

Food Physics and Modeling

12:50-4:00 PM, Wed, Nov. 11

Why this workshop

While model-based understanding of food physics and its applications to computer-aided manufacturing is expanding rapidly, educational programs to prepare a future workforce well-versed in modeling have roadblocks.

This workshop should provide a quantum leap in resources for anyone interested in modeling (from beginning graduate students all the way to experienced educators and for industry personnel), by providing comprehensive physical frameworks, instructional resources and approaches, and a walkthrough of the modeling process. I will showcase pedagogically rich, modularized, active learning-enabled, multistage content that can effectively accommodate a wide range of learner backgrounds and interests.

For the first time, AI-based surrogate modeling that dramatically reduces computation time and enable real-time use of physics-based models for applications like digital twins, 3D-printing, and process control, will be included.

There will be two parts to the presentation: 1) for the educators, and 2) for the learners.

For the educators, I want to share how, using the modules, existing courses can be greatly enhanced, or new courses can be developed with minimal effort using a hybrid format, on food physics and modeling.

For the learners, starting from the big picture of frameworks -- the simplest to the most complex -- we will focus on the framework that treats food as porous media with multiphase/multicomponent transport due to diffusion, capillary pressure, swelling pressure, and gas pressure, with shrinkage/expansion driven by moisture change and internal pressure. Mechanistic frameworks for food quality and food safety will complement the framework.

Learning outcomes

At the end of the workshop, attendees will be able to:

1. Apply the modular framework of food physics and/or modeling to your existing or planned course within any engineering curriculum, not just food engineering [for the educators].
2. Compare and contrast between simpler and more comprehensive physics frameworks for understanding and optimization of complex food processes [for the learners and the educators].
3. Formulate a computational model of a chosen food process with the eventual goal of speeding up the design cycle [for the learners and the educators].

Target audience

1. Beginner and advanced learner (industry and academia) in physics and modeling of food processes
2. Any food engineering teaching faculty wishing to supplement with food physics modules and modeling
3. Anyone interested in modeling transport processes in biomaterials

Prerequisites

Undergraduate courses in heat and mass transfer, basic engineering mechanics; no prior experience in modeling necessary

Workshop active-learning format

For learner engagement, guided worksheets will be provided to the learners so they can work in groups and benefit from each other. The three activities will include: 1) the big picture of how to enhance teaching and learning of food physics and modeling, 2) comparing frameworks in food physics, and 3) applying a framework to a learner-chosen process (primarily problem formulation, turning a real-world problem into its mathematical model, which is generally the hardest part). This is not a COMSOL learning, or numerical methods workshop.

Instructor background

Ashim Datta, Professor, Cornell University, USA

Costs

See website.

Questions

Email Professor Ashim Datta at akd1@cornell.edu
