BIOE 332
Spring 2011
Transport Process Design
(3 Credit Hours)

Scheduling: Offered each spring semester, T-Th 2:00-3:15 HBK 0115, T or Th 3:30-4:30

Description: A study of the transport processes of fluid flow, heat transfer, and mass transfer applied to biological organisms and systems. Means to design processes and products using transport processes and knowledge of biological organisms will be discussed.

Instructors:

Arthur T. Johnson, PhD PE
Professor Emeritus
1429 ANSC
artjohns@umd.edu
301-405-1184

Jessica Terrell
jterrell@umd.edu
301-405-4255

Text: Johnson, A. T., 1999, Biological Process Engineering, John Wiley, New York, New York.

References:

Eisenberg, A., 1982, Effective Technical Communication (McGraw-Hill: New York, New York)

Geankoplis, C. G., 1983 Transport Processes and Unit Operations (Allyn and Bacon: Boston, MS

Truskey, G. A., F. Yuan, and D. F. Katz, 2004, Transport Phenomena in Biological Systems (Prentice Hall: Upper Saddle River, NJ).

Objectives:

Goals for this course include:

1. Analysis of physical processes such as heat transfer, fluid flow, and mass transfer, used to modify physical characteristics, placement, or general usefulness of biological products or systems.
2. Impart an appreciation for systems analysis and analogic thinking.
3. Improve written and oral presentation of material.
4. Exercise the ability to research material on a chosen topic.
5. Give the opportunity to work in teams.

Outcomes:

Students will demonstrate the abilities to:

1. Use a systems approach.
2. Analyze transport processes problems.
3. Design solutions to ill-defined engineering problems.
4. Gather pertinent information from diverse sources.
5. Evaluate engineering reports.

Instructional Procedures:

Two 1 hour lecture-discussion periods (Tuesday and Thursday), one 1 hour recitation per week (Tuesday and Thursday) are devoted to the topics listed in the syllabus. Students will be expected to have read the assigned material prior to the class. Lecture/discussion in the scheduled class period will be used to clarify items not understood from the reading material. Short quizzes will be administered once per week to test the students' retention of material in class. There will be no other examinations administered in this course.

Only the top 10 quiz grades will be used to compute the quiz average. Missing a quiz due to illness, religious holiday, visit to your grandmother, or other reason will result in a zero grade on that quiz. Missed quizzes will not be made up.

Students in the class will be assigned to groups. Homework problems, and design problems will be completed and graded on a group basis. Each group member should feel responsible that all group members perform to their maximum abilities. Groups will be reassigned for each chapter of the text.

Each person is required to sign homework submissions. When you sign, you agree that you know how to do all the problems and that you attest to the fact that all your group members know how to do all problems. You are not signing just to indicate that you contributed; you are signing as an acceptance of your responsibility to help your fellow group members to understand class materials.

Your signature on homework submissions and reports indicates that you take full responsibility for the entire submission, not just the portion that you worked on. Therefore, it is a good idea to check it all over to be sure that you know what is there.

Homework problems will be assigned throughout the semester. Each person will be responsible for knowing how to solve each of the problems. Homework problems may be submitted in neat handwriting written in ink. Pencil-written homework will not be accepted. Assignments submitted late will not be graded.

This course is intended as an engineering design course. The major performance factor in this course will be three design projects and reports. One project will be assigned for

each of the major topic areas of fluid flow, heat transfer, and mass transfer. Projects will deal with one of the three major applications areas of environment, food or biotechnology, and medicine.

Design projects will be assigned toward the ends of the presentations of the major topic areas. Design projects will be presented verbally, and with the intention that students must clarify the projects before they are fully specified. Students are expected to produce workable and practical solutions in reports that are accurate, well organized, and presented favorably to impress the potential client. Students will have approximately two weeks to complete each project. Reports must be submitted in typed form and all illustrations must be neat and have a professional appearance.

Grading of reports will occur in two stages. Reports will be evaluated by students, using standard peer evaluation forms. Both reports and students' evaluations will be graded by the instructor. The instructor's comments will be verbally recorded and sent to each group by email.

At the end of each of the four major topics, and at the end of the constituted groups, students will be asked to evaluate the contributions of each of the group members. Based upon these peer evaluations of group contributions, adjustments of plus or minus one letter grade may be made in an individual student's final grade.

To assist in the development of written communication skills, a short review of technical writing techniques will be presented to the students. This review will consist of class discussion as well as two videotaped lectures available in the non-print media department of Hornbake Library. The student is cautioned that basic English will not be taught in the course, but all students are expected to know it.

There will be a teaching assistant this semester, Jordan Betz (jbetz@umd.edu). He is available to help answer questions and guide students. He will also lead students in discussion exercises designed to illustrate application of material presented in class.

Grades will be determined from the following formula:

Report #1	15%
Technical	*7%*
Communication	*7%*
Evaluation	*1%*
Report #2	25%
Technical	*10%*
Communication	*10%*
Evaluation	*5%*
Report #3	25%
Technical	*13%*

Communication	*12%*
Quizzes (10)	25%
Homework	10%

Conversion from final numerical average to letter grade will generally follow the decades 90+=A, 80-90=B, 70-80=C, etc. The instructor reserves the right to adjust the final letter grade by plus or minus one letter grade based upon group participation peer evaluation scores Your final grade will reflect the quality of your work and not just the quantity

If you have a documented disability and wish to discuss academic accommodations, please contact Dr Johnson (301-405-1184) as soon as possible.

Office Hours:
Office hours will be established for each of the assistants and for me. You will be notified about these.

Attendance:
Class attendance is for your benefit, and is encouraged. Recitation attendance is mandatory.

Cyberinfo:
Course information can be found at http://umd.blackboard.com. You will need an email address at the University of Maryland to access this information. Book errata and supplemental material can be found at http://bioe.umd.edu/~artjohns/ .

Prohibitions:
Cell phones are not welcome in class. If you have one, please make sure it does not ring during class time. If it does, you will be asked to leave.

Unauthorized copying, cheating, or plagiarism will not be tolerated. The University of Maryland, College Park has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity or the Student Honor Council, please visit http://www.studenthonorcouncil.umd.edu/whatis.html.

BIOE 332 SYLLABUS

Class	Date	Topic	Text (Sections)	Recitation
1	Jan 25	Introduction	--	
2	27	Problem Solving	1.1-1.3	Tech Writing
3	Feb 1	Effort and Flow Variables	1.4-1.6	
4	3	Balances	1.7	
5	8	Transport Processes Applications	1.8-1.9	
6	Feb 10	Systems Review Conservation of Mass Conservation of Energy	2.1-2.3	Learning Styles
7	15	Conservation of Momentum Flow Velocity Profiles	2.4	Problem Session
8	17	Pipe Energy Losses	2.5	Problem Session
9	22	**AIMBE**		
10	24	Compressible Flow Distensible Tubes Open-Channel Flow nonNewtonian Fluids	2.6-2.7	Problem Session
11	Mar 1	Power Calculation, Pumps	2.8	
12	3	Fluid-Flow Review	--	
13	8	Conduction Heat Transfer	3.1-3.2	
14	10	Convection Heat Transfer	3.3	Tech Writing
15	15	Radiation Heat Transfer	3.4	
16	17	Heat Storage, Heat Generation	3.5-3.6	
		Spring Break (3/21-3/25)		
17	29	Mixed Mode Heat Transfer, Heat Exchangers	3.7-3.7.1	Problem Session
18	31	Transient Heat Transfer	3.7.2-3.9	
19	Apr 5	Heat System Design	--	
20	7	Heat Transfer Review	--	
21	12	Molecular Diffusion	4.1-4.3.2	
22	15	Reverse Osmosis Membranes and Films	4.3.3-4.3.4	Problem Session
23	19	Mass Generation and Storage Convection	4.5-4.6	
24	21	Mixed Mode Transfer, Transient Transfer	4.4	
25	26	Psychrometrics	4.7	
26	28	Drying, Mass Transfer Design	4.8-4.8.1	
27	May 3	Mass Transfer Review	4.8.2-4.9	
28	5	Ethics/Professionalism	--	
29	10	Student Presentations	--	