

The Pennsylvania State University
Department of Food Science
FDSC 500B
Fall 2017

Course Description:

Food Science Fundamentals-Food Engineering (1:1:0). Overview of food science with a focus on engineering. Major concepts of food engineering including fluid flow, rheology, heat transfer and mass transfer; approaches to solving real-world food engineering/food processing problems.

Prerequisites: Graduate student in Food Science or Permission of instructor.

Student Based Learning Objectives:

1. Through lectures, the student will comprehend principles of fluid flow and heat transfer as applied to food manufacturing operations. (For an in-depth analysis, consider taking FDSC 405 and/or FDSC 430)
2. Through lectures and simulation programs the student will comprehend principles of thermal processing
3. Through homework, the student will learn numerical problem solving and to select equipment within the food industry.
4. Through paper critique, the student will learn to critically assess primary research data in food engineering.
5. *This is NOT a Ph.D. candidacy examination preparation course!*

Instructor:

Swamy Anantheswaran, 305 R. A. Erickson Food Science Building
Phone: (814) 865-3004 (Office); E-mail: swamy@psu.edu
Office hours: M 1:30–2:30 or by appt.

Text:

Introduction to Food Engineering (5th Ed.)
R. P. Singh & D. R. Heldman, Academic Press.

References:

On reserve at Pattee library

Grading:

Paper critique	20%
Exam I	40% (6:00 pm, Oct 25)
Exam II	40% (Finals week)

Questions based on *Reading Assignments* will be included in each exam

The Penn State Principles:

The Pennsylvania State University is a community dedicated to personal and academic excellence. **The Penn State Principles** were developed to embody the values that we hope our students, faculty, staff, administration, and alumni possess. At the same time, the University is strongly committed to freedom of expression. Consequently, these Principles do not constitute University policy and are not intended to interfere in any way with an individual's academic or personal freedoms. We hope, however, that individuals will voluntarily endorse these common principles, thereby contributing to the traditions and scholarly heritage left by those who preceded them, and will thus leave Penn State a better place for those who follow (<http://www.psu.edu/ur/principles.html>)

Academic Integrity:

Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity is a basic guiding principle for all academic activity at The Pennsylvania State University, and all members of the University community are expected to act in accordance with this principle. Consistent with this expectation, students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts. Academic integrity includes a commitment not to engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty violate the fundamental ethical principles of the University community and compromise the worth of work completed by others (see [Faculty Senate Policy 49-20](#) and [G-9 Procedures](#))
<http://studentaffairs.psu.edu/conduct/codeofconduct>)

Academic Integrity Guidelines for the College of Agricultural Sciences can be found at <http://agsci.psu.edu/students/resources/academic-integrity>

A lack of knowledge or understanding of the University's Academic Integrity policy and the types of actions it prohibits and/or requires does not excuse one from complying with the policy. Penn State and the College of Agricultural Sciences take violations of academic integrity very seriously. Faculty, alumni, staff and fellow students expect each student to uphold the University's standards of academic integrity both in and outside of the classroom.

Nondiscrimination Statement:

The University is committed to equal access to programs, facilities, admission and employment for all persons. It is the policy of the University to maintain an environment free of harassment and free of discrimination against any person because of age, race, color, ancestry, national origin, religion, creed, service in the uniformed services (as defined in state and federal law), veteran status, sex, sexual orientation, marital or family status, pregnancy, pregnancy-related conditions, physical or mental disability, gender, perceived gender, gender identity, genetic information or political ideas. Discriminatory conduct and harassment, as well as sexual misconduct and relationship violence, violates the dignity of individuals, impedes the realization of the University's educational mission, and will not be tolerated. Direct all inquiries regarding the nondiscrimination policy to Dr. Kenneth Lehrman III, Vice Provost for Affirmative Action, Affirmative Action Office, The Pennsylvania State University, 328 Boucke Building, University Park, PA 16802-5901, Email: kfl2@psu.edu, Tel (814) 863-0471.

Disability:

Penn State welcomes students with disabilities into the University's educational programs. If you have a disability-related need for reasonable academic adjustments in this course, contact

the Office for Disability Services (ODS) at 814-863-1807 (V/TTY). For further information regarding ODS, please visit the Office for Disability Services Web site at <http://equity.psu.edu/ods/>.

In order to receive consideration for course accommodations, you must contact ODS and provide documentation (see the documentation guidelines at <http://equity.psu.edu/ods/guidelines/documentation-guidelines>). If the documentation supports the need for academic adjustments, ODS will provide a letter identifying appropriate academic adjustments. Please share this letter and discuss the adjustments with your instructor as early in the course as possible. You must contact ODS and request academic adjustment letters at the beginning of each semester.

Mental Health Services:

Mental health services are available to help you maintain your academic success. [Visit the student website](#) today to learn more or to speak with a mental health advocate who can help you address concerns including anxiety, depression, relationship difficulties, and stress. If you or someone you know is experiencing a crisis situation, please call your local emergency service.

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Course Outline

<u>Date</u>	<u>Topic</u>	<u>Reading assignment</u>
Aug. 23	Quiz 0, Teaching philosophy, Syllabus Introduction, Food preservation/Unit operations Mass balance	Ch. 1.13 thru 1.14
Aug 30	Mass and energy balance	Ch. 1.3 thru 1.12 Ch. 1.17 thru 1.22
Sept. 6	Rheology, rotational viscometers	Ch. 2.8
Sept. 13	Pipe flow, friction factor	Ch. 2.3
Sept. 20	Bernouilli equation Pumping of fluids	Ch. 2.4-2.5 Ch. 2.1
Sept. 27	Conduction heat transfer	Ch. 4.2, 4.3, Ch. 4.4.1 thru 4.4.3
Oct. 4	Convection heat transfer	Ch. 4.4.-4.4.5
Oct. 11	Heat exchangers	Ch. 4.4.6-4.4.7
Oct. 18	Modeling (S. Lele)	
Oct. 25	EXAM I (6:00-8:00 pm)(Mass & energy balance, Rheology, fluid flow)	
Nov. 1	Thermobacteriology	Ch. 5.1-5.4
Nov. 8	Thermal processing calculations Aseptic processing Assign paper for critique	Ch. 5.5-5.6 Ch. 5.6.3
Nov. 15	Irradiation (Dr. Athawale)	
Nov. 22	Thanksgiving - No Class	
Nov. 29	COMSOL simulation program (S. Lele)	
Dec. 6	Paper critique Course overview	
Finals week	EXAM II	
	(6:50 – 8:40 pm, Dec 13, 69 Willard)	