

**City University of Hong Kong  
Course Syllabus**

**offered by School of Creative Media  
with effect from Semester A 2022/23**

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**Part I Course Overview**

<b>Course Title:</b>	<b>Introduction to Digital Processes: From Creative Computation to Fabrication</b>
<b>Course Code:</b>	<b>SM5345</b>
<b>Course Duration:</b>	<b>One semester</b>
<b>Credit Units:</b>	<b>3</b>
<b>Level:</b>	<b>P5</b>
<b>Medium of Instruction:</b>	<b>English</b>
<b>Medium of Assessment:</b>	<b>English</b>
<b>Prerequisites:</b> <i>(Course Code and Title)</i>	<b>Nil</b>
<b>Precursors:</b> <i>(Course Code and Title)</i>	<b>Nil</b>
<b>Equivalent Courses:</b> <i>(Course Code and Title)</i>	<b>Nil</b>
<b>Exclusive Courses:</b> <i>(Course Code and Title)</i>	<b>Nil</b>

## Part II Course Details

### 1. Abstract

The course is structured as a series of interlocking lectures, workshops and hands on, in-class exercises, introducing students to the basics of digital manufacturing. The core aim of the course is to convey applied knowledge in all areas of digital manufacturing, from software workflows to hardware machine processes. Students will explore subtractive manufacturing methods in the areas of CNC machining and well as laser cutting and associated assembly techniques and models. Another focus of the course is on additive manufacturing technologies such as 3D printing and associated technologies such as 3D scanning and projection mapping, allowing students to explore the complex interplay of virtual and actual, digital design steps to either capture and process actuality into a digital format or reversely physicalise digital content, ultimately leading them to work with augmented, extended and mixed reality. In-class exercises and assigned projects will expose students to a range of tools and techniques which will enable them to design and produce a series of small digital manufactured objects, as a form of artistic and design production.

### 2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs	Weighting (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	A2	A3
1.	Gain an understanding of digital fabrication technologies and associated materials		✓	✓	
2.	Acquire 3D modelling and scanning skills and techniques through group work and creative exercises			✓	
3.	Interpret/express and transform existing design and art into digital fabricated elements		✓	✓	✓
4.	Experiment and take risks with subtractive and additive fabrication techniques		✓	✓	✓
5.	Transform basic technical competence into a unique style or personal signature through AR/VR components			✓	✓
		100%			

**A1: Attitude**

*Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.*

**A2: Ability**

*Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to self-life problems.*

**A3: Accomplishments**

*Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.*

### 3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.					Hours/week (if applicable)
		1	2	3	4	5	
Lectures	Explain key concepts of digital fabrication methods and examples with discussion	✓					
Workshops	Introduce skills and techniques specific to subtractive and additive fabrication technologies		✓	✓			
Assignments and Exercises	Group projects to practice and creatively apply skills and techniques		✓	✓			
3D Print Projects	Short projects to refine skills and develop original personal expression		✓	✓	✓	✓	
Readings		✓					

### 4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.					Weighting	Remarks
	1	2	3	4	5		
Continuous Assessment: 100%							
Participation and performance	✓	✓		✓		20%	
Experimental Fabrication projects		✓	✓	✓	✓	60%	
Presentation		✓	✓	✓	✓	20%	
Examination: 0% (duration: , if applicable)						100%	

## 5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Applicable to students admitted in Semester A 2022/23 and thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
1. Participation and Performance	This assessment task reviews students' participation and performance in discussions, debates and peer critique during the tutorial sessions. The evidence of 'negotiation', the sign of discovery, lies in students' pre-class preparation and interpersonal sensitivity to his/her peer members.	<ul style="list-style-type: none"> <li>- Active in-class participation, positive listening, strong ability to stimulate class discussion and comment on other points</li> <li>- In-depth pre- class preparation and familiarity with peer reports and other materials</li> <li>- Interpret others' views with an open mind and ready to negotiate</li> <li>- Readiness to share personal insight via analysis and synthesis with informed views</li> <li>- Constructively critical, thus facilitating the discovery of new issues</li> </ul>	<ul style="list-style-type: none"> <li>- Active in-class participation, positive listening, ability to initiate class discussion and comment on other points</li> <li>- Adequate pre-class preparation and familiarity with peer reports and other materials</li> <li>- Interpret opinions effectively</li> </ul>	<ul style="list-style-type: none"> <li>- Unmotivated to participate in class discussion or comment on other people's views</li> <li>- Little pre-class preparation and familiarity with peer reports and other materials</li> <li>- Poor ability in interpreting opinions</li> </ul>	<ul style="list-style-type: none"> <li>- Unwilling to participate in class discussion and comment on other points, even when requested by the teacher</li> <li>- No pre-class preparation and familiarity with peer reports and other materials</li> <li>- Minimal ability in interpreting opinions</li> </ul>
2. Experimental Fabrication projects	Students should demonstrate ability to utilize primary and secondary sources, execute creative ideas and projects. The threshold of 'discovery'	<ul style="list-style-type: none"> <li>- Work has strong affective quality and the articulation of personal styles and signature</li> <li>- Excellent appreciation, exploration and/or application of the</li> </ul>	<ul style="list-style-type: none"> <li>- Strong appreciation, exploration and/or application of the aesthetic and expressive qualities of the medium</li> <li>- Ability to create project / work that</li> </ul>	<ul style="list-style-type: none"> <li>- Marginal appreciation of the aesthetic and expressive qualities of the medium</li> <li>- Marginal ability to create project / work that demonstrate the processes of thinking</li> </ul>	<ul style="list-style-type: none"> <li>- No appreciation of the aesthetics and expressive qualities of the medium</li> <li>- Fail to create project / work that demonstrate the processes of thinking</li> </ul>

	lies in a student's proactively turning theory into praxis, to transform course material into self-owned authorship.	<p>aesthetic and expressive qualities of the medium</p> <ul style="list-style-type: none"> <li>- Work raises questions and instils insights about the process of conception, creative strategisation and production</li> <li>- Innovative exploration by combining knowledge from different disciplines (e.g. mathematics, psychology, physics, anthropology, etc.) to create an inter-disciplinary project</li> <li>- Efficient adjustment of plans and strategies in response to resources (time, space, equipment, etc) available with constructive adjustment</li> </ul>	<p>demonstrate the processes of thinking and creative exploration</p> <ul style="list-style-type: none"> <li>- Proper adjustment of plans and strategies in response to resources (time, space, equipment, etc) available and constructive feedback/suggestions</li> </ul>	<p>and creative exploration</p> <ul style="list-style-type: none"> <li>- Limited adjustment of plans and strategies in response to resources (time, space, equipment, etc) available</li> </ul>	<p>and creative exploration</p> <ul style="list-style-type: none"> <li>- Minimal adjustment of plans and strategies in response to resources (time, space, equipment, etc) available</li> </ul>
3. Presentation	This assessment will grade on content and fluency of presentation. Students should show their co-operation to conduct a well- organized presentation with their own argument and evidence from readings and notes. The threshold of 'discovery' lies in	<ul style="list-style-type: none"> <li>- Rich, informative content, excellent grasp of the material with in-depth and extensive knowledge of the subject matter</li> <li>- Rigorous organization, coherent structure, and systematic exposition with a strong sense of narrative</li> <li>- Superior presentation skills:</li> </ul>	<ul style="list-style-type: none"> <li>- Adequate content with firm grasp of the material that informs the audience on a subject matter</li> <li>- Reasonable organization, balanced structure and composition</li> <li>- Good verbal communication: comprehensible pronunciation, fluent expression and diction,</li> </ul>	<ul style="list-style-type: none"> <li>- Weak content, loose grasp of the general ideas with some knowledge of the subject matter</li> <li>- Poor organization, structure and composition</li> <li>- Poor presentation skills: marginal pronunciation, expression and diction, poor time- management</li> </ul>	<ul style="list-style-type: none"> <li>- Inadequate content, fail to identify the general ideas with knowledge of the subject matter</li> <li>- No organization, structure or/and composition</li> <li>- Poor presentation skills: marginal pronunciation, expression and diction, minimal time-management</li> </ul>

	the student's initiative to conduct additional research and to personalize theories for her/his personal daily experience.	distinct pronunciation, fluent expression and appropriate diction, exact time-management  - Critical analysis with insightful comments opening up new issues, or suggesting the ability to theorize	fair time-management		
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Applicable to students admitted before Semester A 2022/23

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Participation and Performance	This assessment task reviews students' participation and performance in discussions, debates and peer critique during the tutorial sessions. The evidence of 'negotiation', the sign of discovery, lies in students' pre-class preparation and interpersonal sensitivity to his/her peer members.	- Active in-class participation, positive listening, strong ability to stimulate class discussion and comment on other points - In-depth pre-class preparation and familiarity with peer reports and other materials - Interpret others' views with an open mind and ready to negotiate - Readiness to share personal insight via analysis and synthesis with informed views	- Active in-class participation, positive listening, ability to initiate class discussion and comment on other points - Adequate pre-class preparation and familiarity with peer reports and other materials - Interpret opinions effectively	- Attentive in in-class participation, listening with comprehension, but only infrequently contributing - Adequate pre-class preparation but little familiarity with peer reports and other materials - Fair ability in interpreting opinions	- Unmotivated to participate in class discussion or comment on other people's views - Little pre-class preparation and familiarity with peer reports and other materials - Poor ability in interpreting opinions	- Unwilling to participate in class discussion and comment on other points, even when requested by the teacher - No pre-class preparation and familiarity with peer reports and other materials - Minimal ability in interpreting opinions

		<ul style="list-style-type: none"> <li>- Constructively critical, thus facilitating the discovery of new issues</li> </ul>				
2. Experimental Fabrication projects	<p>Students should demonstrate ability to utilize primary and secondary sources, execute creative ideas and projects. The threshold of ‘discovery’ lies in a student’s proactively turning theory into praxis, to transform course material into self-owned authorship.</p>	<ul style="list-style-type: none"> <li>- Work has strong affective quality and the articulation of personal styles and signature</li> <li>- Excellent appreciation, exploration and/or application of the aesthetic and expressive qualities of the medium</li> <li>- Work raises questions and instils insights about the process of conception, creative strategisation and production</li> <li>- Innovative exploration by combining knowledge from different disciplines (e.g. mathematics, psychology, physics, anthropology, etc.) to create an inter-disciplinary project</li> <li>- Efficient adjustment of plans and strategies in</li> </ul>	<ul style="list-style-type: none"> <li>- Strong appreciation, exploration and/or application of the aesthetic and expressive qualities of the medium</li> <li>- Ability to create project / work that demonstrate the processes of thinking and creative exploration</li> <li>- Proper adjustment of plans and strategies in response to resources (time, space, equipment, etc) available and constructive feedback/ suggestions</li> </ul>	<ul style="list-style-type: none"> <li>- Basic appreciation and/or application of the aesthetic and expressive qualities of the medium</li> <li>- Limited ability to create project / work that demonstrate the processes of thinking and creative exploration</li> <li>- Adjustment of plans and strategies in response to resources (time, space, equipment, etc) available</li> </ul>	<ul style="list-style-type: none"> <li>- Marginal appreciation of the aesthetic and expressive qualities of the medium</li> <li>- Marginal ability to create project / work that demonstrate the processes of thinking and creative exploration</li> <li>- Limited adjustment of plans and strategies in response to resources (time, space, equipment, etc) available</li> </ul>	<ul style="list-style-type: none"> <li>- No appreciation of the aesthetics and expressive qualities of the medium</li> <li>- Fail to create project / work that demonstrate the processes of thinking and creative exploration</li> <li>- Minimal adjustment of plans and strategies in response to resources (time, space, equipment, etc) available</li> </ul>

		response to resources (time, space, equipment, etc) available with constructive adjustment				
3. Presentation	This assessment will grade on content and fluency of presentation. Students should show their co-operation to conduct a well- organized presentation with their own argument and evidence from readings and notes. The threshold of ‘discovery’ lies in the student’s initiative to conduct additional research and to personalize theories for her/his personal daily experience.	<ul style="list-style-type: none"> <li>- Rich, informative content, excellent grasp of the material with in-depth and extensive knowledge of the subject matter</li> <li>- Rigorous organization, coherent structure, and systematic exposition with a strong sense of narrative</li> <li>- Superior presentation skills: distinct pronunciation, fluent expression and appropriate diction, exact time-management</li> <li>- Critical analysis with insightful comments opening up new issues, or suggesting the ability to theorize</li> </ul>	<ul style="list-style-type: none"> <li>- Adequate content with firm grasp of the material that informs the audience on a subject matter</li> <li>- Reasonable organization, balanced structure and composition</li> <li>- Good verbal communication: comprehensible pronunciation, fluent expression and diction, fair time-management</li> </ul>	<ul style="list-style-type: none"> <li>- Adequate content with comprehensive grasp of the material demonstrating basic knowledge of the subject matter</li> <li>- Fair organization, weak structure and composition</li> <li>- Fair presentation skills: acceptable pronunciation, expression and diction, fair time-management</li> </ul>	<ul style="list-style-type: none"> <li>- Weak content, loose grasp of the general ideas with some knowledge of the subject matter</li> <li>- Poor organization, structure and composition</li> <li>- Poor presentation skills: marginal pronunciation, expression and diction, poor time-management</li> </ul>	<ul style="list-style-type: none"> <li>- Inadequate content, fail to identify the general ideas with knowledge of the subject matter</li> <li>- No organization, structure or/and composition</li> <li>- Poor presentation skills: marginal pronunciation, expression and diction, minimal time-management</li> </ul>



**Part III Other Information** (more details can be provided separately in the teaching plan)

**1. Keyword Syllabus**

*(An indication of the key topics of the course.)*

3D printing, CNC, subtractive manufacturing, laser cut, digital fabrication, 3D scanning, projection mapping, Augmented Reality

**2. Reading List**

**2.1 Compulsory Readings**

*(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)*

1.	Yuan, P.F., Leach, N. and Menges, A., 2018. <i>Digital fabrication</i> . Tongji University Press Co., Ltd.
2.	Redwood, Ben, Filemon Schffer, and Brian Garret. <i>The 3D printing handbook: technologies, design and applications</i> . 3D Hubs, 2017.

**2.2 Additional Readings**

*(Additional references for students to learn to expand their knowledge about the subject.)*

1.	Rael, Ronald, and Virginia San Fratello. <i>Printing architecture: Innovative recipes for 3D printing</i> . Chronicle Books, 2018.
2.	Rohrbacher, Gary, Anne Filson, Anna Kaziunas France, and Bill Young. <i>Design for CNC: Furniture Projects and Fabrication Technique</i> . Maker Media, Inc., 2017.
3.	Garcia, Diego and Pugliese, D. <i>Advanced 3D Printing with Grasshopper®: Clay and FDM</i> , 2020