

South Dakota School of Mines & Technology
Thermo-Fluid Systems Analysis and Design, Fall, 2021

ME419-M01, 3 credits

ME419L-M51, 1 credit or ME419L-M52, 1 credit, accompanying labs

Instructor Information

Instructor's Name

Dr. D. Lewis Abata, Professor of Mechanical Engineering, P.E.

Instructor's Contact Information

Office Phone 605-394-6070

Instructor's Email

duane.abata@sdsmt.edu

Instructor's Office

Office CM125

Instructor's Website

<http://abata/sdsmt.edu>

Instructor's Office Hours

Office hours are posted or by appointment. Please visit or my website <http://abata/sdsmt.edu> for posted office hours and updated class information. Assistance will also be provided by email or phone call (605-394-6070). Generally responses will typically take no more than one day.

Course Information

Course Start/End Dates

August 23, 2021 through December 15, 2021

Course Meeting Times and Location

Lecture - MWF 1 pm, Material Industries Building, Room 220

Course Delivery Method

ME419-M01 is a face-to-face lecture delivered course unless COVID restrictions are mandated at a later date. The laboratory (ME419L – M51 or ME419L – M52) is a separate course. Students can enroll both in the lecture and lab, or enroll in the lecture portion without enrolling in the lab. Enrolling the lab (ME419L) without the lecture (ME419) is not permitted since material in the lecture augments the lab. There are several different experiments that comprise the lab for this course. A lab manual has been developed and will be available after Sept 1, 2021.

Course Description

ME 419: (3-0) 3 credits. Prerequisites: ME 311, ME 313, ME 331, and ME 351.

Investigation and design of thermal and fluid systems and components, emphasizing the major thermal/fluid design issues that arise in engineering applications involving energy and fluid flow; analysis and synthesis involving modeling and optimization of thermo-fluid systems, components and processes.

Student Learning Outcomes

The student learning objectives of this course are to provide students with the skills to:

- 1) Organize and formulate the process required to create a design that will achieve a specified goal in a thermal or fluid system
- 2) Create and analyze concept solutions to meet given design constraints by applying fundamental principles in thermodynamics, heat transfer and fluid mechanics
- 3) Locate and employ existing empirical knowledge to a new design situation
- 4) Use modern design tools and software to augment the design process and communicate the results to interested parties.

Course Goals

The course will center on the design of a thermal/fluid systems and components involving both gaseous and liquid systems. The internal combustion engine will be used as a focus for a good portion of this course. Air duct systems, water piping systems, heat exchangers, design of engines, and design of various components of engines may also be presented and discussed. The laboratory will include experiments to compliment the lecture material and provide a means for hands on validation of concepts.

Course Materials

Required Textbook(s) and Materials

Sorenson, S. C., Internal Combustion Engine Principles with Vehicle Applications, Department of Mechanical Engineering, Technical University of Denmark, DK2800, Kgs. Lyngby, printed in the United States for the course ME419, SDSMT, July 2016.

Abata, D. L., Experiences in Thermal Systems [laboratory manual for ME419L], August, 2021.

Supplementary Materials (not required, recommended)

McDonald, Andre G. and Hugh L. Magande, Introduction to Thermo-Fluids Systems Design, Wiley, 2012, ISBN 9781118313633.

Howell, R. H., Principles of Heating, Ventilating, and Air Conditioning, 8th Edition, ASHRAE Atlanta, ISBN 978-1-939200-73-0

Technology Equipment Needed for the Course

Computer laptop or desktop as recommended by the SD Mines Admissions Office.

Technology Skills Needed for the Course

Students must be proficient in the use of Matlab as well as the basics of Microsoft Excel and other engineering application software. Knowledge of a programming language (Python) is also required (CSC150, CSC170).

Course Grading

Coursework

1. Since you have a text for the course and a well defined reading schedule (see course syllabus) you are expected to read the material thoroughly and take notes on what you read before each class. If you do not understand a particular point or are confused in any way, you are expected to ask questions during class. If you have a question and are afraid to ask, there are probably several other students with the same question. Remember no question is too simple or too foolish to ask.
2. Lectures will not duplicate word for word what is in the text. You will be expected to do the assigned problems and have these problems completed before the beginning of class.
3. Homework must be done on engineering graph paper (light green in color). Your name must be printed on the upper right corner. The date you completed the homework must be printed below your name. The course number 'ME419' must be printed on the upper left corner. The problem number must be underlined or circled, and on the left margin. Each problem should begin on a new page unless the problem is overly simplistic. Problems must be done in pencil. Homework problems of course must be neat and readable. No credit will be given for problems that do not follow the above format and are not readable. Keep all of your problems together! **Homework problems must be turned into my office at the end of the semester on or before December 8, 2021 no later than 1 pm with the required signed title page.** Late homework will not be accepted.

Attendance Policy

Attendance will not be taken.

Late/Make-up Assignment Policy

Late homework will not be accepted. If you do not plan to attend class due to a schedule conflict you must turn in your homework before it is due.

Academic Integrity

South Dakota Mines is committed to academic honesty and scholarly integrity. The South Dakota Board of Regents Policy 2:33 provides a comprehensive definition of “Academic Dishonesty”, which include cheating and plagiarism. All Instructors at South Dakota Mines are required to report allegations of academic misconduct to the Student Conduct Officer. The South Dakota Board of Regents Policy 3:4 provides detailed information regarding key definitions, policy information, prohibited conduct, and the Student Conduct process adhered to at South Dakota Mines. Any student suspected of violating academic

integrity standards will be reported in accordance with the process outlined on the [South Dakota Mines website](#).

Cheating is not allowed in any shape or form. Students who cheat will be immediately reported to the SDSMT Dean of Students. Cheating takes many forms such as copying the homework of others, looking at the answers or solutions of others during a quiz or examination, or having written or stored information not available to other students during a quiz or exam. Written information may take the form of a note, a 'cheat sheet', that written on one's hand, arm, etc. Stored information may take the form of that stored electronically or otherwise in a computer, calculator, mobile phone, etc. These examples of cheating discussed in this paragraph are not inclusive. Students who cheat are often creative with implementation. It would be too cumbersome and impossible to describe all of the methods of cheating. If you have information that other classmates do not have during an exam, quiz or when completing a homework assignment, then cheating has occurred.

Grading and Assessment

Grading Scale

Letter Grade	Percent
A	90 to 100%
B	80 to 89%
C	70 to 79%
D	60 to 69%
F	0 to 59%

Grading (ME419):

Final Grades will be based upon the following:

Homework and Classroom participation 20%

Tests, both written and oral 80%.

Grading (ME419L):

Lab reports must be delivered and are due the week following the lab before the lab begins. Hardcopy lab reports are to be delivered to collection box in the lab in CM125. Lab grade will be established by:

Quizzes 10%, Lab Reports 90%.

General Operational Policies

Electronic Devices Policy:

Please turn off your cell phone before class starts. No text messaging in class. No headphones.

If you wish to use a laptop/tablet PC, the computer should be in the folded-mode for note taking. Web browsing, game playing, Facebook and other social networking, including sending/reading e-mail, is prohibited during the lecture period. No other use of any other electronic/computer media is allowed during class time.

ADA Statement

South Dakota Mines strives to ensure that physical resources, as well as information and communication technologies, are reasonably accessible to users in order to provide equal access to all. If you encounter any accessibility issues, you are encouraged to immediately contact the instructor of the course and the Title IX and Disability Coordinator, Ms. Amanda Lopez at disabilityservices@sdsmt.edu or 605.394.2533, who will work to resolve the issue as quickly as possible.

COVID-19

In Fall, 2021 courses scheduled to meet face-to-face will be held in person and at normal capacities. If you contract COVID-19 and must isolate, you are asked to reach out to your instructor and the Dean of Students Office (deanofstudents@sdsmt.edu or 605.394.2416) to develop a plan for staying on track with your courses. Class lectures will not be recorded.

Freedom in Learning Statement

Under Board of Regents and University policy, student academic performance may be evaluated solely on an academic basis, not on opinions or conduct in matters unrelated to academic standards. Students should be free to take reasoned exception to the data or views offered in any course of study and to reserve judgement about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled. Students who believe that an academic evaluation reflects prejudiced or capricious consideration of student opinions or conduct unrelated to academic standards should contact the Provost and Vice President for Academic Affairs at provost@sdsmt.edu to initiate a review of the evaluation.