

The Hong Kong Polytechnic University

Subject Description Form

Please read the notes at the end of the table carefully before completing the form.

Subject Code	BME5120
Subject Title	Digital Design and Manufacturing for Biomedical Engineering
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	<p>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.</p> <ul style="list-style-type: none"> ▪ 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 <i>(Note 1)</i>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> 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.

<p>Subject Synopsis/ Indicative Syllabus (Note 2)</p>	<ul style="list-style-type: none"> ▪ Introduction of concepts, principles, technologies and basic knowledge: <ul style="list-style-type: none"> ✓ 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 <ul style="list-style-type: none"> ✓ Analysis of requirements and needs ✓ Finite element methods (FEM) ✓ Determination of materials and 3D printing technologies ✓ Biomechanical evaluation of effectiveness of manufactured products 																								
<p>Teaching/Learning Methodology (Note 3)</p>	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2"></th> <th colspan="4">Intended subject learning outcomes</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> </tr> </thead> <tbody> <tr> <td>1. Lecture</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> </tr> <tr> <td>2. Case Study</td> <td>✓</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>3. Practice</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> </tbody> </table>		Intended subject learning outcomes				a	b	c	d	1. Lecture	✓	✓	✓		2. Case Study	✓	✓			3. Practice	✓	✓	✓	✓
	Intended subject learning outcomes																								
	a	b	c	d																					
1. Lecture	✓	✓	✓																						
2. Case Study	✓	✓																							
3. Practice	✓	✓	✓	✓																					

Assessment Methods in Alignment with Intended Learning Outcomes

(Note 4)

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 %				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

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:	
▪ Lecture	27 Hrs.
▪ Case Study	3 Hrs.
▪ Practice	9 Hrs.
Other student study effort:	
▪ Self-study	38 Hrs.
▪ Assignment and paper preparation	40 Hrs.
Total student study effort	117 Hrs.

<p>Reading List and References</p>	<p><u>Textbooks</u></p> <ul style="list-style-type: none"> ▪ <i>The 3D Printing Handbook: Technologies, design and applications</i> Redwood, B., Schöffner, F., & Garret, B. (2017). 3D Hubs. ▪ <i>Computer Aided Design and Manufacturing</i> Zhuming Bi, and Xiaoqin Wang (2020). John Wiley & Sons, 2020
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Note 1: Intended Learning Outcomes

Intended learning outcomes should state what students should be able to do or attain upon subject completion. Subject outcomes are expected to contribute to the attainment of the overall programme outcomes.

Note 2: Subject Synopsis/Indicative Syllabus

The syllabus should adequately address the intended learning outcomes. At the same time, overcrowding of the syllabus should be avoided.

Note 3: Teaching/Learning Methodology

This section should include a brief description of the teaching and learning methods to be employed to facilitate learning, and a justification of how the methods are aligned with the intended learning outcomes of the subject.

Note 4: Assessment Method

This section should include the assessment method(s) to be used and its relative weighting, and indicate which of the subject intended learning outcomes that each method is intended to assess. It should also provide a brief explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes.

(Form AR 140) 8.2020