

**Probabilistic Engineering Tools for  
Product, Process, Storage, and Packaging Design**

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This 10 h hands-on workshop focuses on the application of probabilistic principles to the design of formulations, processes, packaging, and storage conditions for foods. It is tailored for food engineers, food technologists, food R&D professionals, and food science and food engineering students. The most important skill to master is how to include variability and uncertainty in food engineering designs using tools such as Monte Carlo simulations. This workshop begins with a two-hour introduction to probabilistic design, brief descriptions of diverse food industry applications, and full demonstration of an application using Excel.

The introduction will be followed by hands-on applications solved using Excel which will require that all students bring a laptop, preferably a PC which will be one used by the Course Instructor. These exercises will show how to meet government safety and company quality levels with the required safety or desired quality confidence level, respectively. As an example of the former, a thermal pasteurization process will be designed to meet 5 decimal reduction in pathogens with 95% confidence. An example of the latter will be the selection of a packaging film for breakfast cereal providing the moisture barrier required to ensure a three month shelf life with 80% confidence. Another application will be the cost analysis when replacing a product fill units with higher product delivered amount precision. These and other practical activities will emphasize real-world scenarios and allow attendees to gain foundational skills on how to apply probabilistic tools in the food processing industry. For those interested in gaining more expertise, can work on publishable application cases such as the ones that will be included in the course material for this Workshop. Finally, you will receive a video recording for all calculations and pdf copies of PowerPoint presentations used in the course.

## FOOD MaCKiE Workshop

### Probabilistic Engineering Product and Process Design

**INSTRUCTOR:** J. Antonio Torres, Distinguished International Professor

**ASSISTANT:** Gerardo Fernandez Villanueva, Doctoral candidate  
Tecnologico de Monterrey, MEXICO

**INSTRUCTION HOURS: 10**

**HELP SESSION HOURS: 4**

<b>Wednesday Sep 3, 2025, Room: GERENCE 2</b>		
08:00 – 10:00	<b>WS Part 1</b>	Introduction and Probabilistic Estimation Principles Application 1: Instructor-solved and output analysis (Excel template and solution provided before lecture)
10:00 – 11:00	<b>WS Part 2</b>	Application 2: Instructor-guided solution and output analysis (Excel template and solution provided before and after lecture, respectively)
10:45 – 11:00	Stretch-your-legs + Coffee/Tea/Water Break in Workshop Room	
11:00 – 12:00	<b>WS Part 3</b>	Review session Application 3: Group Assignment due before Session 4 Support help sessions available
Small Groups in Hotel Cafeteria		
14:30 – 16:30	<b>Group 1</b>	Application 4: Instructor-guided solution and output analysis (Excel template and solution provided before and after lecture, respectively)
14:30 – 16:30	<b>Group 2</b>	Application 4: Instructor-guided solution and output analysis (Excel template and solution provided before and after lecture, respectively)
16:30 – 18:30	<b>Group 1</b>	Application 5: Instructor-guided solution and output analysis (Excel template and solution provided before and after lecture, respectively)
16:30 – 18:30	<b>Group 2</b>	Application 5: Instructor-guided solution and output analysis (Excel template and solution provided before and after lecture, respectively)
<b>Thursday Sep 4, 2025, Room: Denizkzi 1</b>		
20:00 – 21:00	<b>Help Session 1</b>	Workshop Group Assignment Assistance (Prior reservation required)
21:00 – 22:00	<b>Help Session 2</b>	Workshop Group Assignment Assistance (Prior reservation required)
<b>Friday Sep 5, 2025, Room: Denizkzi 1</b>		
08:00 – 08:30	<b>WS Part 4</b>	Review of assignment solution
08:30 – 10:00	<b>WS Part 5</b>	<b>ASSESSMENT:</b> Excel-based open notes test