

MEC 422 Thermal System Design

Instructor: Prof. GunWoong Bahng

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Office Hours: Monday and Wednesdays 10 – 12 pm or by appointment

Course Description

Thermal system design. Credit 3: Design of fluid thermal system including piping systems and heat exchangers. Component matching and system simulation by modified Bernoulli equation. Optimization including thermo-economic evaluation and energy analysis. Devices pressure meters, viscosity meters, and flow meters will be discussed. Operating characteristics of pumps and fans, and the frictional loss and head in design practices will be covered. Varieties of heat exchangers will be discussed. If possible, a technical tour to LNG terminal located near Songdo will be arranged.

Course Prerequisites: Mass and Heat Transfer, Fluid Mechanics, Thermodynamics

Textbook

“Design of Fluid Thermal System”, 4th Ed.(SI version), William S. Janna, Cengage Learning, 2015

References

1. Heat Transfer: A Practical Approach by Yunus A. Cengel, 6th Ed., McGraw-Hill, 2020
2. Analysis and design of Energy Systems, Hodge, B.K. and R.P. Taylor, 3rd Edition, Prentice Hall, 1999
3. Design of Thermal Systems, Stoecker, W., McGraw-Hill, 1989
4. Elements of Thermal-Fluid System Design, Burmeister, L. C., Prentice Hall, 1998
5. Design Optimization of Thermal Systems, Jaluria, Y., McGraw-Hill, 1998

Class schedule

Lectures: Mondays and Wednesdays at 17:00 pm – 18:20 pm.

Course Topics

1. Introduction to design and analysis and project initiation
2. Fluid properties and basic equations
3. Piping systems I
4. Piping systems II
5. Selected topics in Fluid mechanics
6. Pumps and piping systems
7. Some heat transfer fundamentals
8. Double pipe heat exchangers

9. Shell and tube heat exchangers

10. Plate and frame and cross flow heat exchangers

Grading and Class Policies

Final grade is determined based on your performance on the following areas:

Class attendance: 5 %

Presentation and Homework: 15 %

Midterm: 40 %

Final: 40 %

Grading scale; All of the examinations will be open-book. No electronic devices will be allowed. The scores will be converted to points with the given weight percentage. The final grade will be given based on the points and relative evaluation.

Teaching Assistant : To be announced.

Course Policies

1. Lecture slides will be posted on the blackboard.

2. Depending on the COVID situation, lectures will be held via on-line or in-class. It will be posted before the start of the semester.

3. Each student will be assigned to give a presentation about a design of pump system utilizing commercially available motors and pumps.

Student Accessibility Support Center Statement

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Student Accessibility Support Center. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Student Accessibility Support Center. For procedures and information go to the following website: <http://www.stonybrook.edu/ehs/fire/disabilities>.

Academic Integrity Statement

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at http://www.stonybrook.edu/commcms/academic_integrity/index.html

Critical Incident Management

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.