

Summer Programme: Bioprinting

MPxxxx: Bioprinting: Principles and Applications

No of Academic Units: 3

Pre-requisites: Nil

Learning Objectives

This course aims to provide a general understanding of Bioprinting. Bioprinting is a multidisciplinary technology that merges the fields of cell culture, biomaterials science and mechanical engineering. This is a new manufacturing paradigm that has huge potential impact in the development of advanced biological tissue models and medical therapeutic products.

The course starts with introduction to tissue engineering and scaffolds for tissue engineering. Various bioprinting processes will be explained and the materials for bioprinting will be introduced. The students will also learn about cell sources and 3D cell culture techniques. Other topics include computational design and simulation in bioprinting. The students will attend a workshop on bioprinting to be exposed to the operation of a bioprinter. There will be also a group discussion session for the students to critically analyze the research field of bioprinting from their point of view.

Topical Course Outline

Lesson	Description
1	Introduction to Tissue Engineering
2	Scaffolds for Tissue Engineering
3	Materials for Bioprinting
4	Cell Sources for Bioprinting
5	Bioprinting Techniques
6	3D Cell Culture Techniques
7	Computational Design and Simulation in Bioprinting

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8	Group work discussion and presentation session: Bioprinting: Fantasy or impending reality?
9	Workshop exposure to bioprinter

Learning Outcome

Upon successful completion of the course, students will be able to:

- Gain overall understanding of the multidisciplinary nature of bioprinting and its potential.
- Have fundamental knowledge of the biological building blocks of bioprinting such as cell and biomaterials.
- Learn various fabrication techniques of scaffolds via additive manufacturing; understand the strengths and shortcomings of each technique.
- Understand the processes of various bioprinting techniques
- Understand cell processing and 3D cell culture techniques
- Gain exposure to computational design and simulation in bioprinting
- Gain exposure to bioprinting process through a workshop
- Critically analyze the overall research potential of bioprinting

Assessment

- Class attendance and participation: 20%
- Written assessment: 40%
- Group work discussion and presentation: 40%

Participation and Attendance

- For the purpose of participation assessment, any unexcused lateness beyond 20 minutes of class start time will be marked as an absence.

Textbooks/References

- Bioprinting: Principle and Applications. Chua CK and Yeong WY, World Scientific Publishing, Jan 2015.