

# Optimal Design

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## Course Instructor :

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## Course Information :

Days and Hours : 10:10-11:00 am, Tuesdays ; 8:10-10:00 am, Wednesdays

Classroom : Room #103, ME Building

Webpage : <http://iteach.ncku.edu.tw> (需登入，確認已將此課程加入，並設定常用Email帳號)

Textbook :

“*Principles of Optimal Design : Modeling and Computation*” 2th ed.

by Panos Y. Papalambros, Douglass J. Wilde, Cambridge University Press, 2000

<http://www.optimaldesign.org>

Reference :

“*Optimization Concepts and Applications in Engineering*” by Belegundu and Chandrupatla, Prentice Hall, 2003

Credit : 3

Grades (100%):

Homework <sup>1</sup>	15%
Attendance and Participation	10%
Midterm Exam #1	15%
Midterm Exam #2	15%
Individual subsystem	25%
System synthesis	20%

## Course Mission :

The course aims at providing the first exposure to a rational integration of traditional design methodologies with concepts and techniques of modern optimization theory and practice. "Design" is defined in a broad context and students from diverse disciplines, including outside engineering, can benefit from the course. The student learns to create appropriate mathematical optimization models and to use analytical and computational techniques to solve them. Availability of software analysis models, such as finite element analysis, makes possible optimization of increasingly complex designs.

## Course Project :

- An individual project where a design problem chosen by each student is formulated, analyzed and solved, as a independent subsystem of the larger system;
- A team project where 3 students combine their individual subsystem design problems into a system design synthesis. The teams are formed early on so that the individual design projects can be selected to fit into the final system design problem. There is no final exam other than project presentations.
- The project grading can be based on the model's originality and on the successful application of the course theory for design optimization model analysis, numerical solution, and interpretation of results.

## Computer Requirements

Students are expected to program the analysis models needed to compute objective and constraint functions and to interface them with the available optimization routines. However, students are not typically expected to code their own optimization algorithms, except as practice in homework. The ability to model in Matlab, Mathematica, or other commercial packages is expected.

## Honor Code :

我在考試時絕不會給予別人協助，也不會接受他人的幫忙，所有作業及考試的答案均為本人努力的結果，若有違背誓言，一切依校規處置。

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<sup>1</sup> Homework Policy : 每星期二公佈作業題目，隔週三上課時繳交，遲交n日，該次作業成績滿分減為 (100-n\*20)%。

**Class Schedule : (updated 7/2)**

\* Holidays

Wk.	Dates		Lecture	Homework	Project
	Tue.	Wed.			
1	9/16	9/17	Syllabus, Introductions (Chap 1)		
2	9/23	<b>9/24</b>	Optimization Process Overview (Chap 1)	<b><u>HW #1(9/24)</u></b>	交分組名單
3	9/30	10/1	Mathematical Review		分組面談
4	10/7	<b>10/8</b>	Math and Modeling (Chap 2,3)	<b><u>HW #2(10/8)</u></b>	
5	10/14	<b>10/15</b>	Modeling and Monotonicity Analysis (Chap 2,3)		繳交計畫大綱，甘特圖，及分工細節
6	10/21	<b>10/22</b>	<b><u>Monotonicity Analysis (Chap 2,3,6)</u></b> <b><u>Midterm Exam #1 (10/22)</u></b>		
7	10/28	10/29	Differential Theory : Boundary Optima(Chap 5)		
8	11/4	<b>11/5</b>	Differential Theory : Boundary Optima(Chap 5)	<b><u>HW #3 (11/5)</u></b>	繳交次系統數學模型
9	11/11*	11/12	Numerical Solutions (Chap 7)		
10	11/18	<b>11/19</b>	Numerical Solutions (Chap 7)	<b><u>HW #4 (11/19)</u></b>	
11	11/25	<b>11/26</b>	Implementation Issues (Chap 8)		繳交次系統最佳化結果
12	12/2	<b>12/3</b>	<b><u>Midterm Exam #2 (12/3)</u></b>		
13	12/9	12/10	Implementation Issues (Chap 8)		
14	12/16	<b>12/17</b>	System Design Optimization	<b><u>HW #5 (12/17)</u></b>	繳交系統最佳化數學模型
15	12/23	12/24	System Design Optimization		
16	12/30	<b>12/31</b>	System Design Optimization		系統最佳化結果驗證及分析
17	1/6	1/7	Project Presentations		
18	1/13	<b>1/14</b>	<b><u>Project Final Report Due (1/14)</u></b>		