City University of Hong Kong Course Syllabus

offered by School of Creative Media with effect from Semester A 2024/25

Part I Course Overv	view
Course Title:	Introduction to Digital Processes: From Creative Computation to Fabrication
Course Code:	SM5345
Course Duration:	One semester
Credit Units:	3
Level:	P5
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: (Course Code and Title)	Nil
Precursors: (Course Code and Title)	Nil
Equivalent Courses : (Course Code and Title)	Nil
Exclusive Courses: (Course Code and Title)	Nil

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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	Discov	ery-eni	riched
		(if	curricu	ılum rel	lated
		applicable)	learnin	g outco	omes
			(please	tick	where
			approp	riate)	
			A1	A2	A3
1.	Gain an understanding of digital fabrication technologies		1	1	
	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 real-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. Learning and Teaching Activities (LTAs)

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

LTA	Brief Description	CILO	CILO No.		Hours/week applicable)	(if		
		1	2	3	4	5	applicasie)	
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		√	1	√			
Readings		1						

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	1	1		1		20%	
Experimental		1	1	1	1	60%	
Fabrication projects							
Presentation		1	1	1	1	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 before Semester A 2022/23 and in Semester A 2024/25 & thereafter

Assessment Task	Criterion	Excellent	Good	Fair	Marginal	Failure
		(A+, A, A-)	(B+, B, B-)	(C+, C, C-)	(D)	(F)
1. Participation and Performance	This assessment task reviews students' participation and	- Active in- class participation, positive listening,	- Active in- class participation, positive listening,	- Attentive in in- class participation,	- Unmotivated to participate in class discussion or	- Unwilling to participate in class discussion 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.	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 - Constructively critical, thus facilitating the discovery of new issues	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	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	comment on other people's views - Little pre- class preparation and familiarity with peer reports and other materials - Poor ability in interpreting opinions	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
2. Experimental	Students should demonstrate	- Work has	- Strong	- Basic	- Marginal	- No
Fabrication	ability to utilize primary and	strong affective quality and the	appreciation, exploration and/or	appreciation and/or application	appreciation of the aesthetic and	appreciation of the aesthetics and
projects	secondary sources, execute	articulation of personal styles and	application of the aesthetic and	of the aesthetic and expressive	expressive qualities of the	expressive qualities of the

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	creative ideas and projects.	signature	expressive	qualities of the	medium	medium
	The threshold of 'discovery'	- Excellent	qualities of the	medium	- Marginal	- Fail to create
	•	appreciation,	medium	- Limited	ability to create	project / work that
	lies in a student's proactively	exploration and/or	- Ability to	ability to create	project / work that	demonstrate the
	turning theory into praxis, to	application of the	create project /	project / work that	demonstrate the	processes of
		aesthetic and	work that	demonstrate the	processes of	thinking and
	transform course material into	expressive qualities	demonstrate the	processes of	thinking and	creative
	self-owned authorship.	of the medium	processes of	thinking and	creative	exploration
		- Work raises	thinking and	creative	exploration	- Minimal
		questions and	creative	exploration	- Limited	adjustment of
		instils insights	exploration	- Adjustment	adjustment of	plans and
		about the process of	- Proper	of plans and	plans and	strategies in
		conception, creative	adjustment of	strategies in	strategies in	response to
		strategisation and	plans and	response to	response to	resources (time,
		production	strategies in	resources (time,	resources (time,	space, equipment,
		- Innovative	response to	space, equipment,	space, equipment,	etc) available
		exploration by	resources (time,	etc) available	etc) available	
		combining	space, equipment,			
		knowledge from	etc) available and			
		different disciplines	constructive			
		(e.g. mathematics,	feedback/			
		psychology,	suggestions			
		physics,				
		anthropology, etc.)				
		to create an inter-				
		disciplinary project				
		- Efficient				
		adjustment of plans				
		and strategies in				
		response to				
		resources (time,				
		space, equipment,				
		etc) available with				
		constructive				
		adjustment	A 1 .	A 1	XX7 1	T 1
3. Presentation	This assessment will grade on	- Rich,	- Adequate	- Adequate	- Weak	- Inadequate
	content and fluency of	informative	content with firm	content with	content, loose	content, fail to
	Contont and Indency of	content, excellent	grasp of the	comprehensive	grasp of the	identify the
		grasp of the	material that	grasp of the	general ideas with	general ideas with

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	material with indepth and extensive knowledge of the subject matter - Rigorous organization, coherent structure, and systematic exposition with a strong sense of narrative - Superior presentation skills: distinct	informs the audience on a subject matter - Reasonable organization, balanced structure and composition - Good verbal communication: comprehensible pronunciation, fluent expression and diction, fair	material demonstrating basic knowledge of the subject matter - Fair organization, weak structure and composition - Fair presentation skills: acceptable pronunciation,	some knowledge of the subject matter - Poor organization, structure and composition - Poor presentation skills: marginal pronunciation, expression and diction, poor time-	knowledge of the subject matter - No organization, structure or/and composition - Poor presentation skills: marginal pronunciation, expression and diction, minimal time-management
and to personalize theories for her/his personal daily experience.	pronunciation, fluent expression and appropriate diction, exact time- management - Critical analysis with insightful comments opening up new issues, or suggesting the ability to theorize	time-management	expression and diction, fair time-management	management	

Applicable to students admitted from Semester A 2022/23 to Summer Term 2024

Assessment Task	Criterion	Excellent	Good	Marginal	Failure
		(A+, A, A-)	(B+, B)	(B-, C+, C)	(F)
1. Participation and	This assessment task reviews	- Active in-class	- Active in-class	- Unmotivated to	- Unwilling to
Performance	students' participation and	participation, positive listening, strong ability	participation, positive listening, ability to	participate in class discussion or comment	participate in class discussion and
	performance in discussions,	to stimulate class	initiate class discussion	on other people's views	comment on other
	debates and peer critique	discussion and comment on other	and comment on other points	- Little pre-class preparation and	points, even when requested by the teacher
	during the tutorial sessions.	points	- Adequate pre-class	familiarity with peer	- No pre-class
	The evidence of 'negotiation',	- In-depth pre- class preparation and	preparation and familiarity with peer	reports and other materials	preparation and familiarity with peer
	the sign of discovery, lies in	familiarity with peer	reports and other	- Poor ability in	reports and other
	students' pre-class preparation	reports and other	materials	interpreting opinions	materials
	and interpersonal sensitivity to	materials - Interpret others'	- Interpret opinions effectively		- Minimal ability in interpreting opinions
	his/her peer members.	views with an open mind and ready to			
		negotiate			
		- Readiness to share			
		personal insight via			
		analysis and synthesis			
		with informed views			
		- Constructively			
		critical, thus facilitating			
		the discovery of new			
		issues			
2. Experimental	Students should demonstrate	- Work has strong	- Strong	- Marginal	- No appreciation of
Fabrication projects	ability to utilize primary and	affective quality and the articulation of personal	appreciation, exploration and/or	appreciation of the aesthetic and expressive	the aesthetics and expressive qualities of
	secondary sources, execute	styles and signature	application of the	qualities of the medium	the medium
	creative ideas and projects.	- Excellent appreciation,	aesthetic and expressive qualities of the medium	- Marginal ability to create project / work	- Fail to create project / work that
	The threshold of 'discovery'	exploration and/or	- Ability to create	that demonstrate the	demonstrate the
	lies in a student's proactively	application of the aesthetic and expressive	project / work that demonstrate the	processes of thinking and creative exploration	processes of thinking and creative exploration
	turning theory into praxis, to	qualities of the medium	processes of thinking	- Limited	- Minimal
		- Work raises	and creative exploration	adjustment of plans and	adjustment of plans and

		questions and instils	Propor adjustment	stratagies in response to	stratagies in response to
	transform course material into	insights about the	- Proper adjustment	strategies in response to	strategies in response to
	self-owned authorship.	<u> </u>	of plans and strategies	resources (time, space,	resources (time, space,
	1	process of conception,	in response to resources	equipment, etc)	equipment, etc) available
		creative strategisation	(time, space, equipment,	available	avanable
		and production	etc) available and		
		- Innovative	constructive feedback/		
		exploration by	suggestions		
		combining knowledge			
		from different			
		disciplines (e.g.			
		mathematics,			
		psychology, physics,			
		anthropology, etc.) to			
		create an inter-			
		disciplinary project			
		- Efficient			
		adjustment of plans and			
		strategies in response to			
		resources (time, space,			
		equipment, etc)			
		available with			
		constructive adjustment			
3. Presentation	This assessment will grade on	- Rich, informative	- Adequate content	- Weak content,	- Inadequate
	content and fluency of	content, excellent grasp of the material with in-	with firm grasp of the material that informs	loose grasp of the general ideas with some	content, fail to identify the general ideas with
	presentation. Students should	depth and extensive	the audience on a	knowledge of the	knowledge of the
	•	knowledge of the	subject matter	subject matter	subject matter
	show their co-operation to	subject matter	- Reasonable	- Poor organization,	- No organization,
	conduct a well- organized	- Rigorous	organization, balanced	structure and	structure or/and
	presentation with their own	organization, coherent structure, and	structure and composition	composition - Poor presentation	compositionPoor presentation
	argument and evidence from	systematic exposition	- Good verbal	skills: marginal	skills: marginal
	readings and notes. The	with a strong sense of	communication:	pronunciation,	pronunciation,
	threshold of 'discovery' lies in	narrative - Superior	comprehensible pronunciation, fluent	expression and diction, poor time- management	expression and diction, minimal time-
	the student's initiative to	presentation skills:	expression and diction,	1	management
	conduct additional research	distinct pronunciation,	fair time-management		
		fluent expression and			
	and to personalize theories for	appropriate diction,			

her/his personal dail experience.	- Critical analysis with insightful comments opening up new issues, or	
	suggesting the ability to theorize	

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. The 3D printing handbook: technologies, design and applications. 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:</i> Furniture Projects and Fabrication Technique. Maker Media, Inc., 2017.
3.	Garcia, Diego and Pugliese, D. Advanced 3D Printing with Grasshopper®: Clay and FDM, 2020.