

**COURSE INFORMATION:**

**FOOD PROCESSING TECHNOLOGY 11:400:301 (4 credits)**

Offered every fall semester. Core course required for all Food Science students

**CONTACT INFORMATION:**

Instructor(s): Dr. Paul Takhistov

Office Location: Food Science Building Room # 415

Office Hours: By appointment

Phone: 848 932 5478

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**COURSE MATERIALS:**

- **Food Processing Technology: Principles and Practice, by P. J. Fellows (Second Edition)** that includes some materials covered in this course. If the student chooses to use a prior edition, it is the student's responsibility to overcome any difficulties associated with using a book other than the one prescribed for this course such as chapter numbering, problems, or material.
- Additional materials will be provided in form of class notes, web sources and excerpts from professional publications. They will be available through the class web.

**COURSE DESCRIPTION:**

Food processing is the set of methods and techniques used to transform raw ingredients into food for consumption by humans. In order to meet the sensory quality, safety, nutrition, health, economy and novelty demanded of food products by consumers, it is necessary to improve food processing operations. Food processing has moved on from being a craft to a modern technology. This course covers principles of operation and design of industrial equipment, used in the processing, storage and packaging of foods. Food quality and food safety aspects, related to food processing equipment, are emphasized. Food processing equipment is classified and described according to the basic unit operations, including mechanical transport, mechanical processing and separations, heat transfer operations, evaporation, dehydration, thermal processing, etc.

The descriptive information provides students with background on the process and the impact of the process on food product quality. Examples utilizing different food commodities are incorporated to ensure that the student gains an understanding of the relationship between commodities and processes.

**LEARNING OBJECTIVES:**

Upon completion of the course students should be able to understand general processing flow for various food products, physical principles of operation for various types of equipment and impact of the processing on the physical, chemical and sensory properties of the food products. Additionally, they

learn on how to select the food processing method most suitable for specific application. The students will complete laboratory work cooperatively in small groups, and will present a final project to the entire class.

## **ASSIGNMENTS/RESPONSIBILITIES & ASSESSMENT:**

### **GRADING AND EVALUATION**

Grade Components:

- Laboratory works (40%)
- Course project (30%)
- Final Exam (30%)

Letter Grade:

A= 90-100% B=80-89% C=70-79% D=60-69% F<60%

### **Cheating/Academic Dishonesty**

All Academic Integrity issues will be considered accordingly to the Academic Integrity Policy

<http://academicintegrity.rutgers.edu/integrity.shtml>

## **OTHER INFORMATION:**

Students will be responsible for adhering to the academic integrity policies found at <http://academicintegrity.rutgers.edu>.

It is important that students have the tools to succeed in this course. Please see the instructor \*as soon as possible\* with any difficulties or questions regarding the course materials. In addition, the Office of Student Affairs is available at <http://studentaffairs.rutgers.edu> for any other needs or concerns.

## **COURSE SCHEDULE:**

### **GENERAL PRINCIPLES OF MANUFACTURING PROCESS**

- Manufacturing processes: batch, Semi-batch and continuous
- Mass-balance calculations

### **NON-CONVERSION OPERATIONS**

- Food raw materials: physical, functional and geometric properties
- Cleaning of raw materials: cleaning methods and contaminations
- Sorting and grading of foods: weight, size, shape, buoyancy, photometry sorting

### **FOOD CONVERSION OPERATIONS**

- Size reduction and screening of solids: equipment, modes of operation. Disintegration of materials: slicing, dicing, shredding, pulping
- Mixing and emulsification
- Filtration and membrane separation: principles, design features and general applications
- Centrifugation: principles and applications
- Solid-liquid extraction and expression
- Heat processing (Part 1): modes of heat transfer,. Methods of applying heat to food.

### **MIDTERM EXAMINATION**

### **PRESERVATION OPERATIONS**

- Heat processing (Part 2): microbiological considerations. Methods of heat sterilization in containers. Pasteurization by heat processing
- Non-thermal processing and Hurdle technologies
- Evaporation: evaporation principles and equipment

- Dehydration: water in food, drying (contact, radiation, sublimation)
- Freezing: freezing/thawing
- Food storage: storage conditions and packaging (materials, filling, closing and sealing equipment).

### **LABORATORY EXERCISES (5 TOTAL)**

Laboratory sessions are intended to incorporate actual engineering data and situations into the class taught materials and provide basic practical knowledge of food processing operations (cleaning, sorting, size reduction, basic thermal and non-thermal processing etc.). Additionally, some laboratory sessions, ( approximately two per course), will consist of field trips to local food processing plants in which tours will be provided and, in some cases, data will be collected to provide input for classroom/homework problems.

### **COURSE PROJECT**

Course project is dedicated to comprehensive study of the technological processing of the foodstuff and interest for the student that will contribute to the in-depth knowledge in the subject. Students will choose their own topic i.e. food product that must be appropriate for study instructor will provide the feedback to promote success. In order to complete the project students will prepare two 15 min presentations: 1) general processing consequence for the chosen food product, description of raw materials and general considerations (nutrition value, safety etc.) for the specific product; 2) in-depth description of the design, operation principle and cost/energy requirements for one operational unit from the processing of the chosen product. Additionally, written report is required.

### **FINAL EXAMINATION**

### **FIELD TRIP (2)**

## **ACADEMIC INTEGRITY**

The University's policy on Academic Integrity is available at <http://academicintegrity.rutgers.edu/academicintegrity-policy>

The principles of academic integrity require that a student:

- properly acknowledge and cite all use of the ideas, results, or words of others.
- properly acknowledge all contributors to a given piece of work.
- make sure that all work submitted as his or her own in a course or other academic activity is produced without the aid of impermissible materials or impermissible collaboration.
- obtain all data or results by ethical means and report them accurately without suppressing any results inconsistent with his or her interpretation or conclusions.
- treat all other students in an ethical manner, respecting their integrity and right to pursue their educational goals without interference. This requires that a student neither facilitate academic dishonesty by others nor obstruct their academic progress.
- uphold the canons of the ethical or professional code of the profession for which he or she is preparing.

Adherence to these principles is necessary in order to ensure that

- everyone is given proper credit for his or her ideas, words, results, and other scholarly accomplishments.
- all student work is fairly evaluated and no student has an inappropriate advantage over others.
- the academic and ethical development of all students is fostered.
- the reputation of the University for integrity in its teaching, research, and scholarship is maintained and enhanced.

Failure to uphold these principles of academic integrity threatens both the reputation of the University and the value of the degrees awarded to its students. Every member of the University community therefore bears a responsibility for ensuring that the highest standards of academic integrity are upheld.

## **STUDENT WELLNESS SERVICES**

Just In Case Web App <http://codu.co/cee05e>

Access helpful mental health information and resources for yourself or a friend in a mental health crisis on your smartphone or tablet and easily contact CAPS or RUPD.

**Counseling, ADAP & Psychiatric Services (CAPS).** (848) 932-7884 / 17 Senior Street, New Brunswick, NJ 08901/[www.rhscaps.rutgers.edu/](http://www.rhscaps.rutgers.edu/).

CAPS is a University mental health support service that includes counseling, alcohol and other drug assistance, and psychiatric services staffed by a team of professional within Rutgers Health services to support students' efforts to succeed at Rutgers University. CAPS offers a variety of services that include: individual therapy, group therapy and workshops, crisis intervention, referral to specialists in the community and consultation and collaboration with campus partners.

**Violence Prevention & Victim Assistance (VPVA)**

(848) 932-1181 / 3 Bartlett Street, New Brunswick, NJ 08901 / [www.vpva.rutgers.edu/](http://www.vpva.rutgers.edu/)

The Office for Violence Prevention and Victim Assistance provides confidential crisis intervention, counseling and advocacy for victims of sexual and relationship violence and stalking to students, staff and faculty. To reach staff during office hours when the university is open or to reach an advocate after hours, call 848-932- 1181.

**Disability Services**

(848) 445-6800 / Lucy Stone Hall, Suite A145, Livingston Campus, 54 Joyce Kilmer Avenue, Piscataway, NJ 08854 / <https://ods.rutgers.edu/>. Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: <https://ods.rutgers.edu/students/documentation-guidelines>. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS web site at: <https://ods.rutgers.edu/students/registration-form>.

**Scarlet Listeners**

(732) 247-5555 / <http://www.scarletlisteners.com/>. Free and confidential peer counseling and referral hotline, providing a comforting and supportive safe space.