THE UNIVERSITY OF VICTORIA
DEPARTMENT OF MECHANICAL ENGINEERING

Mech 493 - Design of Thermofluids Systems

Spring 2014

Instructors

Dr. Sadik Dost
Professor and Canada Research Chair
Department of Mechanical Engineering EOW 523
Tel: 721-8898, sdost@me.uvic.ca

Jordan Roszmann
Crystal Growth Laboratory
Engineering Lab Wing B152
Tel: 721-8648, roszmann@me.uvic.ca

Lectures

Tuesdays, 1:30 to 4:20 in ECS 104.

Office hours

Normally lectures hours, and others outside lectures hours by appointment only.

Textbook

William S. Janna: "Design of Fluid Thermal Systems", PWS Publishing Co., New York, 2nd or 3rd ed.

Course Description

This course is intended as a capstone design course in the area of thermofluid systems. In other words, it is a final design project in this field, and will be treated like a project submitted to a client's request for proposals. The textbook explains such a process very clearly. Please read carefully.

The course and the textbook are designed for the graduating class, so **MECH 345 and 395 are required as prerequisites. No exceptions will me made regarding the prerequisites**. A design project will normally be carried out in groups of four students. Any exceptions to this must be approved by the instructors (i.e., for groups of 3 or 5 students).

Grading

Quizzes (**2**): 15% each	30 %	individual mark
Midterm Report:	25 %	group mark
Project Presentation:	15 %	group mark
Final Report:	30 %	group mark
Total	100%	

Schedule

January 7	Select Group Members
January 14	Quiz 1 preparation: Piping Systems
January 21	**Quiz 1**, submit **Proposal Report** in class and through Moodle
January 28	**Project Introductions**: 5 min each
February 4	Quiz 2 preparation: Heat exchangers
February 11	**Reading Break**
February 18	**Quiz 2**
March 11	**Midterm Report, Project Presentation**: 15 min each
April 1	**Final Report**, submit to ELWB152 and through Moodle

Quizzes

Two quizzes will be from "piping systems" and "heat exchangers" that are covered in the textbook very well, and are also based largely on material you have covered in Mech 345, 390, and 395. Quizzes will be completed individually (you will receive individual marks which will have a 30% contribution towards your final grade). Quizzes are required by the Department to assign partial individual marks to group members. Quiz topics will be presented briefly in class, and problem sets will be provided to help students prepare.

Project

Groups of four students will design a new thermal or fluid system for a real or fictitious client. A proposal describing the potential benefit of the new fluid system and outlining the technical analysis required will be submitted in the third week of class. A midterm report will give a detailed technical design strategy, and the project will be presented to the class again at that point. A final report will specify the new system and include the project's net present value supported by an economic analysis.

Wherever appropriate, projects will include analysis related to the quiz material such as "Pumps and Piping Systems" or "Heat Exchangers." Other analyses may be proposed based on, for example, thermal modeling, mass transport, potential flow theory, etc. but all projects must include a rigorous technical component.

Specific Requirements for Reports and Presentations

All reports must be submitted at the start of class. An electronic version must also be submitted in .pdf format to the course Moodle page before midnight the same day.

The title pages of all reports must include the group number, group name, and the names and student numbers of all group members. Reports must be presented clearly and professionally, and marks may be deducted for poor grammar, illegible plots, or missing page numbers or captions.

Presentations should be no longer than the allotted time. All group members must participate in the presentations and attend the presentations of all other groups. Presentation slides should be brought to class on a flash drive. Pdf format is recommended for slides, but Power Point will be provided.

Proposal: (2-3 pages)

The project proposal will briefly outline the work to be done in broad terms. There are no marks assigned for the report, but a clear and well thought-out proposal will make for less work later. Please review the material covered by the two quizzes and choose a project that includes similar analyses. The project may be a highly detailed, optimized design of a single component such as a heat exchanger or a broader analysis of a complete system, such as a refrigerated shipping container, in which several components are chosen "off the shelf". The proposal should include the following:

1) Technical Proposal
    a) Project motivation / benefit
    b) Objectives and scope
    c) Anticipated analytical methods

2) Budget Proposal
    a) Project tasks (Gantt chart)
    b) Design consultancy budget (charge $100/hr)
    c) Estimated budget for the project implementation

Midterm Report

The progress report should be the largest and the most technically-focused of the project reports. It should describe the project in detail including what work has been done and what remains. The report should address questions such as how systems will be modeled, what software will be used, what characteristics will be optimized and how the benefit of the system will be evaluated. It must include:

1) Executive summary (Layman's abstract)
2) Technical summary
3) Project description
    a) Motivation
    b) Objectives / Scope
4) Technical Progress Report
    a) A detailed explanation of the analytical methods to be used
    b) A progress report including the results of preliminary analyses
    c) An updated work schedule showing the completed and outstanding tasks
5) Budget Report
    a) Tables showing whether the consultancy budget is on target.
    b) An updated implementation budget
6) Concerns or issues that have arisen, and proposed actions
7) Conclusion

Project Presentation: 15 min

The project presentation is an opportunity to show the client what work has been done and how the rest of the project will unfold. It should clearly present the project objectives and scope and describe the technical methods that are being used in as much detail as possible. Consultancy and project budgets should be reviewed and revised where necessary. Any preliminary results should be presented. Everyone in the group will take part in the presentation.

Attendance to presentations, and also staying in class until all the presentations completed, is compulsory.

Final Report:

The final report documents the project and its findings. While less technically focused than the midterm report, it should clearly describe the design process and provide a detailed technical description of any analysis not previously described. The final report does not need to repeat the material covered in the midterm report, but the two reports together must completely document the project. The final report should focus primarily on the project schedule and budget, and on the project's value to the client.

1) Executive and technical summaries
2) Technical Report
    a) Overview of the methods used
    b) Detailed description of methods not already described in the Progress Report
    c) Key design decisions
    d) Technical conclusions and outstanding issues
3) Budget Report
    a) Budget tables for the design and implementation
    b) Work schedule sheet showing the completed tasks
4) Concerns or issues that arose
5) Conclusions
6) Recommendations