ChE 370 Heat and Mass Transfer
Spring 2018

Otto H. York Department of Chemical, Biological & Pharmaceutical Engineering, New Jersey Institute of Technology

Spring 2018 Academic Calendar

January	15	Monday	Martin Luther King, Jr. Day
January	16	Tuesday	First Day of Classes
January	20	Saturday	Saturday Classes Begin
January	22	Monday	Last Day to Add/Drop Classes
January	22	Monday	Last Day for 100% Refund, Full or Partial Withdrawal
January	23	Tuesday	W Grades Posted for Course Withdrawals
January	29	Monday	Last Day for 90% Refund of Tuition (no refund for fees), Full or Partial Withdrawal - no refund for partial withdrawal after this date
February	12	Monday	Last Day for 50% Refund of Tuition (no refund for fees), Full Withdrawal
March	5	Monday	Last day for 25% Refund of Tuition (no refund for fees), Full Withdrawal
March	11	Sunday	Spring Recess Begins - No Classes Scheduled - University Open
March	18	Sunday	Spring Recess Ends
March	26	Monday	Last day to Withdraw
March	30	Friday	Good Friday - No Classes Scheduled
May	1	Tuesday	Friday Classes Meet
May	1	Tuesday	Last Day of Classes
May	2	Wednesday	Reading Day
May	3	Thursday	Reading Day
May	4	Friday	Final Exams Begin
May	10	Thursday	Final Exams End
May	12	Saturday	Final Grades Due
TBA			Commencement (tentative)

General course information

CHE 370 - HEAT AND MASS TRANSFER (4 credits). The principles of heat and mass transfer in chemical engineering systems are covered. Steady and unsteady heat transfer is examined, with emphasis on the heat exchanger design. Mass transfer by steady and unsteady molecular diffusion, and turbulent convective mass transfer is studied.

Class: 5:45PM – 9:35PM, Thursday, Central King Building 106

Pre-requisites: Chemical Process Calculations II (ChE 240), Fluid Flow (ChE 260), Differential Equations (Math 222)

Credits and contact hours
(4-0-0) (4 credits, 4 contact hours)

Course coordinator/instructor
Dr. Boris Khusid
Faculty Memorial Hall 215 (office); 973-596-5707 (phone); khusid@njit.edu (e-mail)
http://chemicaleng.njit.edu/people/profiles/khusid.php (website)

Office Hours Thursday: 3:45 pm – 5:45 pm
Note: you can always schedule an appointment by email if the office hour time conflicts with your classes

Specific course information
Textbooks: **Required** - Yunus Cengel and Afshin Ghajar, Heat and Mass Transfer: Fundamentals and Applications, 5th Ed, McGraw-Hill, 2015
https://www.mheducation.com/highered/product/M0073398187.html

Recommended –1) J.R. Welty, G.L. Rorrer, D.G. Foster, Fundamentals of Momentum, Heat and Mass Transfer, 6th Edition, Wiley, 2014
http://www.wiley.com/WileyCDA/WileyTitle/productCd-1118804279.html
2) R. Byron Bird, Warren E. Stewart, Edwin N. Lightfoot, Transport Phenomena, Revised 2nd Edition, Wiley, 2009
https://www.wiley.com/en-us/Transport+Phenomena%2C+Revised+2nd+Edition-p-9780470508633

Other learning material: The lecture notes to be posted on the Moodle website give a summary of the material. Please print and bring them along with your book, laptop, and calculator before coming to the lecture. You will make additional notes during the lectures.

Required software: Latest versions of MS Office, Adobe Reader (all can be downloaded from NJIT IST webpage). Student Mall labs and ChE department PC lab have most of the software.

Specific course objectives
1. To develop the students' skills in applying differential equations for describing steady and transient heat and mass transfer problems
2. To develop the students' skills in applying engineering design approaches for heat and mass transfer components and systems
3. To develop the students' skills in modeling and dimensionless analysis for heat and mass transfer problems in different geometries
4. To provide the students with fundamental theoretical concepts and practical analysis skills

associated with convective heat and mass transfer including external and internal flow configurations
5. To provide the students with fundamental theoretical concepts and practical analysis skills associated with radiation heat transfer
6. To develop students' skills in solving practical heat transfer problems using thermal resistance networks
7. To develop students' skills in working with contemporary heat and mass transfer related research literature and develop their own, application driven engineering solutions working as a team.

Grading
Your performance will be graded on an absolute scale, so your grade is not affected by how others do. Final letter grades will be awarded based on your weighted average score as follows:

Homework (individual)	10%
Quizzes (individual)	10%
Group project (team work)	20%
Mid-exam (individual)	30%
Final exam (individual)	30%

Letter grades will be assigned automatically by an Excel code based on the following totals:

A	85% and above
B+	80%-84.9%
B	75%-79.9%
C+	70%-74.9%
C	65%-69.9%
D	55%-64.9%
F	Less than 55%

For success, you are strongly advised to

Review/work on the material of the previous lecture before the next class.
Read the lecture notes and covered sections of the required textbook,
Bring the printed lecture notes to class along with the computer and calculator,
Take additional notes during the lectures
Work out all derivations and examples in the lecture notes and in-class examples on your own after each lecture.
In case of questions, please see the instructor during Office Hours or raise questions in the class. Do not delay this to the exam week.

Policies on assignments/exams and classroom policy
Homework is an integral part of the course:

- Homework is collected at the beginning of the class.
- Late homework will not be accepted for grading
- Feedback on the homework will be provided during lectures, solutions will be discussed and posted on the MOODLE website; graded homework will be returned
- Each problem will be graded individually

You are allowed to discuss HW problems with peer students, but cannot copy the solution.

Quizzes:

There will be quizzes occasionally at the beginning of the class. If you miss the class, you will miss the quiz that day. There will be no makeup quiz.

Group project assignment

Students will work as a team by cooperating in a group (up to 3) to carry out a short project on specific applications of heat & mass transfer process, prepare and post the progress/final reports & slides on the MOODLE website, and give an oral presentation at the class. Topics for projects may include but are **not limited to**:

- Heat and mass transfer in convective drying processes
- Heat and mass transfer in a refrigerator
- Heat and mass transfer in a loop heat pipe
- Heat transfer in chemical reactors
- Heat and mass transfer in freeze drying processes
- Heat and mass transfer in condensation of water vapor from moist air

Grading of the project report and oral presentation will be based on

- Mastery of the subject
- Quality of the write-up
- Presentation of the subject matter

In-class project/group activities policy:

Each student will be asked at the end of the semester to confidentially rate his/her performance/effort as well as that of all his/her group-members. The evaluation form is listed in the syllabus. The completed evaluation form has to be submitted either as a hard copy in a sealed envelope or as a word-file attached to an e-mail to the instructor.

- Evaluation forms are due on May 1st, 2018.
- Submission of the form after May 1st, 2018 and before the final exam will lead to 25% reduction of the credit.
- Submission of the form at the final exam will lead to a further 25% reduction of the credit.
- A student **will not be allowed** to take the final exam without prior submission of the self & peer evaluation form.

Exam policy:

There will be one midterm and one final exams; both are open book & lecture notes, computer and calculators can be used. However, the use of the Internet, emails, and cell phones is not allowed to prevent any communication with the outside people.

- Exact date of the midterm exam will be announced a week before.
- There will be a final exam during Finals' week, covering the course materials and the topics of students' projects. .
- The midterm and final exams must be completed individually, in accordance with the NJIT Honor Code.
- Each exam problem will be graded independently.
- A missed midterm exam will be averaged into the final grade as zero, unless an excuse is obtained. Excuses are granted only for very serious circumstances attested to by the NJIT Dean of Student Office. A student who has been excused will be required to take a makeup exam.
- A students missing the final exam without a documented reason will get an Incomplete.
- Exams will be administered either at NJIT or at testing centers, as described below:

According to NJIT policy, all students taking the class but living within 50 miles of NJIT

must take the required exams at the NJIT's main campus in Newark, NJ. The exact time and the room where the exam will take place will be specified by the instructor prior to the exam. Students living outside this 50-mile zone can take the exams at predefined testing locations. The National College Testing Association (NCTA) lists the participating institutions nationwide where students can take proctored tests according to the rules set up by the course instructor. Students should visit this website, identify the testing location where they plan to take the exams, and inform the course instructor within two weeks from the beginning of classes of which testing location they have selected. Students should be aware that they will be required to pay a fee to the chosen testing center for each exam that they take there. Such a fee is typically on the order of $25-$50 per exam, depending on the testing center. Prior to each exam, students should make arrangements with the selected testing center to ensure that they can take the exam at the predefined location at a given day and time.

Disputing a grade on tests/assignments:
If a student has questions about the grade received for an exam, homework, or project, he/she must talk to the instructor (or the teaching assistant where appropriate) **no later than a week** after the graded activity has been returned to students.

Course delivery:
ChE 370 will be delivered in the converged learning model. You will be able to physically come to class as you normally would, but you can also choose to stay home (or a location or your choice) and join the class through a video conferencing tool called WebEx. This initiative gives you more flexibility in how you come to class. You do not have to choose one option or the other. You can choose how you want to attend each individual class session. No matter how you choose to attend class, you will still have to participate in the content and contribute your thoughts and understanding of the material presented in class.

Here's what you'll need to successfully join the WebEx sessions:
- a strong internet connection
- a quiet location to join the session
- a laptop or desktop with a webcam
- a headset or earbud/mic set with a mic (this will give you better audio than the integrated laptop or desktop mic)

You have a WebEx link on your Moodle course; you can click on the link each class if you would like to join class through virtual means. The class will have a technical assistant that you can communicate with using WebEx's "Chat" feature if you encounter issues. Before you join class for the first session, it is strongly encouraged that you watch the following short video on joining class via WebEx--it will go over all the basics: http://webex.njit.edu . If you need help learning more about WebEx, see the extended PDF tutorial on this website.

Accommodations due to disability:
If you need accommodations due to a disability please contact Chantonette Lyles, Associate Director of Disability Support Services, Fenster Hall Room 260 to discuss your specific needs. A Letter of Accommodation Eligibility from the Disability Support Services office authorizing your accommodations will be required.

Course outcomes (a-k ABET):
a) an ability to apply knowledge of mathematics, science and engineering
b) an ability to design and conduct experiments, as well as to analyze and interpret data

c) an ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
d) an ability to function on multi-disciplinary teams
e) an ability to identify, formulate, and solve engineering problems
f) an understanding of professional and ethical responsibility
g) an ability to communicate effectively
h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context
i) a recognition of the need for, and an ability to engage in life-long learning
j) a knowledge of contemporary issues
k) an ability to use the techniques, skills and modern engineering tools necessary for chemical engineering practice

Tentative weekly listing of topics (15-week schedule)

Week	Book Chapters
1	Chapter 1
2	Chapter 1/2
3	Chapter 2
4	Chapter 2/3
5	Chapter 3
6	Chapter 4
7	Chapter 4/6
8	Chapter 6/ Midterm exam
9	Chapter 11
10	Chapter 11
11	Chapter 12
12	Chapter 12
13	Chapter 12/14
14	Chapter 14
15	Chapter 14/Project presentation

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Self and Peer Rating of Project Team Members

Name **Group #:**

Please write the names of all of your team members, INCLUDING YOURSELF, and rate the degree to which each member fulfilled his/her responsibilities in completing the project assignment. The possible ratings are as follows:

Excellent	Consistently went above and beyond (tutored teammates, carried more than his/her fair share of the load)
Very good	Consistently did what he/she was supposed to do, very well prepared and cooperative
Satisfactory	Usually did what he/she was supposed to do, acceptably prepared and cooperative
Ordinary	Often did what he/she was supposed to do, minimally prepared and cooperative
Marginal	Sometimes failed to show up or complete assignments, rarely prepared
Deficient	Often failed to show up or complete assignments, rarely prepared
Unsatisfactory	Consistently failed to show up or complete assignments, unprepared
Superficial	Practically no participation
No show	No participation at all

These ratings should reflect each individual's level of participation, effort, and sense of responsibility, NOT his or her academic ability.

NAME OF TEAM MEMBER	**RATING**

Your signature: Date :