SYLLABUS

Metal Casting & Heat Transfer

Maymester 2025

Pre-requisite: MME 2303

Course Description: This course introduces students to the foundational principles of metal casting and heat transfer while emphasizing practical applications in manufacturing and engineering. Students will explore key concepts of metal casting, with a focus on sand casting techniques, including mold preparation, material properties, and casting process design. The course integrates heat transfer fundamentals, covering conduction, convection, and radiation to model and analyze thermal behavior in castings. Safe practices and ethical behavior in lab work will be emphasized.

Instructor: Dr. Christopher Bradley
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Office Hours: TBD

Instructor: Dr. Omar Cedillos Barraza
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Subject Matter Experts: Dr. Mathew Hayne mhayne@lanl.gov
Dr. Roger Jaramillo jaramillo_r@lanl.gov

Required Textbook: No textbook is required for this course. All references will be made available in class as well as out-of-class research including books available in the library, online references and other materials.

Steel- or composite-toe boots/shoes are mandatory for this course and must be worn in the lab every day!

Grading*:	Attendance	25%
	Assignments/Participation	25%
	Report	25%
	Presentation	25%

**Instructor reserves the right to change the grading scale and/or percentages.*

Honesty and Professionalism: Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, cheating, plagiarism, and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying research data on laboratory reports. Plagiarism occurs when someone intentionally or knowingly represents the words or ideas of another as one's own. Collusion involves collaborating with another person to commit any academically dishonest act. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. All suspected violations of academic integrity at The University of Texas at El Paso must be reported to the Office of Student Conduct and Conflict Resolution (OSCCR) for possible disciplinary action. To learn more, please visit HOOP: Student Conduct and Discipline.

Course Drop Policy:
According to UTEP Catalog, "*At the discretion of the instructor, a student can be dropped from a course because of excessive absences or lack of effort*". For this course, **ONE** absence will be considered excessive due to the dynamic nature of the course and amount of participation that is required! A grade of "*W*" will be assigned before the course drop deadline and a grade of "*F*" after the course drop deadline." See "*Policies and Regulations*" in the UTEP Undergraduate Catalog for a list of excuse absences. Therefore, if I find that, due to non-performance in the course, you are at risk of failing, I will drop you from the course. The students will have until May 26 to drop the course on their own. The instructor will have until May 30 (last day of class) to drop the student. An email will be sent 24 hours before the course drop process is put into effect.

Classroom and Laboratory Etiquette: Part of being a professional is to arrive on time and be prepared to participate. Another part is respecting the other people in the class, including the speaker. Please use professional discretion with your cell phone and turn off sound during class. If you must answer the phone, please leave the class discreetly. You may return to the class once your call is finished.

COVID-19 Precautions: Please stay home if you have been diagnosed with COVID-19 or are experiencing COVID-19 symptoms. If you are feeling unwell, please let me know as soon as possible, so that we can work on appropriate accommodations. If you have tested positive for COVID-19, you are encouraged to report your results to covidaction@utep.edu, so that the Dean of Students Office can provide you with support and help with communication with your professors. The Student Health Center is equipped to provide COVID 19 testing.

The Center for Disease Control and Prevention recommends that people in areas of substantial or high COVID-19 transmission wear face masks when indoors in groups of people. The best way that Miners can take care of Miners is to get the vaccine. If you still need the vaccine, it is widely available in the El Paso area and will be available at no charge on campus during the first week of classes. For more information about the current rates, testing, and vaccinations, please visit epstrong.org.

General Course Topics

a. Enforcing laboratories, workplace, and chemical safety principles to ensure safe working environments and establish well-developed hands-on experience.
b. Familiarize students with the functions of the Foundry and metallography lab.
c. Introduction to casting process and mold design.
d. Introduce heat transfer fundamentals for convection, conduction, and radiation.
e. Integration of heat transfer fundamentals to metal casting and its applicability to manufacturing and engineering.
f. Introduction to modeling and simulation for mold design.
g. Effects of alloy content on castability for aluminum and its alloys
h. Effects of cooling rates on mechanical properties and microstructural features for aluminum and its alloys.
i. Casting defects and solutions
j. Engineering ethics, including honesty and "data ethics".
k. Statistical analysis of data and drawing conclusions from lab work.
l. Writing concise and professional engineering reports.

Tentative Course Outline *(Topics may be subject to change)*

Day	Date	Course		
		8:00 – 9:00AM	*12:00 – 1:00PM*	*9:00AM – 12:00PM*
1	May 19	*Syllabus & Introductions* *Casting 101* *Campbell's 10*	*Heat Transfer – Topic I*	*Safety/Sand/First Cast* *Pre-job* *Post job*
2	May 20	*Industrial applications* *Gating Systems* *Casting Defects* *Chvorinov's Rule*	*Heat Transfer – Topic II*	***Cylinder*** *Pre-Lab* *Pre-job* *Casting* *Post job*
3	May 21	*Pattern Design* *Mold Assembly*	*Heat Transfer – Topic III*	*Results from Cylinder* ***Blocks*** *Pre-lab* *Pre-job* *Block Casting* *Post Job*
4	May 22	*Phase Diagrams* *Cooling Curves* *Fluid Flow* *Effect of Cooling Rate*	*Modeling I* *Program Introduction* *1D Problem* *BC's* *Modeling II* *2D Problem* *Simplifications* *Fluid Flow*	*Results from Blocks* ***Spirals*** *Pre-lab* *Pre-job* *Spiral Casting* *Results from Spirals* *Post job*
5	May 23	*Casting Defect Solutions* *Mechanical Properties of Castings* *Microstructures of Castings* *Heat Treatment of Castings*	*Modeling III* *3D Problem* *Parametric Study*	*Project I: Assign Problem* *Time for deling*
6	May 26	***Memorial Day (No class)***		
7	May 27	*Presentation and Technical Writing*		*Project II: Time for Modeling*
8	May 28	*Presentation and Technical Writing*		*Project III: Try Casting*
9	May 29	*Presentation and Technical Writing*		*Project IV: Report Wrap-up*
10	May 30	*Final Presentations*		