SDSU College of Engineering Mechanical Engineering

Mechanical Engineering Seminar Series

December 2nd, 2025, 11:00AM

Dean's Conference Room, E-203E

Title: Toward Human-Relevant Radiobiology with 3D Bioprinting

Dr. Mauro Tambasco

San Diego State University

Abstract: Radiation oncology needs human-relevant models that capture tumor–stroma–immune crosstalk and support modern dose paradigms like spatially fractionated radiotherapy (SFRT/GRID). With FDA and NIH momentum behind New Approach Methodologies (NAMs), 3D bioprinting offers a regulatory-aligned path beyond routine animal testing. I present a bioprinted tumor platform that combines CAD-defined architectures, tunable hydrogels, and film/Monte Carlo dosimetry to link radiation peak-to-valley dose metrics with biological endpoints (DNA damage, clonogenic survival, immune signaling). In an alginate–gelatin model, irradiation left the storage modulus (G′) unchanged while decreasing the loss modulus (G″) leading to a decreased tan(δ), indicating more elastic, less dissipative behavior with maintained viability. Finally, I outline our ultimate goal: patient-specific tumor–immune models to evaluate and optimize radiotherapy–immunotherapy combinations, showing how bioprinting can accelerate radiobiology and guide treatment.

Brief Bio: Dr. Mauro Tambasco is an Associate Professor and Director of Medical Physics at San Diego State University, and he is also a clinically certified radiation oncology physicist. His research history is wide-ranging, spanning fundamental areas like computational hemodynamics and radiation dosimetry, all the way to digital pathology and radiobiology. However, his current research is focused on the ultimate goal of personalized cancer care: developing 3D bioprinted tumor models to precisely investigate and optimize the impact of radiotherapy, both alone and in combination with other novel cancer therapies for solid tumors. This approach holds the promise of improving treatment outcomes while reducing side effects for patients with solid tumors.