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### Syllabus

**Course:** Thermodynamics, MECH 337

**Meeting times:** MWF 2:00-2:50 p.m. (Clark A 207)

W 3:00-3:50 p.m. (Clark A207)

**Instructor:** Dr. Anthony J. Marchese Office: Eng A103H

[marchese@colostate.edu](mailto:marchese@colostate.edu) Phone: 1-2328

**Instructor Office Hours:** Mon. 12:00 p.m. to 1 p.m.

Wed. 12:00 p.m. to 1 p.m.

AbioCor™ Implantable Replacement Heart.

**Teaching Assistant:**  Khandakar “Niaz” Morshed Office: A103J

[knmorshed@gmail.com](mailto:knmorshed@gmail.com)

**TA Office Hours**: Thursday, 11:30 a.m. to 1:30 p.m.

**Textbook:** Fundamentals of Engineering Thermodynamics, 7th Edition, Moran and Shapiro, 2011, Wiley.

**Course Description:** This course will provide an introduction to the basic concepts of properties and states of a substance, equilibrium, energy, entropy, processes and cycles. We will apply these principles toward the analysis of engineering systems such as engines, compressors, pumps, steam plants, and thermodynamic cycles for power generation and refrigeration.

**Grading Policy:**

*Homework/Quizzes (30%).* Approximately 5 to 8 homework problems per week will be assigned. Ten-minute, in-class quizzes will be given on the day that homework is due.

*Exam #1 (20%).* A 1.5-hour examination will be given at approximately the 6th week of class. Exam 1 is closed book, but a 1-page cheat sheet is permitted.

*Exam #2 (20%).* A 1.5-hour examination will be given at approximately the 12th week of class. Exam 2 is closed book, but a 1-page cheat sheet is permitted.

*Final Exam (30%).* A 2-hour comprehensive final exam will be given during finals week. The final exam is closed book, but two 1-page cheat sheets are permitted.

**Homework Format and Grading**

Approximately 5 to 8 problems will be assigned each week and 2 to 3 problems will be graded in detail at random. 20 % of each homework grade will be based on your having attempted all problems. 80% of the homework grade will be based on the graded problems. Assignments are due at the beginning of the class on the day announced by the instructor. Late assignments will not be collected (Late = 0), but the lowest homework grade will be dropped.

Assignments must be done on engineering paper in the format specified by the instructor (Known, Find, Given, Schematic Diagram, Engineering Model, Analysis). A sample of the required format is attached.

**Attendance and Lateness Policy**

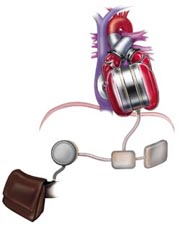
Attendance at all lectures and recitations is mandatory. Note that in-class quizzes will be given on days when homework is due. Sleeping in class is forbidden. Notebooks and calculators should be brought to each class. Please turn off your cell phones. If you have an emergency situation where your phone needs to be left on, please alert me prior to class…and please put it on vibrate. Class begins promptly at 2:00 p.m.; please do not be late!

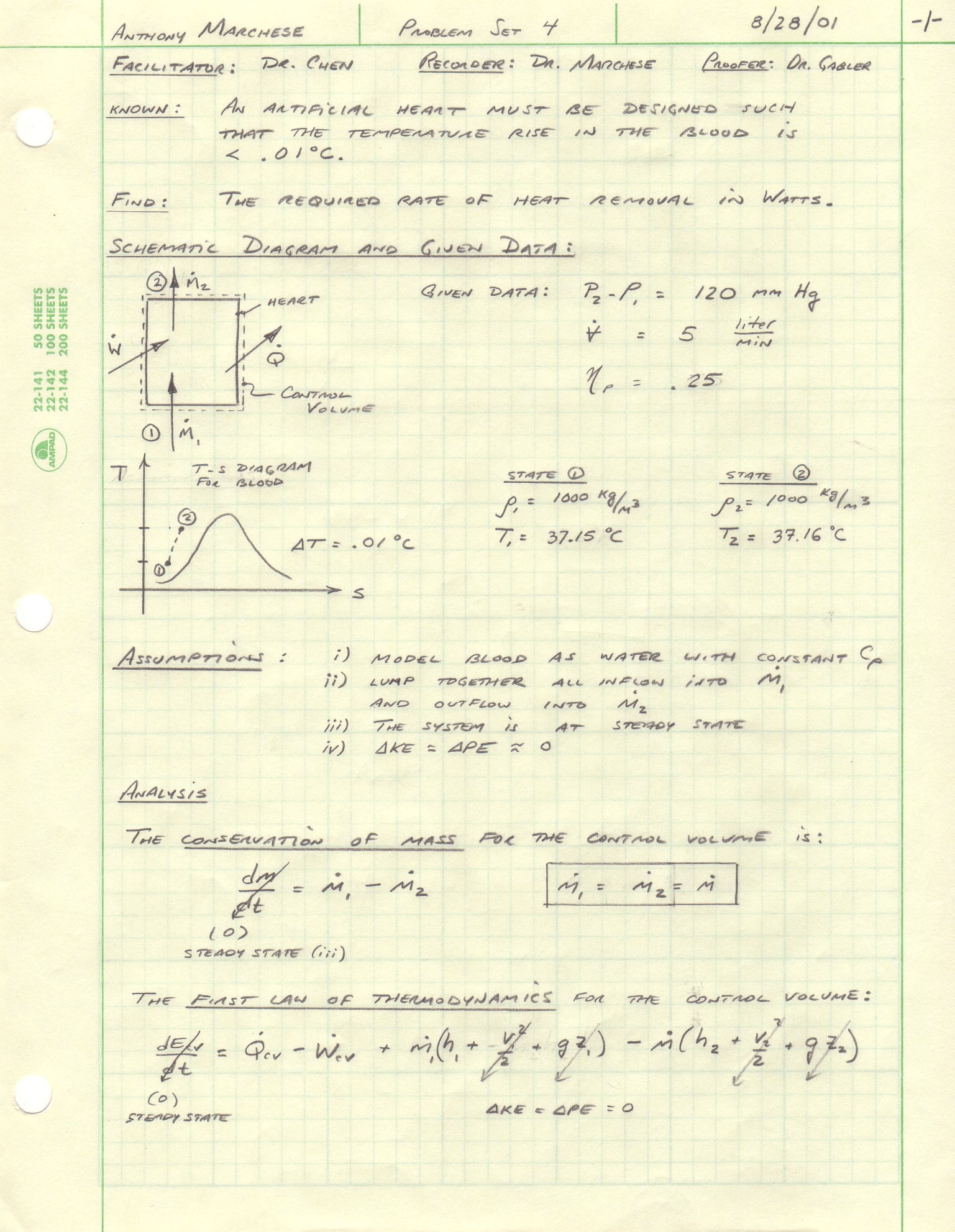
**Course Website**

Information on this class (including this syllabus) will be posted on the web at: <http://www.engr.colostate.edu/~marchese/mech337-11>

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| *Week* | *Date(s)* | *Text* | *Topics* | *Homework* |
| 1 | Aug. 22  Aug. 24  Aug. 26 | Ch. 1 | Introductory Concepts and Definitions | *Problems:*  *Date Due:* |
| 2 | Aug. 29  Aug. 31  Sep. 2 | Ch. 2 | Energy and the First Law of Thermodynamics | *Problems:*  *Date Due:* |
| 3 | Sep. 7  Sep. 9 | Ch. 3 | Evaluating Thermodynamic Properties | *Problems:*  *Date Due:* |
| 4 | Sep. 12  Sep. 14  Sep. 16 | Ch.3 |  | *Problems:*  *Date Due:* |
| 5 | Sep. 19  Sep. 21  Sep. 23 | Ch. 4 | Control Volume Energy Analysis | *Problems:*  *Date Due:* |
| 6 | Sep. 26  Sep.28  Sep. 30 | Ch. 5 | The Second Law of Thermodynamics  **Exam #1 (approx. date)** | *Problems:*  *Date Due:* |
| 7 | Oct. 3  Oct. 5  Oct. 7 | Ch. 6 | Defining entropy change, entropy balances for closed systems | *Problems:*  *Date Due:* |
| 8 | Oct. 10  Oct. 12  Oct. 14 | Ch. 6 | Entropy balances for open systems, isentropic efficiency | *Problems:*  *Date Due:* |
| 9 | Oct. 17  Oct. 19  Oct. 21 | Ch. 8 | Vapor Power Systems | *Problems:*  *Date Due:* |
| 10 | Oct. 24  Oct. 26  Oct. 28 | Ch. 8 | Vapor Power Systems | *Problems:*  *Date Due:* |
| 11 | Oct. 31  Nov. 2  Nov. 4 | Ch. 9 | Gas Power Systems | *Problems:*  *Date Due:* |
| 12 | Nov. 7  Nov. 9  Nov. 11 | Ch. 9 | Gas Power Systems | *Problems:*  *Date Due:* |
| 13 | Nov. 14  Nov. 16  Nov. 18 | Ch. 10 | Refrigeration and Heat Pump Systems  **Exam #2 (approx. date)** | *Problems:*  *Date Due:* |
| 14 | Nov. 21-25 |  | Fall Break |  |
| 15 | Nov. 28  Nov. 30  Dec. 2 | Ch. 12 | Ideal Gas Mixtures and Humid Air Calculations (Psychrometrics) | *Problems:*  *Date Due:* |
| 16 | Dec. 5  Dec. 7  Dec. 9 | Ch. 13 | Reacting Mixtures and Combustion | *Problems:*  *Date Due:* |
| 17 | Dec. 12-16 |  | **Final Exam (Date TBD)** |  |

Example Homework Problem and Solution Technique

*Raw Problem Statement.* One of the design requirements of an artificial heart under development is that the blood temperature does not increase by more than .01 °C as it is pumped through the heart. It is known that the pressure rise required for the heart pump is 120 mm Hg and that the average flow rate required is 5 liter/min. Assuming that the electrical and mechanical losses result in a pump efficiency of 25%, estimate the rate of heat removal in Watts required to maintain the allowable temperature increase.



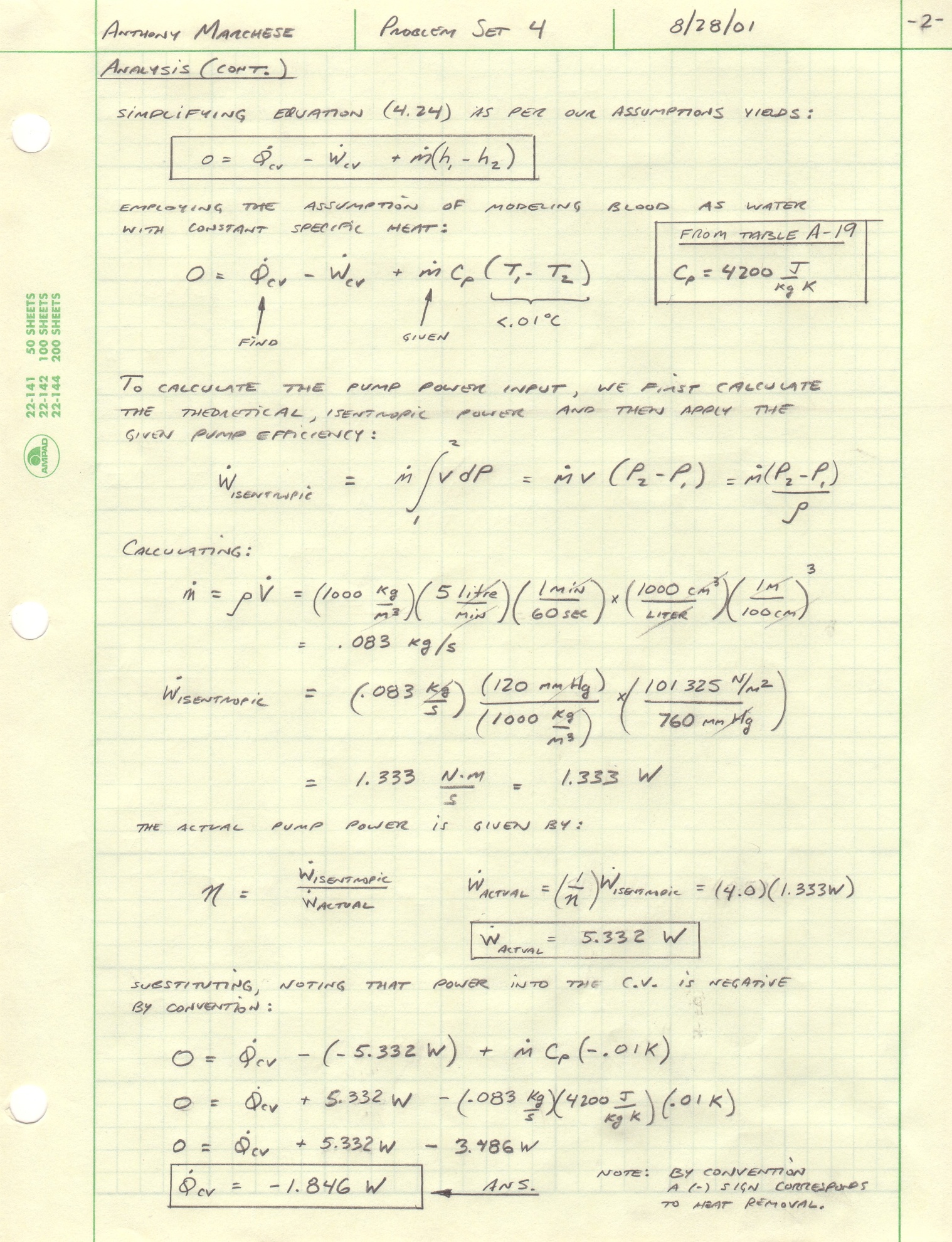
**Serial Number**

Date

Collaborators:

Engineering Model:

Name



Name

Date