

## COURSE OUTLINE FOR STUDENTS AT NTU

<b>Academic Year</b>	2019/20	<b>Semester</b>	2
<b>Course Coordinator</b>	Associate Professor Moon Seung Ki		
<b>Course Code</b>	MA2013		
<b>Course Title</b>	Creative Thinking Design		
<b>Pre-requisites</b>	Nil		
<b>No of AUs</b>	3		
<b>Contact Hours</b>	Lectures: 26 hours Practical: 36 hours		
<b>Proposal Date</b>	November 2019		

### Course Aims

This course introduces you to the fundamentals of creative thinking and design, the process of product design and development, ideas generation, problem solving techniques and design foundation including elements and principles of visual design. It also aims at providing you with practical experience in problem solving skills as well as form and visual design via a series of assignments and mini-projects.

### Intended Learning Outcomes (ILO)

Upon successful completion of the course, you should be able to;

- 1) Explain a range of approaches to creative thinking and problem solving in the area of design,
- 2) apply problem solving techniques to overcome difficult design problems encountered in practice,
- 3) generate, synthesise and evaluate design ideas,
- 4) determine the design elements and principles in product design,
- 5) communicate one's own design ideas and intent,
- 6) explain the designers' role and responsibilities in the product design and development process.

### Course Contents

	Topic	Hours
1.	<b>Fundamental Design</b> Introduction to creative thinking & design. Two-dimensional & three-dimensional design. Design process. Colour harmony. The S.A.F.E. design concept.	12 (Lecture: 6 hours; Practical: 6 hours)
2.	<b>Design Methods</b> System models/process models/graphic methods. Diagramming. Ranking matrices. Means/ends analysis. Semantic differential. Criterion function analysis. Decision making under uncertainty. Qualitative decision. Delphi techniques. Competitive decision making.	20 (Lecture: 8 hours; Practical: 12 hours)

3.	<b>Creative Thinking</b> Creative thinking. Visual thinking. Blocks to creative thinking. Overcoming blocks in creative thinking. Generation of ideas: Brainstorming, Mind mapping, Incubation and Attribute listing. Problem solving techniques.	30 (Lecture: 12 hours; Practical: 18 hours)
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**Assessment (includes both continuous and summative assessment)**

Component	Course LO Tested	Related Programme LO or Graduate Attributes	Weighting	Team/ Individual	Assessment rubrics
1. Continuous Assessment 1 - In-class Assignments	LO1-LO4	<i>EAB SLO a, b, c, e</i>	25%	Individual	Appendix 1
2. Continuous Assessment 2 – Project 1	LO1-LO6	<i>EAB SLO a, b, c, d, e, h, i, j</i>	30%	Team	Appendix 1
3. Continuous Assessment 3 – Project 2	LO1-LO6	<i>EAB SLO a, b, c, d, e, h, i, j, l</i>	45%	Team	Appendix 1
Total			100%		

\* EAB SLO stands for the Engineering Accreditation Board Student Learning Outcomes. The list is below:

- a) **Engineering knowledge:** Apply the knowledge of mathematics, natural science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems
- b) **Problem Analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- c) **Design/development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
- d) **Investigation:** Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
- e) **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

- f) **The engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- g) **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for the sustainable development.
- h) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- i) **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
- j) **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- k) **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and economic decision-making, and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- l) **Life-long Learning:** Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

### Formative feedback

Formative feedback will be given:

- Verbally and/or in writing after class activities and project submission
- Presentation at the end of each project
- Verbally feedback after each project presentation

### Learning and Teaching approach

Approach	How does this approach support students in achieving the learning outcomes?
Lecture	This provides the essential relevant knowledge on creative thinking and design.
Design Project	In teams, you will brainstorm ideas and design innovative solutions to solve real problems. Your team should utilise the materials and tools at MAE workshop to build a prototype of your design.

## Reading and References

### Textbook

Nil

### References

1. Hanks, K., Belliston, L. & Edwards, D., Design Yourself, Crisp Publications, 1992.
2. Lumsdaine, E., Lumsdaine, M. & Shelnut, J.W., Creative Problem Solving and Engineering Design, McGraw Hill, 1999.
3. Ulrich, K.T., Eppinger, S.D., Product Design and Development, 4th Edition, McGraw Hill, 2008.
4. Jones, J. C., Design Methods, John Wiley & Sons, 1992.
5. Cross, N., Engineering Design Methods: Strategies for Product Design, 4th Edition, John Wiley & Sons, 2008.

## Course Policies and Student Responsibilities

As a student of the course, you are required to abide by both the University Code of Conduct and the Student Code of Conduct. The Codes provide information on the responsibilities of all NTU students, as well as examples of misconduct and details about how students can report suspected misconduct.

The university also has the Student Mental Health Policy. The Policy states the University's commitment to providing a supportive environment for the holistic development of students, including the improvement of mental health and wellbeing. These policies and codes concerning students can be found in the following link.

<http://www.ntu.edu.sg/SAO/Pages/Policies-concerning-students.aspx>

## Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the [academic integrity website](#) for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

## Course Instructors

Instructor	Office Location	Phone	Email
Moon Seung Ki	N3.2-02-24	6790 5599	<a href="mailto:skmoon@ntu.edu.sg">skmoon@ntu.edu.sg</a>
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## Planned Weekly Schedule

Week	Topic	Course LO	Readings/ Activities
1	Introduction to Creative Thinking and Design: Creative and Visual Thinking	LO1, LO2, LO4	Part A: Shape Abstraction
2	Creative Thinking I; Space, Shape, Form and Structure I	LO1-LO5	Part B: 2.5D Design – Paper Carving
3	Creative Thinking II; Space, Shape, Form and Structure II	LO1-LO5	Part C: Construction of 3D objects with Design Elements
4	Creative Thinking III; Space, Shape, Form and Structure III	LO1-LO5	Part C: Construction of 3D objects with Design Elements
5	Creative Thinking IV; Space, Shape, Form and Structure IV	LO1-LO5	Part C: Construction of 3D objects with Design Elements
6	Design & Innovation	LO1-LO5	Part C: Construction of 3D objects with Design Elements
7	Design Methods: Design Thinking	LO1-LO5	Project II descriptions
8	Recess		
9	Design Integration	LO1-LO6	Project II
10	Design Methods: Defining Vision	LO1-LO6	Project II
11	Design Methods: Know People & Context	LO1-LO6	Project II
12	Design Methods: Idea Exploration	LO1-LO6	Project II
13	Design Methods: Design Thinking; Process & Tools; Prototyping & Iteration	LO1-LO6	Project II
14	Project II Final Presentation	LO1-LO6	Project II