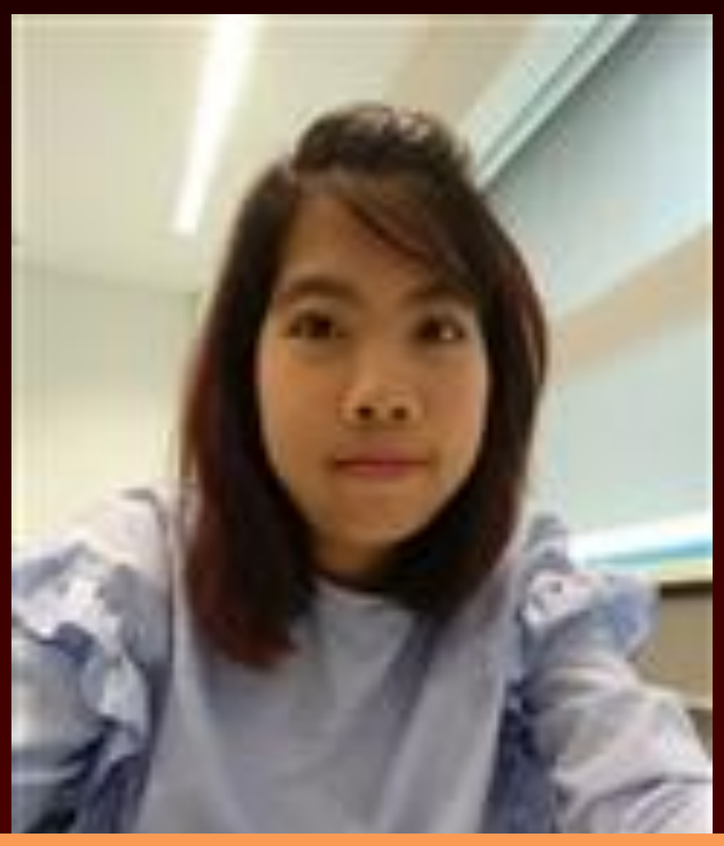
Biomedical Engineering Seminar Series

1st Semester, Academic Year 2017

Date: October 24, 2017
Time: 11.00 AM - 12.00 PM
Room 6373, 3rd level, Building 3,
Department of Biomedical Engineering,
Faculty of Engineering, Mahidol University



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"From Intricate to Integrated: Biofabrication of Articulating Joints"

Articulating joints owe their function to the specialized architecture and the complex interplay between multiple tissues including cartilage, bone and synovium. Especially the cartilage component has limited self-healing capacity and damage often leads to the onset of osteoarthritis, eventually resulting in failure of the joint as an organ. Although in its infancy, biofabrication has emerged as a promising technology to reproduce the intricate organization of the joint, thus enabling the introduction of novel surgical treatments, regenerative therapies, and new sets of tools to enhance our understanding of joint physiology and pathology. Herein, we address the current challenges to recapitulate the complexity of articulating joints and how biofabrication could overcome them. The combination of multiple materials, biological cues and cells in a layer-by-layer fashion, can assist in reproducing both the zonal organization of cartilage and the gradual transition from resilient cartilage toward the subchondral bone in biofabricated osteochondral grafts. In this way, optimal integration of engineered constructs with the natural surrounding tissues can be obtained. Mechanical characteristics, including the smoothness and low friction that are hallmarks of the articular surface, can be tuned with multi-head or hybrid printers by controlling the spatial patterning of printed structures. Moreover, biofabrication can use digital medical images as blueprints for printing patient-specific implants. Finally, the current rapid advances in biofabrication hold significant potential for developing joint-on-a-chip models for personalized medicine and drug testing or even for the creation of implants that may be used to treat larger parts of the articulating joint.

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