The University of Texas at TYLER
COLLEGE OF ENGINEERING

Department of Mechanical Engineering
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Uttyler.edu/engineering

MENG 4348/5348 – Applied CFD and Heat Transfer
Course Syllabus

Semester / Year	Fall 2019
Catalog Description	This course provides an understanding of the theory and process of computational flow analysis and computational heat transfer analysis by giving students the opportunity to use commercial simulation software to solve thermo-fluid of engineering systems. Topics covered include conservation of mass, momentum and energy; boundary conditions; turbulence modeling; mesh generation; solution procedures; and verification/validation. Students will work in teams on simulation projects based on realistic applications. One of the main learning objectives of this course is to develop the ability to think critically about simulation results and assess whether they give an acceptable level of accuracy for a given problem. To reach this objective, students will present their team's project progress throughout the semester, with an emphasis on providing clear and persuasive evidence of solution accuracy. A commercial software package will be used for simulations in this course.
Prerequisites	**MENG 3401** (Thermodynamics)**, MENG 3316** (Heat Transfer) and **MENG 3310** (Fluid Mechanics)
Section number	001/040
Instructor name	Fredericka Brown, PhD, MBA, PE
Contact info	RBN 3004 903.565.5828 fbrown@uttyler.edu
Class Type / Location	Face-to-face/Zoom
Class Time	W 2:00 p.m.- 4:45 p.m.
Office Hours	T/R 8:30 a.m. – 10:00 a.m.
Credits	3
Required Textbook	N/A
Optional References	Short list of resources for learning ANSYS and practicing numerical analysis 1) ANSYS Student Community: This is a free resource offered by ANSYS. In addition to the discussion forums here, there are lots of helpful tutorials if you poke around a bit. 2) Textbooks recommended for Numerical Analysis: This is a list of books that someone over on ANSYS Student Community

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	compiled of ANSYS specific books as well as general numerical analysis books. 3) Online courses: There are other courses offered in numerical analysis, including a Master's degree offered in ANSYS by a university in Madrid. Some of these will be free (such as MIT's OpenCourseWare), whereas others might cost you something. Simply Google "numerical analysis course" and add "ANSYS" if you are only interested in ANSYS and not just general numerical analysis.
Additional requirements	The course is designed to be used with the academic version of ANSYS located at one.uttyler.edu. A free ANSYS Student software (version 2019 R2), which can be downloaded at http://www.ansys.com/student. The software's model size will be limited compared to the academic version. In downloading this software, you are agreeing to ANSYS' Terms of Use. **You need a computer running Microsoft Windows (64-bit) to install ANSYS Student**. See ANSYS platform support for details. If you do not have access to a Windows computer, you have the option of to subscribe to one of ANSYS Cloud Hosting Partners that allow users the option of running ANSYS in a web browser on any device without the need to install it locally or installing a Microsoft operating system on your computer. **Working laptops running Microsoft Windows (64-bit) operating system with at least 8 GB of RAM are required for use during class.** Students who prefer to use a Mac will be required to also install a Microsoft Windows operating system or use a cloud based service to use and access the software on their laptop. Please note that most of the software problems encountered in class come from students who are using a Mac with a Windows operating system. Contact IT support for assistance. Working knowledge of a CAD software program is expected.
Evaluation Method	Tutorials 15%/ Exercises 10%/ Project 30%/ Final Exam 45% A = > 90, B = > 80, C = > 70, D = > 60, F < 60

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	F if scores 50% or Less on the Final Examination regardless of previous performance
Grading Policy / Scale	Letter grades
Important events / dates	Census date: TBD Final date: TBD
Attendance / Makeup policy	**ATTENDANCE.** Regular attendance is required. In case you have to miss a class, it is your responsibility to keep up with the class work and be informed of all announcements made in the class. **THERE WILL BE NO MAKE-UP EXAMS**. The percentage of any exam missed by a student will be added to his/her final comprehensive exam only if prior approval is granted. The student is responsible to contact the instructor at least a week before the scheduled exam date to get an excuse from the exam. If you have to miss an exam due to emergencies (such as medical and other emergencies) please inform the instructor as soon as possible before or immediately after the exam. Final course grades will be determined on the basis of the class evaluation method. If you miss any exam without getting **prior approval from the instructor at least a week before the exam date**, it will be counted as zero in the calculation of your final course grade. If you intend to be absent for a university-sponsored event or activity, you (or the event sponsor) must notify the instructor at least a week prior to the date of the planned absence.
Course Learning Objectives / ABET & PEOs relation	By the end of this course students will be able to demonstrate the ability to: 1. use modern CFD software tools to build flow geometries, generate an adequate mesh for an accurate solution, select appropriate solvers to obtain a flow solution, and visualize the resulting flow field. 2. analyze a flow field to determine various quantities of interest, such as flow rates, heat fluxes, pressure drops, losses, and heat transfer, using flow visualization and analysis tools. 3. recognize the type of fluid flow that is occurring in a particular physical system and to use the appropriate model equations to investigate the flow. 4. simplify a real thermo-fluid system into a simplified model problem, to select the proper governing equations for the physics involved in the system, to solve for the flow, to investigate the fluid-flow behavior and heat transfer, and to understand the results.

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	5. communicate the results of this detailed fluid flow and/or heat transfer study in a written format. 6. For *undergraduates* only: Conduct a group major course project such as simulation design and analysis of a complete mechanical system using a CFD commercial software and report the results at a publishable level. 7. For *graduates* only: Conduct an individual major course project such as simulation design and analysis of a complete mechanical system using a CFD commercial software and report the results at a publishable level.
Tentative Topics	1. Introduction to the use of modern CFD software, including geometry building, mesh generation, solution techniques, and flow visualization. 2. The investigation of various fluid flow and heat transfer systems aimed at a deeper understanding of the basic principles of fluid mechanics. 3. An assigned group major course project for undergraduates. A written project report is required. 4. An assigned individual major course project for graduates. A written project report is required.
Other	

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Tentative Course Schedule			
Week	***Date(s)***	***Topics***	***Assignment***
1	08/28	Finite Element Analysis (FEA)	*Date Due:*
2	09/04	Finite Element Analysis (FEA)	*Date Due:*
3	09/11	Finite Element Analysis (FEA)	*Date Due:*
4	09/18	Computational Fluid Dynamics (CFD)	*Date Due:*
5	09/25	Computational Fluid Dynamics (CFD)	*Date Due:*
6	10/02	CFD plus FEA	*Date Due:*
7	10/09	Advanced Modeling and Simulation	*Date Due:*
8	10/16	Advanced Modeling and Simulation	*Date Due:*
9	10/23	Advanced Modeling and Simulation	*Date Due:*
10	10/30	Advanced Modeling and Simulation	*Date Due:*
11	11/06	Advanced Modeling and Simulation	*Date Due:*
12	11/13	Project	*Date Due:*
13	11/20	Project	*Date Due:*
14	11/25 – 11/29	Thanksgiving Break	
15	12/04	Project	*Date Due:*
16	12/10 – 12/13	**Final Exam (Date TBD)**	

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University Policies:

UT Tyler Honor Code
Every member of the UT Tyler community joins together to embrace: Honor and integrity that will not allow me to lie, cheat, or steal, nor to accept the actions of those who do.

Students Rights and Responsibilities
To know and understand the policies that affect your rights and responsibilities as a student at UT Tyler, please follow this link: http://www.uttyler.edu/wellness/rightsresponsibilities.php

Campus Carry
We respect the right and privacy of students 21 and over who are duly licensed to carry concealed weapons in this class. License holders are expected to behave responsibly and keep a handgun secure and concealed. More information is available at http://www.uttyler.edu/about/campus-carry/index.php

UT Tyler a Tobacco-Free University
All forms of tobacco will not be permitted on the UT Tyler main campus, branch campuses, and any property owned by UT Tyler. This applies to all members of the University community, including students, faculty, staff, University affiliates, contractors, and visitors.
Forms of tobacco not permitted include cigarettes, cigars, pipes, water pipes (hookah), bidis, kreteks, electronic cigarettes, smokeless
tobacco, snuff, chewing tobacco, and all other tobacco products.
There are several cessation programs available to students looking to quit smoking, including counseling, quitlines, and group support.
For more information on cessation programs please visit www.uttyler.edu/tobacco-free.

Grade Replacement/Forgiveness and Census Date Policies
Students repeating a course for grade forgiveness (grade replacement) must file a Grade Replacement Contract with the Enrollment Services Center (ADM 230) on or before the Census Date of the semester in which the course will be repeated. Grade Replacement Contracts are available in the Enrollment Services Center or at http://www.uttyler.edu/registrar. Each semester's Census Date can be found on the Contract itself, on the Academic Calendar, or in the information pamphlets published each semester by the Office of the Registrar.
Failure to file a Grade Replacement Contract will result in both the original and repeated grade being used to calculate your overall grade point average. Undergraduates are eligible to exercise grade replacement for only three course repeats during their career at UT Tyler; graduates are eligible for two grade replacements. Full policy details are printed on each Grade Replacement Contract.
The Census Date is the deadline for many forms and enrollment actions of which students need to be aware. These include:

- Submitting Grade Replacement Contracts, Transient Forms , requests to withhold directory information, approvals for taking courses as Audit, Pass/Fail or Credit/No Credit.
- Receiving 100% refunds for partial withdrawals. (There is no refund for these after the Census Date)
- Schedule adjustments (section changes , adding a new class, dropping without a "W" grade)
- Being reinstated or re-enrolled in classes after being dropped for non-payment
- Completing the process for tuition exemptions or waivers through Financial Aid

State-Mandated Course Drop Policy

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Texas law prohibits a student who began college for the first time in Fall 2007 or thereafter from dropping more than six courses during their entire undergraduate career. This includes courses dropped at another 2-year or 4-year Texas public college or university. For purposes of this rule, a dropped course is any course that is dropped after the census date (See Academic Calendar for the specific date). Exceptions to the 6-drop rule may be found in the catalog. Petitions for exemptions must be submitted to the Enrollment Services Center and must be accompanied by documentation of the extenuating circumstance. Please contact the Enrollment Services Center if you have any questions.

Disability/Accessibility Services
In accordance with Section 504 of the Rehabilitation Act, Americans with Disabilities Act (ADA) and the ADA Amendments Act (ADAAA) the University of Texas at Tyler offers accommodations to students with learning, physical and/or psychological disabilities. If you have a disability, including a non-visible diagnosis such as a learning disorder, chronic illness, TBI, PTSD, ADHD, or you have a history of modifications or accommodations in a previous educational environment, you are encouraged to visit https://hood.accessiblelearning.com/UTTyler and fill out the New Student application. The Student Accessibility and Resources (SAR) office will contact you when your application has been submitted and an appointment with Cynthia Lowery, Assistant Director of Student Services/ADA Coordinator. For more information, including filling out an application for services, please visit the SAR webpage at http://www.uttyler.edu/disabilityservices, the SAR office located in the University Center, # 3150 or call 903.566.7079.

Student Absence due to Religious Observance
Students who anticipate being absent from class due to a religious observance are requested to inform the instructor of such absences by the second class meeting of the semester.

Student Absence for University-Sponsored Events and Activities
If you intend to be absent for a university-sponsored event or activity, you (or the event sponsor) must notify the instructor at least two weeks prior to the date of the planned absence. At that time the instructor will set a date and time when make-up assignments will be completed.

Social Security and FERPA Statement
It is the policy of The University of Texas at Tyler to protect the confidential nature of social security numbers. The University has changed its computer programming so that all students have an identification number. The electronic transmission of grades (e.g., via e-mail) risks violation of the Family Educational Rights and Privacy Act; grades will not be transmitted electronically.

Emergency Exits and Evacuation
Everyone is required to exit the building when a fire alarm goes off. Follow your instructor's directions regarding the appropriate exit. If you require assistance during an evacuation, inform your instructor in the first week of class. Do not re-enter the building unless given permission by University Police, Fire department, or Fire Prevention Services.

Student Standards of Academic Conduct
Disciplinary proceedings may be initiated against any student who engages in scholastic dishonesty, including, but not limited to, cheating, plagiarism, collusion, the submission for credit of any work or

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materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.

i. "Cheating" includes, but is not limited to:
   - copying from another student's test paper;
   - using, during a test, materials not authorized by the person giving the test;
   - failure to comply with instructions given by the person administering the test;
   - possession during a test of materials which are not authorized by the person giving the test, such as class notes or specifically designed "crib notes". The presence of textbooks constitutes a violation if they have been specifically prohibited by the person administering the test;
   - using, buying, stealing, transporting, or soliciting in whole or part the contents of an unadministered test, test key, homework solution, or computer program;
   - collaborating with or seeking aid from another student during a test or other assignment without authority;
   - discussing the contents of an examination with another student who will take the examination;
   - divulging the contents of an examination, for the purpose of preserving questions for use by another, when the instructors has designated that the examination is not to be removed from the examination room or not to be returned or to be kept by the student;
   - substituting for another person, or permitting another person to substitute for oneself to take a course, a test, or any course-related assignment;
   - paying or offering money or other valuable thing to, or coercing another person to obtain an unadministered test, test key, homework solution, or computer program or information about an unadministered test, test key, home solution or computer program;
   - falsifying research data, laboratory reports, and/or other academic work offered for credit;
   - taking, keeping, misplacing, or damaging the property of The University of Texas at Tyler, or of another, if the student knows or reasonably should know that an unfair academic advantage would be gained by such conduct; and
   - misrepresenting facts, including providing false grades or resumes, for the purpose of obtaining an academic or financial benefit or injuring another student academically or financially.

ii. "Plagiarism" includes, but is not limited to, the appropriation, buying, receiving as a gift, or obtaining by any means another's work and the submission of it as one's own academic work offered for credit.

iii. "Collusion" includes, but is not limited to, the unauthorized collaboration with another person in preparing academic assignments offered for credit or collaboration with another person to commit a violation of any section of the rules on scholastic dishonesty.

iv. All written work that is submitted will be subject to review by plagiarism software.

UT Tyler Resources for Students

- UT Tyler Writing Center (903.565.5995), writingcenter@uttyler.edu
- UT Tyler Tutoring Center (903.565.5964), tutoring@uttyler.edu
- The Mathematics Learning Center, RBN 4021, this is the open access computer lab for math students, with tutors on duty to assist students who are enrolled in early-career courses.

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- UT Tyler Counseling Center (903.566.7254)