Course Syllabus for ECH 6270
Continuum Basis
Fall 2019

Full Course Title: Continuum Basis of Chemical Engineering

Class Meetings: Monday, Wednesday, and Friday
3:00 pm - 3:50 pm in NEB 102

Course Content: Integrated introduction to transport processes in continuous media with emphasis on fluid mechanics and heat and mass transfer.

Prerequisites: Admission to the chemical engineering graduate program or by consent of instructor, dependent upon prior background in undergraduate fluid mechanics and heat and mass transfer, at a level required to obtain an undergraduate degree in Chemical Engineering.

Instructor: Jason E. Butler
Professor of Chemical Engineering
431 Chemical Engineering Bldg. (CHE)
e-mail: butler@che.ufl.edu
Office hours every Tuesday and Thursday,
1:00 pm to 2:00 pm, or by appointment.

Class Website: · will use UF E-Learning to post assignments, solutions, etc.
· access at http://elearning.ufl.edu/

Textbook: *Analysis of Transport Phenomena*
by William M. Deen
Oxford University Press
ISBN: 9780199740284

Exam dates:
● Final Assessment
Monday, December 10th, 10:00 am - 12:00 pm
● Regular Assessments
to be announced

Grading Criteria: 67% Regular Assessments
33% Final Assessment
** All assessments cumulative.

Homework:
● Homework will not be graded.
● Suggested homework problems will be assigned on a periodic basis and solutions will be posted.

Grading Scale: These percentages will earn you a letter grade of *at least*

$\geq 85\%$ - A-

$\geq 70\%$ - B-

The instructor guarantees these grades if you earn the posted percentages. Other marks (B, B+, etc.) will be decided by the instructor based upon a curve and the instructor may decide to *lower* the thresholds for the grades listed, based upon a curve.

More information on UF grading policy may be found at: http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades

Exam Directions:
- Bring your UF ID with you for identification purposes.
- Write your name and UF ID# on top of the exam page.
- Final answers, only, should be written on the exam page.
- Write name on top of every subsequent page which contains your work.
- Write (neatly) on only one side of 8.5x11 inch sheets of paper. Gather all pages together and hand in work unfolded.
- Begin each new problem on a new page
- Clearly identify solutions by boxing all final and intermediate answers.
- Include enough details to justify your solutions.

Grading:
- Award of partial credit on individual questions will be made on a basis specified by the instructor and will be consistently applied.
- Graders will attempt to assess the value of all work accurately; however, you should present solutions that are neat and well thought-out to maximize your grade.
- Meeting the percentages listed above guarantees the specified letter grade at least.
- Instructor may employ a curve only to lower the threshold for attaining the letter grades specified above.
- The percentages for obtaining grades not listed (A, B+, etc.) above will be set by a curve.
- More information on UF grading policies may be found at: http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades

Attendance:

· Students are strongly encouraged to attend all lectures, though attendance is not required.

· Exams/quizzes will be rescheduled only for those students who missed due to an acceptable reason (illness, serious family emergencies, military obligation, religious holidays, and participation in official university activities) as listed in the graduate student catalog (http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance).

· Students arriving late for a quiz/exam will be given only the balance of time remaining to complete their work unless an acceptable reason (see above) is provided.

Students Requiring Accommodations:

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, https://www.dso.ufl.edu/drc) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should

follow this procedure as early as possible in the semester.

Course Evaluation:
Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

University Honesty Policy:
UF students are bound by The Honor Pledge which states, We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: On my honor, I have neither given nor received unauthorized aid in doing this assignment. The Honor Code (https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment:
The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.
If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:
· Your academic advisor or Graduate Program Coordinator
· Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
· Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
· Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use:
All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy:

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: https://registrar.ufl.edu/ferpa.html

Campus Resources:

· U Matter, We Care: Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

· Counseling and Wellness Center: http://www.counseling.ufl.edu/cwc, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

· Sexual Discrimination, Harassment, Assault, or Violence: If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the Office of Title IX Compliance, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

· Sexual Assault Recovery Services (SARS): Student Health Care Center, 392-1161.

· University Police Department at 392-1111 (or 9-1-1 for emergencies), or http://www.police.ufl.edu/.

Academic Resources

· E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml.

· Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. https://www.crc.ufl.edu/.

· Library Support, http://cms.uflib.ufl.edu/ask. Various ways to receive assistance with respect to using the libraries or finding resources.

· Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. https://teachingcenter.ufl.edu/.

· Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. https://writing.ufl.edu/writing-studio/.

· Student Complaints Campus: https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

· On-Line Students Complaints: http://www.distance.ufl.edu/student-complaint-process.

Teaching Objectives for ECH 6270, Fall 2019

This course will provide students with a unified formulation of transport processes, with special emphasis on momentum, heat, and mass transport. The goal is to enable students to read and utilize literature that is relevant to their own work, as well as to give students the tools to create their own models and calculations. By the end of this course, students will be able to apply the differential mass and momentum balances for fluid flow to a wide range of processes including those involving non-Newtonian flow, turbulent flow, and convective heat and mass transfer:

- Identify and setup problems involving individual or combined transport of momentum, energy, and mass, or any other conserved physical quantity;

- Formulate the appropriate governing equations and associated boundary conditions for such problems;

- Simplify the governing equations for such problems, though dimensional analysis, scaling, and other asymptotic techniques.

- Apply advanced mathematical and numerical methods to obtain solutions for such problems.

Students taking this course should have a background in undergraduate fluid mechanics and heat and mass transfer, at a level required to obtain an undergraduate degree in Chemical Engineering. Students should also have a strong background in calculus and differential equations, commensurate with what is required to obtain an undergraduate degree in Chemical Engineering in the United States.

In addition to the required textbook, recommended references include:

- Vectors, Tensors, and the Basic Equations of Fluid Mechanics, by R. Aris. Dover Publications, New York, NY, 1989. This relatively inexpensive book provides a thorough introduction to the nomenclature and mathematics of vectors and tensors, within the context of fluid mechanics.

- Transport Phenomena, Second Edition, by R. B. Bird, W. E. Stewart, and E. N. Lightfoot. Wiley, New York, NY, 2001. This second edition of the classic textbook provides an introduction to the relevant aspects of momentum, heat, and mass transport at the undergraduate level, with selected advanced topics. Studying/reviewing the material presented in this book is recommended for students who feel the need to strengthen their background on transport phenomena.

- Advanced Engineering Mathematics, 9th Edition, by E. Kreyszig. Wiley, New York, NY, 2005. This is only one of many available textbooks on engineering mathematics. This textbook covers topics relevant to the course, such as solution methods for ordinary differential equations, special differential equations and the properties of their solutions (e.g. Bessel equations and functions), and Fourier series and generalized Fourier representation of functions. While this textbook is recommended any textbook with similar coverage should serve students well as reference.