Fall 2018

CHE 370 - Heat and Mass Transfer

Boris Khusid

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## Syllabus

**ChE 370 Heat and Mass Transfer**  
**Fall 2018**

*Otto H. York Department of Chemical & Materials Engineering*  
*New Jersey Institute of Technology*

### Fall 2018 Academic Calendar

<table>
<thead>
<tr>
<th>Month</th>
<th>Day</th>
<th>Event</th>
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<tbody>
<tr>
<td>September</td>
<td>3</td>
<td>Monday Labor Day</td>
</tr>
<tr>
<td>September</td>
<td>4</td>
<td>Tuesday First Day of Classes</td>
</tr>
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<td>September</td>
<td>8</td>
<td>Saturday Saturday Classes Begin</td>
</tr>
<tr>
<td>September</td>
<td>10</td>
<td>Monday Last Day to Add/Drop a Class</td>
</tr>
<tr>
<td>September</td>
<td>10</td>
<td>Monday Monday Classes Meet</td>
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<tr>
<td>September</td>
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<td>Monday Last Day for 100% Refund, Full or Partial Withdrawal</td>
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<td>September</td>
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<td>Tuesday W Grades Posted for Course Withdrawals</td>
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<tr>
<td>September</td>
<td>17</td>
<td>Monday Last Day for 90% Refund, Full or Partial Withdrawal after this date</td>
</tr>
<tr>
<td>October</td>
<td>1</td>
<td>Monday Last Day for 50% Refund, Full Withdrawal</td>
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<tr>
<td>October</td>
<td>22</td>
<td>Monday Last Day for 25% Refund, Full Withdrawal</td>
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<td>November</td>
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<td>Monday Last Day to Withdraw</td>
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<td>November</td>
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<td>Tuesday Thursday Classes Meet</td>
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<tr>
<td>November</td>
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<td>Wednesday Friday Classes Meet</td>
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<tr>
<td>November</td>
<td>22</td>
<td>Thursday Thanksgiving Recess Begins</td>
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<tr>
<td>November</td>
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<td>Sunday Thanksgiving Recess Ends</td>
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<tr>
<td>December</td>
<td>12</td>
<td>Wednesday Last Day of Classes</td>
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<tr>
<td>December</td>
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<td>Thursday Reading Day 1</td>
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<td>December</td>
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<td>Friday Reading Day 2</td>
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<td>December</td>
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<td>Saturday Final Exams Begin</td>
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<tr>
<td>December</td>
<td>21</td>
<td>Friday Final Exams End</td>
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<tr>
<td>TBA</td>
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<td>Final Grades Due</td>
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</tbody>
</table>
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.

Days/ Times: Tuesday: 11:30AM – 12:20PM, Tuesday & Thursday: 4:00PM – 5:20PM

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

Credits and contact hours
(4-0-4) (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/khusid.php (website)

Office Hours Tuesday: 9:30AM – 11:30AM
Note: you can always schedule an appointment by email if the office hour time conflicts with your classes

Specific course information

https://www.mheducation.com/highered/product/M0073398187.html


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 textbook, laptop, and calculator to the class. 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.

Course objectives
1: Provide students with knowledge of fundamental concepts of heat & mass transfer and skills for design of heat & mass transfer components and systems
2: Teach students how to develop mathematical models of heat & mass transfer and use them in analysis of practical examples
3: Develop skills to work in a team to acquire new knowledge on specific heat & mass transfer applications and communicate it in written & verbal form
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)  25%
Mid-exam (individual)  20%
Final exam (individual)  35%

Letter grades will be assigned automatically by an Excel code based on the following totals:
A (Superior)  85% and above
B+ (Excellent)  80%-84.9%
B (Very Good)  75%-79.9%
C+ (Good)  70%-74.9%
C (Acceptable)  65%-69.9%
D (Minimum)  55%-64.9%
F (Inadequate)  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; if you cannot attend the class you have
  send the solution to the instructor before the class.
• 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. Guidelines for preparing a project, topics & abstracts of projects presented in the 2018 Spring Semester and detailed criteria for grading the project report and oral presentation are posted on the MOODLE website. Topics presented in the 2018 Spring Semester serve as examples, but cannot be copied!

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 December 12, 2018.
- Submission of the form after December 12, 2018 and before the final exam will lead to 25% reduction of the credit for project.
- Submission of the form at the final exam will lead to a further 25% reduction of the credit for the project.
- 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.
- The comprehensive final exam during Finals’ week will cover 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.

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: Face-to-Face

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 (1-7 ABET):**
1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3) An ability to communicate effectively with a range of audiences.
4) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

**Tentative weekly listing of topics (15-week schedule)**

<table>
<thead>
<tr>
<th>Week</th>
<th>Book Chapters</th>
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<tbody>
<tr>
<td>1</td>
<td>Chapter 1</td>
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<tr>
<td>2</td>
<td>Chapter 1/2</td>
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<tr>
<td>3</td>
<td>Chapter 2</td>
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<td>4</td>
<td>Chapter 2/3</td>
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<tr>
<td>5</td>
<td>Chapter 4</td>
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<td>6</td>
<td>Chapter 4/6</td>
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<tr>
<td>7</td>
<td>Chapter 7/8</td>
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<td>8</td>
<td>Chapter 8/9</td>
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<tr>
<td>9</td>
<td>Chapter 9/10 Midterm exam</td>
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<td>10</td>
<td>Chapter 11</td>
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<td>11</td>
<td>Chapter 11/12</td>
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<td>12</td>
<td>Chapter 12</td>
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<td>13</td>
<td>Chapter 12/14</td>
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<td>14</td>
<td>Chapter 14</td>
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<tr>
<td>15</td>
<td>Chapter 14/Project presentation</td>
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ChE 370 Heat and Mass Transfer
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.

<table>
<thead>
<tr>
<th>NAME OF TEAM MEMBER</th>
<th>RATING</th>
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Your signature: ________________________________  Date: ________________________________