Program: ECE
Degree Level: Master

Faculty/College: TGGS

Course 090245431

Design Methodology

King Mongkut's University of Technology North Bangkok

The Sirindhorn International Thai-German Graduate School of Engineering

Electrical and Software Systems Engineering Program

Section 1: General Information

1. Course code and course title

090245431 Design Methodology

2. Total credits

3 credits ☐ (2-2-5) ☑ (3-0-6) ☐ (3-0-9) ☐ (2-3-7)

3. Curriculum and course category:

Curriculum: *Master of Engineering in Electrical and Software Systems Engineering*

Course category: Required Courses

☑ Core Course ☐ Specific Core Course

☐ Industrial Internship ☐ Master Thesis

Elective Courses

☐ General Elective ☐ Specific Elective ☐ Other Elective

4. Course coordinator/ Instructors

Course Coordinator: Asst. Prof. Dr.-Ing. Chayakorn Netramai

Instructor: Dr. Alex Brezing

5. Semester/ year of study

☑ Semester 1 (Aug. to Dec.) ☐ Semester 2 (Jan. to May) Academic Year: 2021

6. Pre-requisite (if any)

☑ No ☐ Yes, please provide: .....

7. Co-requisites (if any)

☑ No ☐ Yes, please provide: .....

8. Venue of study

Lecture Day/Time: Monday at 09.00-12.00

☐ On-site: Lecture Room No.:..... Floor:.....

☐ TGGS, KMUTNB ☐ Faculty of Engineering, CU ☐ RWTH

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☑ On-line*: Teaching Media: ☐ Microsoft Teams ☐ Google Meet
☑ Zoom ☐ Webex
☐ Other (specify) .....

*Remark: * During COVID-19, the teaching can be on-site and/or on-line according to TGGS Policy.*

9. Information for quality assurance in education

This course shows evidence of:

- Development of implementation from previous practices, e.g. the improvement of class teaching, course content, content classification and methods used for learning assessment
- ☐ Involvement from professional bodies/ external agencies in instruction; thus Enhancing student academic and professional experiences
- ☑ Integration of research or creative activities with instruction; use of research-based learning management; knowledge management practices for learning improvement
- ☐ Integration of academic services and course implementation
- ☐ Combination of cultural heritage preservation efforts into instruction or student activities

10. Date of latest revision:

July 2021

Section 2: Course Description and Implementation

1. Course Description *(As written in the Official Approved Curriculum)*

Design processes for mechatronic systems (VDI 2221, VDI 2206), methods for conceptual design. Introduction to the development of consumer goods: Theoretical Approaches, Practical Methods, Introduction to Styling and Visualization Techniques. Project: Briefing, Design Review, Final Presentation

2. Number of hours per semester

Lecture	Practice	Self-study
48 hours/ semester (*3 hours/week**)		*96 hours/ semester* (*6 hours/week**)

*Remark: * Based on 16 weeks of lecture*

Course Category: ☑ Lecture ☐ Practice ☐ Laboratory

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Course Evaluation: ☐ A-F ☐ S/U ☐ P

3. Number of hours per week for academic guidance to individual students

☐ 1. Giving academic advice (minimally number hour per week) during the office hour

☐ 1 ☐ 2 ☑ 3 ☐ 4 ☐ 5 ☐ .....

The student can arrange the time via communication apps or email for the meeting date/time.

☐ 2. Adopting information technology-based academic advising

☐ Email: alex.b@tggs.kmutnb.ac.th, chayakorn.n@tggs.kmutnb.ac.th

☐ Phone:

☐ Communication Apps: Line ID:

☐ Meeting Online: The platform will be informed to students upon the request.

☐ Other (specify) .....

☐ 3. .....

4. Course Learning Outcomes (CLOs): Students should be able to:

CLO 1. To understand the theoretical concepts in the followings:

- Design process for mechatronic systems (VDI 2221, VDI 2206)
- Method for conceptual design
- Development of consumer goods
- Styling and visualization techniques

CLO 2. To apply the knowledge in design methodology for engineering design to engineering problems

CLO 3. To apply the knowledge in design methodology for industrial/product design

Remark: 1. Guidelines according to Bloom's Taxonomy is available at https://courses.dcs.wisc.edu/design-teaching/PlanDesign_Fall2016/2-Online-Course-Design/2_Learning-Objectives-Alignment/6_objectives_blooms-taxonomy.html

2. For the master level course, CLOs should be "apply" and "analyze" or possibly to consider the doctoral CLOs "evaluate" and "create". "Remember" and "Understand" are for the undergraduate level courses, however, they can be implemented only at the beginning of the course.

3. CLOs can be defined as many as appropriated for the course.

5. The mapping between Expected Learning Outcomes (ELOs) from the curriculum and Course Learning Outcomes (CLOs)

Table 5.1 ELOs-CLOs Consistency *(for a subject-specific course/ a specific curriculum)*

ELOs/CLOs consistency	CLO 1	CLO 2	CLO 3
ELO1			
ELO2			
ELO3	✓	✓	
ELO4			
ELO5		✓	
ELO6		✓	✓
ELO7		✓	✓
ELO8			
ELO9			
ELO10			

Remark: All ELOs and ELOs for the course (highlighted row) are as written in the Official Approved Curriculum.

Table 5.2 Mapping desirable characteristics of KMUTNB graduates and CLOs *(for non-specific courses designed for various curriculums)*

Consistency between desirable characteristics of KMUTNB Graduates- CLOs	CLO 1	CLO 2	CLO 3
1. **Professional credentials with critical thinking skills**		✓	
2. **Integrity and social responsibility**		✓	
3. **Innovative and technopreneur mindset**		✓	✓
4. **Global Competence**		✓	✓

Section 3: Student Improvement in relation to Course Learning Outcomes (CLOs)

Organizing learning to develop skills/ knowledge; evaluation of CLOs in accordance with the ones identified in Section 2.4

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Course Learning Outcomes (CLOs)	Teaching Methods compliant with CLOs	Evaluation Methods compliant with CLOs
CLO 1	• Lecture* • Active learning** • In-class exercises • Individual and/or group assignment • Additional reading assignments from research and/or literature journals	• Assignment evaluation • Feedback and discussion of assigned exercises • Exam****
CLO 2	• Lecture on how to apply theoretical concepts to the actual applications • Case studies, project-based learning • In-class exercises • Individual and/or group assignment • Additional reading assignments • Group discussions	• Feedback and discussion of assigned project • Project presentation • Project evaluation
CLO 3	• Lecture on how to apply theoretical concepts to the actual applications • Case studies, project-based learning • In-class exercises • Individual and/or group assignment • Additional reading assignments • Group discussions	• Feedback and discussion of assigned project • Project presentation • Project evaluation

*Remark: * Lecture on the concept of the topic is introduced with basic or fundamental definitions, visualization and correlations. For the complicated equation, the derivation from the basic laws can be shown to students. So, the students do not memorize the equations but understand the basic concept and basic equation. The lecturer will introduce the advanced and new concepts, technologies, and findings to students from publications such as journals and websites and from the research and industrial experiences.*

*** Active learning by asking questions related to the topic in the lecture and encouraging the students to response to the questions. If the students cannot response with answers, then the lecturer will give some guidance until the students can response.*

**** Quiz in the closed-book format on the basic concepts and equations with simple problem solving to evaluate their learning. The solution will be given to students after grading, so they can identify their mistakes and weakness.*

***** Exam on the basic concepts and equations with simple problem solving in the closed-book format as a review, whereas the complicated/integrated problem solving will be worked in the open-book format.*

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Section 4: Lesson Plan and Evaluation

1. **Lesson Plan**

Week	Topics/Details	CLOs	Hours	Learning and teaching activities; teaching media (if any)	Lecturer
1	Introduction and Overview	CLO 1	3 Hrs	• Lecture • Power Point	Dr.Alex
2	EDM (Engineering Design Methodology) Overview	CLO 1	3 Hrs	• Lecture • Power Point	Dr.Alex
3	Technical Specification	CLO 1	3 Hrs	• Lecture • Power Point	Dr.Alex
4	Concept Development	CLO 1	3 Hrs	• Lecture • Power Point	Dr.Alex
5	Concept Evaluation & Validation / Project 1 announcement	CLO 1	3 Hrs	• Lecture • Power Point	Dr.Alex
6	Midterm Exam	CLO 1	3 Hrs	• - Paper-based examination	Dr.Alex
7	Design Review Presentation (Project 1)	CLO 2	3 Hrs	• Power Point	Dr.Alex
8	Final Presentation (Project 1)	CLO 2	3 Hrs	• Power Point	Dr.Alex
9	ID/PD (Industrial Design/Product Design) Overview	CLO 1	3 Hrs	• Lecture • Power Point	Dr.Alex
10	Product Semantics	CLO 1	3 Hrs	• Lecture • Power Point	Dr.Alex
11	Industrial Design Process and Tools (1)	CLO 1	3 Hrs	• Lecture • Power Point	Dr.Alex
12	Industrial Design Process and Tools (2)	CLO 1	3 Hrs	• Lecture • Power Point	Dr.Alex
13	Announcement/Discussion of Project 2 (Industrial Design)	CLO 3	3 Hrs	• Lecture • Power Point	Dr.Alex
14	Design Review 1	CLO 3	3 Hrs	• Power Point	Dr.Alex
15	Design Review 2	CLO 3	3 Hrs	• Power Point	Dr.Alex
16	Final Presentation (Project 2)	CLO 3	3 Hrs	• Power Point	Dr.Alex
		Total	48.0		

2. **Evaluation Plan (in accordance with OBE 2 mapping framework)**

Course Learning Outcomes (CLOs)	Evaluation Methods	Week of Evaluation	Percentage of Evaluation
CLO 1	Midterm exam	6	30%
CLO 2	Project 1	8	30%
CLO 3	Project 2	16	40%

Section 5 Teaching/Learning Resources

Textbooks and materials

- G. Pahl, W. Beitz, J. Feldhusen, K-H. Grote, “Engineering Design: A Systematic Approach”, ISBN-13: 978-1846283185.
- Electronic copies of the lecture presentations and assignments are handed over

Section 6 Course Evaluation and Improvement

1. **Course evaluation by students**

The students will have an opportunity to evaluate the effectiveness of the course in a form of paper survey and group interview at the end of each semester. The results of survey and interview including the grading will be reviewed by the curriculum meeting to evaluate the course's effectiveness.

2. **Strategies for assessing learning management**

The students will have an opportunity to evaluate the teaching of the course in a form of paper survey and group interview at the end of each semester. The results of survey and interview including the grading will be reviewed by the curriculum meeting to evaluate the teaching as well as returning to the lecturer for further improvement.

3. **Improvement schemes of course implementation**

The evaluation from the students including the grading will be submitted to the curriculum meeting for reviewing and brainstorming to improve teaching of each course. Comments and suggestions given by the curriculum meeting will be informed to the responsible lecturer of each course.

4. **Verification of students' learning outcomes, referred to OBE 2 and 3**

The grading of this course will be evaluated and reviewed by the Department meeting and the TGGS executive board meeting in order to verify its appropriateness before the final approval.

5. Course review and improvement plans

The results of the grading evaluation and student evaluation will be submitted to the curriculum meeting for reviewing and brainstorming to improve the effectiveness of the offered courses. Comments and suggestions will be informed to the responsible lecturer of each course.