Course Outline for BSYSE 585

Food Packaging

Instructor:
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Course description:
Primary food packaging materials and package manufacturing/fabrication, engineering properties of packaging materials, food quality deteriorative mechanisms, shelf-life estimation, active and intelligent packaging, interaction between food packaging and the environment, safety and legislative aspect of packaging, and the package requirement of food products

Course objectives:
The objectives of this course are to help students:

• Understand the benefits and properties of packaging materials
• Gain knowledge of factors that influence shelf life of food products
• Learn about the packaging requirements of food products

Expected outcomes:
Upon the successfully completion of this course

• The student should be able to determine mechanical, thermal and gas barrier properties of selected packaging materials.
• The student should be able to identify potential microbiological, chemical and physical degradation reactions for different class of food products.
• The student should be able to determine shelf life of food products under normal distribution using appropriate accelerated shelf life testing methods.
• The student will have an aptitude to design an appropriate package for a given food product.
• The student should be able to recognize potential safety, environmental and economic issues related to packaging materials intended for food.

Contact hours:
This is a three-credit course. The class includes three contact hours per week for 15 weeks. Schedule of classes: Tu 1.10-2.25; Th 1.10-2.00; LJ Smith Hall #264

Materials and Resources:
Food Packaging by Gordon L. Richardson
Food Packaging Science and Technology by D. S. Lee, K. L. Yam and L. Piergiovanni
Electronic databases: Journals (ISI Web of Science)
WSU libraries

Grade composition:
Assignments 35%
Laboratory 30%
Quizzes 10%
FPA Student Design Competition 10%
Term project (report + presentation) 15%
POLICIES
Reasonable accommodations are available for students who have a documented disability. Please notify the instructor(s) during the first week of class. Late notification may cause the requested accommodations to be unavailable. All accommodations must be approved through Disability Resource Center in Cleveland 57, 335-1566.

Plagiarism and cheating in exams and home work are unprofessional conduct and will not be tolerated. Instances of plagiarism and cheating will be treated as specified in the Office of Student Conduct Policy. Students are encouraged to review WSU’s policy on plagiarism and cheating by viewing the following web site: http://www.wsulibs.wsu.edu/plagiarism/main.html.

Course Outline and Lecture Week

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<tr>
<th>Week</th>
<th>Topic</th>
<th>Reading</th>
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<tr>
<td>1</td>
<td>Introduction to Food Packaging Historical: Definition, Function of packaging, Package environments</td>
<td>Chapter 1</td>
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<td>2</td>
<td>Primary packaging materials, Plastics, Paper, Metal &amp; glass</td>
<td>Chapters 2, 6, 7, 9</td>
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<td>3-4</td>
<td>Manufacturing/fabrication of packages</td>
<td>Chapters 2-9</td>
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<td>5-7</td>
<td>Engineering properties of packaging materials</td>
<td>Chapters 3-4</td>
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<td>8-9</td>
<td>Food quality deteriorate mechanisms: Introduction, Deteriorative reactions in foods Enzymatic, Chemical, Physical, Biological, Rates of deteriorative reactions, Extrinsic factors controlling the rates of deteriorative reactions</td>
<td>Chapter 10</td>
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<td>10-11</td>
<td>Design of Shelf life: Definitions, Factors controlling shelf life, Reaction kinetic approach for shelf life design, Accelerated shelf life testing, Shelf life devices</td>
<td>Chapter 12</td>
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<td>12</td>
<td>Active and intelligent packaging</td>
<td>Notes will be provided</td>
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<td>Oxygen scavenging, antimicrobial, gas emitting/absorbing, moisture control, Freshness indicator, RFID, Tamper-evidence, traceability, bioterrorism</td>
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<td>13</td>
<td>Food-packaging Interaction</td>
<td>Notes will be provided</td>
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<td>Migration of packaging materials into foods, Mathematical description of component migration, Loss of aroma/flavor from food to the packaging</td>
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<td>14</td>
<td>Safety and Legislative Aspects of Packaging:</td>
<td>Chapter 20</td>
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<td>Food safety, Regulatory considerations: Plastic packaging, Metal packaging, Paper packaging, Glass packaging</td>
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<tr>
<td>15</td>
<td>Packaging requirements for different food systems</td>
<td>Chapters 13-19</td>
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Laboratories:
1. Water vapor transmission rate of polymeric films
2. Oxygen transmission rate of polymeric films
3. Thermal properties of polymeric material
4. Mechanical properties of polymeric materials
5. Dielectric properties of polymeric films
6. Frozen foods subjected to temperature fluctuations and importance of packaging
7. Fabricating films using solution casting method
8. Oxygen ingress in pouches
9. Film/sheet extrusion

Suggested term project topics:
1. Develop a computer program to estimate useful remaining shelf life of a product based on reaction kinetics (quality) and time-temperature-integrator concept
2. Develop an expert system for the selection of polymer base packaging using produce respiration and gas (CO₂ and O₂) permeability of films database
3. Modeling diffusion of gases through nanocomposite polymeric structures
4. Modeling migration of additives (i.e. antioxidants, antimicrobials)/nano particles from package into food
5. Design of intelligent and active packages
6. Biobased or biodegradable packaging
7. Life cycle analysis

Flexible Packaging Design Challenge
1. Flexible Packaging Association
2. TAPPI PLACE

Assignments
1. Poor packaging and good packaging
2. Properties of different polymers
3. Packaging related patents
4. Waste management
5. Effect of temperature and relative humidity on gas barrier properties
6. Packaging requirements of food products
7. Regulatory considerations of packaging in US, Canada, Europe, Japan and Australia