Velocity Potential
6	Oct 01	Numerical Solutions. Midterm Review
	Oct 03	Midterm Exam #1
7	Oct 08	Bernoulli's Equation and Its Applications
	Oct 10	Governing Equation for 2D Incompressible Potential Flow
8	Oct 15	Elementary Flows
	Oct 17	Superposition of Elementary Flows
9	Oct 22	Nonlifting Flow over a Circular
	Oct 24	Lifting Flow over a Cylinder
10	Oct 29	Kutta-Joukowski Theorem. The Numerical Source Panel Method
	Oct 31	Airfoil Nomenclature. Airfoil Characteristics. Vortex Sheet
11	Nov 05	Kelvin's Circulation Theorem. The Kutta Condition. Thin Airfoil Theory
	Nov 07	Thin Airfoil Theory for Symmetric Airfoil. Midterm Review
12	Nov 12	Midterm Exam #2
	Nov 14	Thin Airfoil Theory for Cambered Airfoil
13	Nov 19	Viscous Flow over an Airfoil. Flow Separation
	Nov 21	Incompressible Flow over Finite Wings. Downwash and Induced Drag
14	Nov 26	Fall Break
	Nov 28	Fall Break
15	Dec 03	Prandtl's Classical Lifting-Line Theory
	Dec 05	Elliptical and General Lift Distribution
16	Dec 10	Numerical Methods. Final Review
	Dec 12	Final Exam

Evaluation Components

- **Attendance:**
  - Regular attendance is required. Students are responsible for all information and material presented in class. Use computers in class only for course-related activities. **Do not use your cellphone during any class activity**. Texting, chatting online, using social networks and other similar services is not allowed during the class.

- Attendance will be checked randomly during class by quizzes. **Make-up quizzes are not allowed** unless advance notice is given and supported by an official document.

- **Homework Assignments:**
  - Weekly homework assignments will be posted on Canvas on **Th.**. Completed homework must be uploaded to Canvas by the date and time as specified in the assignment.
  - **5% of the grade will be deducted for each hour the assignment is late.** No assignments will be accepted 20 hours after the deadline.
  - Each student is required to complete homework assignments **independently**. Collaboration or copying of answers is strictly prohibited and may result in academic penalties as per university policies.

- **Exams:**
  - There will be two midterm exams and one comprehensive final exam. All exams are open book, open notes. You are required to indicate the steps you followed to obtain the solution of the problems contained in the exam with adequate level of detail. Your solution must be written clearly and in a readable manner. **Poorly written or unclear parts will not be graded**.
  - Make-ups for exams can be arranged for "excused absences" (per University Policy) **only with advance notice** and an **official document**, but **make-ups are generally more difficult than the original exams**.
  - It is the student's responsibility to bring the required materials to take the exams. **Borrowing or sharing is not permitted**. Ensure that all pages of the exams are submitted. Failure to submit all pages, regardless of intent or circumstance, will result in a score of **ZERO** for the exam.
  - If the student is found to be **cheating** during an exam, they will receive an automatic **ZERO** and be reported to the department chair for disciplinary actions.

How to Contact the Instructor

Students can contact the instructor by email (Jingyi.Zeng@csulb.edu) including their **class number, class time, student name, and school ID**. Students may expect to get a response within 48-72 hours during the business day.

Plagiarism/Academic Integrity Policy

There is **zero tolerance** for cheating, plagiarism, or any other act of violation of the Academic Integrity policy. Work that you submit is assumed to be original unless your source material is documented appropriately, using proper citation. Using the ideas or words of another person, even a peer, or a website, as if it were your own, is plagiarism. Any individual or group caught cheating on homework, lab assignments, or any exam/quiz will be subjected to the full extent of academic actions allowed under University regulations. At a minimum, any student caught violating Academic Integrity Policy will receive no credit for the work concerned and one grade lower letter grade. To learn more about the University policy on Cheating and Plagiarism, visit: Academic Information and Regulations-Cheating and Plagiarism

D Syllabus MAE365

CALIFORNIA STATE UNIVERSITY, LONG BEACH
COLLEGE OF ENGINEERING
MAE 365 COURSE OUTLINE
Fall 2024
Monday & Wednesday 3:30PM – 4:45PM @VEC-113

1. Course Title: Aerospace Structures I
2. Format: Lecture-Discussion-Problems, 3 hours per week
3. Textbook:
   Mechanics of Aircraft Structures, any Edition
   Author: C.T. Sun; John Wiley & Sons, 2006.
   Fundamentals of Aircraft Structural Analysis
   Author: H.D. Curtis, McGraw-Hill, 1996.
4. Instructor:
   Name: JJ Wang, Ph.D.
   Office: VEC-219A
   E-mail:jianjuei.wang@csulb.edu
   Hours: M/W, 3:00PM-3:30PM or by appointment
5. Description:
   This course is designed for junior and senior undergraduate students with an engineering background that want to learn more about the mechanical behavior of aerospace materials. The course will include an in depth look at: torsion of thin walled section beams, bending and torsion of advanced beams, analysis of stiffened box beams, load transfer in stiffened panel structures and failure criteria of aerospace materials. The outline of the course will follow.
6. Prerequisites:
   The prerequisite for this course is MAE 373 (Mechanics of Deformable Bodies) with a C or better, or equivalent course.
7. Course Objectives/Outcomes:
   This course will focus on problem-solving where students will gain experience in taking a quantitative approach to structural analysis. Students will be familiarized with current research studies and experimental techniques in the field of aerospace structures to develop a better understanding of the current breakthroughs and challenges in the field.

   a. Upon completion of the course, the student should:
   1. Have a knowledge of the fundamentals of structural analysis and basic concepts of design.
   2. Have an understanding and knowledge of aerospace materials and their application in aerospace structures.
   3. Learn how to analyze open and closed thin-walled section bars subjected to torsional loads.
   4. Learn how to analyze open and closed stringer-stiffened thin-walled section beams subjected to transverse shear and torsional loads.
   5. Learn how to apply aerospace structural techniques to perform preliminary structural analysis for typical wing, fuselage, and other aerospace structural components.
   6. Have a general understanding and knowledge of failure criteria for isotropic materials.
   b. ABET Student Outcomes:
   1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. ABET (1)
   2. an ability to communicate effectively with a range of audiences. ABET (3)

3. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives. ABET (5)
4. . an ability to acquire and apply new knowledge as needed, using appropriate learning strategies. ABET (7)

8. Course Outline:

1. Introduction. Understanding basic structural components: axial loaded bar, shear panel, beam and torsional member. Next, students will look at loadings: wing and fuselages, types of loading and load transfer. Then, a understanding of aircraft structural components will be introduced.
2. Introduction to Elasticity. For this part of the course we will examine the concepts of displacement, strain and stress. An understanding of non-uniform stress fields, linear stress-strain relationships, elastic strain energy and plane elasticity will be investigated.
3. Torsion. We will examine torsion by looking at uniform bars and thin-walled sections.
4. Bending and Flexural Shear. Investigation of Bernoulli-Euler flexure theory, Bi-directional bending and transverse shear stress in symmetric sections will be looked at.
5. Advanced Beam Theory. We will examine flexural shear flow in an open then-walled section, shear center of open sections, closed thin-walled sections and a combined flexural and torsional shear flow.
6. Failure Criteria. We will investigate the failure criteria for isotropic materials by looking at brittle and ductile failure criteria, Coulomb-Mohr criterion and concepts of cracks.

9. Grade make-up: Attendance 10%, Midterms (30% and 30%), Final 30%.

10. Grades reference: A:100-90%, B:89-80%, C:79- 70%, D:69- 60%, F:below 60%

11: Homework will be assigned for practice.

11. There are no makeup exams.

12. % of overall attendance will be affected for more than two absences, i.e. two absences are allowed without affecting the % of overall attendance, in addition to the excused absences listed below.

University Attendance Policy:
EXCUSED ABSENCES include:

1. Illness or injury to the student
2. Death, injury, or serious illness of an immediate family member or the like
3. Religious reasons (California Education Code section 89320)
4. Jury duty or government obligation
5. University sanctioned or approved activities (examples: artistic performances, participation in research conferences, intercollegiate athletic activities, student government, required class filed trips, etc.)
6. Faculty members are not obligated to consider other absences as excused. Faculty members will ask for documentation as they deem appropriate for each excused absence.

The following University ethics policy applies to this course:
Cheating and *plagiarism* will not be tolerated in this course. Any individual caught cheating on quizzes, homework, lab projects, or the final exam will be punished to the full extent allowed

under University regulations. Plagiarism on papers or assignments is not acceptable and work that is plagiarized will not receive credit. Plagiarism is considered cheating.

Note: any time another person’s work is used without giving them proper credit, it is considered plagiarism and cheating. *At a minimum,* any student caught cheating will receive no credit for the work concerned, and will receive a reduction of one letter grade from their final course grade.

Academic Honesty Policy Summary:

Introduction

In addition to skills and knowledge, California State University, Long Beach aims to teach students appropriate Ethical and Professional Standards of Conduct. The Academic Information, Policies and Regulations exists to inform students and Faculty of their obligations in upholding the highest standards of professional and ethical integrity. All student work is subject to Academic Information, Policies and Regulations. Professional and Academic practice provides guidance about how to properly cite, reference, and attribute the intellectual property of others. Any attempt to deceive a faculty member or to help another student to do so will be considered a violation of these standards and regulations.

Instructor's Intended Purpose

The full text of the Academic Information, Policies and Regulations can be found in the California State University, Long Beach Catalog.

E Syllabus MAE409A

MAE 409A, FINITE ELEMENT METHODS I, Fall 2024

Instructor: Dr. Ali Momeni, Ph.D., P.E.
Email: ali.momeni@csulb.edu
Course: MAE 409A

Mode of delivery: Face-to-Face

Term: Fall 2024

Office Hours: MoWe 6-7 PM, TuTh 4-5:30 PM **Office:** VEC Room 219	
Class Days and Times: As Scheduled	
Class Location: As Scheduled	

Course Description: This course introduces several concepts in finite element analysis including but not limited to: matrix structural analysis, strong and weak formulations, Gauss quadrature integration, 1D/2D/3D shape functions, and element selection.

Units : 3

Prerequisites: MAE 305 and MAE 373 with a grade of "C" or better.

Required Textbooks: 1. D. Logan, "A first course in the finite element method", 5th Edition, ISBN: 9780495668251. This is the main textbook for the course.
2. "VECTOR MECHANICS FOR ENGINEERS, STATICS", 12th Ed. By Beer, Johnston, Cornwell, and Self.
3. MATLAB, An Introduction with Applications, 6th Edition, by Amos Gilat

Software: MATLAB
RISA-2D (Rapid Interactive Structural Analysis), RISA | RISA-2D Educational Version
Abaqus/CAE (Computer-Aided Engineering), https://edu.3ds.com/en/software/abaqus-student-edition

Course Objectives

Understand the fundamentals of finite element structural analysis and approaches to analyzing complex structural systems using finite element methods.

Course Structure and Delivery Mode

1. You will be responsible for all lecture materials and reading assignments posted on **CANVAS**. This responsibility for effective learning rests solely with the student. The instructor is essentially more of a guide and consultant than just a teacher. **To enhance your learning, please read the assigned materials carefully before each lecture.**
2. This is a three-unit engineering course that will take approximately 9 hours per week outside the class, for an average student, for an average grade.
3. Several sets of homework assignments will be assigned during the semester. The object of these assignments is to help you understand the subjects covered and prepare you for the exams. You are therefore urged to work out all assigned problems for your benefit. To help you find your mistakes, the solutions to all homework problems will be posted which

need to be used responsibly. The office hours are intended for you to enhance your learning, so please don't hesitate to use them as much as you can.

Course Communication

We will use CANVAS to **make announcements**, communicate information, post assignments, exam dates, and discuss course-related topics. **Please note, it is your responsibility to check CANVAS regularly, as** it will contain **important information about upcoming class assignments, activities, or concerns.**

Tentative Course Schedule

1. Chapter 10 of Statics: Methods of Virtual Work and Potential Energy
2. Chapter 1: Introduction to the Finite Element Method
3. Chapter 2: Introduction to the Stiffness (Displacement) Method
4. Chapter 3: Development of Truss Equations (2D)
5. Chapter 4: Development of Beam Equations (2D)
6. Chapter 6: Development of the Plane Stress and Plane Strain Equations
7. Chapter 9: Axisymmetric Elements

Grading

1. Attendance	10 points
2. Exam 1, Covers Chapters 10, 1, 2	15 points
3. Exam 2, Covers Chapters 3, 4	30 points
4. Exam 3, Covers Chapter 6	30 points
5. Final Exam, Covers Chapter 9	15 points

Total	100 points

The final letter grades will be determined as below based on the adjusted total scores.

A: 100-90 points
B: 89-80 points
C: 79-70 points
D: 69-60 points
F: 59-0 points

Reasonable accommodation will be provided to any student who is with the Office of Students with Disabilities and requests needed accommodation.