Subject Description Form

Subject Code	BME5120
Subject Title	Digital Design and Manufacturing for Biomedical Engineering
Credit Value	3
Level	5
Responsible staff & Department/School	Dr Annie WANG (BME)
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	This subject provides students with a broad understanding of the theories and practices required to enable successful implementation of digital technologies in biomedical research and industry. ▪ To introduce the key concepts, technologies and fundamental knowledge of digital design and manufacturing in industrial and biological applications. ▪ To enable the students to design and manufacture medical products for customized solutions to healthcare.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Equip with the knowledge in digital design and manufacturing technologies. b. Understand the scope and limitations of the applications of digital design and manufacturing technologies. c. Enable to use computer-aided design and manufacturing techniques. d. Develop industrial and entrepreneurial experience and skills for fresh thinking and customization of healthcare products.
Contribution to Programme Outcomes (Refer to Part I Section 2)	Programme Learning Outcome (a): Acquire and apply advanced levels of knowledge and skills in BME professions (Teach, Practice and Measure) Program Learning Outcome (b): Apply critical analysis and problem-solving skills for evidence-based practice in BME discipline. (Practice) Programme Learning Outcome (c): Demonstrate a higher level of professional competence to cope with the rapid changes in practice (Teach and Practice)
Subject Synopsis/ Indicative Syllabus	▪ **Introduction of concepts, principles, technologies and basic knowledge:** ✓ Computer Aided Design (CAD): Geometric Modelling; Knowledge Based Engineering; Platforming Technology; Reverse Engineering; and Motion Simulation. ✓ Computer Aided Manufacturing (CAM): Group Technology and Cellular Manufacturing; Computer Aided Fixture Design; Computer Aided Manufacturing; Simulation of Manufacturing Processes; and Computer Aided Design of Tools, Dies and Molds (TDM) ✓ Digital Manufacturing; Additive Manufacturing; and Design for Sustainability ✓ Application in healthcare industry

- **Bio-printing and applications**

- **Practical design and manufacture skills in design and customization for healthcare products**
  - ✓ Analysis of requirements and needs
  - ✓ Finite element methods (FEM)
  - ✓ Determination of materials and 3D printing technologies
  - ✓ Biomechanical evaluation of effectiveness of manufactured products

Teaching/Learning Methodology

Teaching/learning methodology	Intended subject learning outcomes			
	a	b	c	d
1. Lectures	√	√	√	
2. Case Study	√	√		
3. Practice	√	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed					
		a	b	c	d		
1. Assignment	10%	√	√	√			
2. Case Study Presentation/Report	20%	√	√				
3. Practice	30%	√	√	√	√		
4. Final quiz	40%	√	√	√			
Total	100 %						

Assignment will be used to test the ability of the students to understand the fundamental knowledge and technologies in the digital design and manufacturing field. The students will be required to review on the cutting-edge development of the digital design and manufacturing technologies and the applications in case study to benefit their recognition.

In order to strengthen students' understanding of fundamental knowledge and develop practical skills, practice will be arranged to design and manufacture customized healthcare products.

Final quiz will comprehensively test the understanding of knowledge, technologies, limitations and the applications in the field of digital design and manufacturing

Student Study Effort Expected	Class contact:	
	▪ Lectures	27 Hrs.
	▪ Case Study	3 Hrs.
	▪ Practice	9 Hrs.
	Other student study effort:	
	▪ Self-study	53 Hrs.
	▪ Assignments and paper presentation	50 Hrs.
	Total student study effort	142 Hrs.
Reading List and References	<u>Textbooks</u> ▪ Srivastava, M., Rathee, S., Maheshwari, S., & Kundra, T. K. (2019). Additive manufacturing: fundamentals and advancements. CRC Press.	
Date of Last Major Revision	3 January 2022	
Date of Last Minor Revision	24 August 2022	