Course Syllabus

1. Class Information

- **Class**: Topics in Ship Design Automation
- **Class Number**: 414.556 (3 Credits)
- **Semester**: Fall 2016
- **Level of Course**: Graduate
- **Time**: Tue. 15:30-16:45, Thu. 15:30-16:45
- **Location**: Room 201, Bldg. 36
- **Instructor**: Prof. Myung-Il Roh
  Office: Room 308D, Bldg. 36
  E-mail: miroh@snu.ac.kr
  Phone: (02) 880-7328
  Office Hours: Available before school and after school by appointment.
- **Teaching assistants**: Seung-Ho Ham
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  Office: Room 206, Bldg. 36
  Phone: (02) 880-8378

2. Course Topics and Description

This course gives a core technology for design automation of ship. Especially, in this semester an optimum design method which is one of core technologies will be presented in detail. First, the necessity of optimum design and major optimization algorithms are presented, then the applications of optimization technique in the field of naval architecture and ocean engineering are presented.

Students have to work in team on a term project. That is, they (1) find and formulate an optimization problem in the field of naval architecture and ocean engineering, (2) select a suitable algorithm for the problem, (3) develop a computer program which computerizes the algorithm, and (4) find an optimum of the problem.

(1) Optimization algorithms

Unconstrained optimization methods

- Gradient method (Steepest descent method, Conjugate gradient method, Newton's method, Davidon-Fletcher-Powell (DFP) method, Broyden-Fletcher-Goldfarb-Shanno (BFGS) method)
- Enumerative method (Hooke & Jeeves method, Nelder & Mead simplex method, Golden section search method)

Constrained optimization methods

- Penalty function method

- LP (Linear Programming)
- SQP (Sequential Quadratic Programming)

Metaheuristic optimization method
- Genetic algorithms

(2) Case studies
Optimal dimension design
Optimal route design
Optimal layout design

(3) Term project
Overall procedures for performing term project are as follows.
- Team making
- Decision of team subject: Any problem in the field of naval architecture and ocean engineering
- Formulation of optimization problem
- Selection of optimization algorithm
- Development of optimization program: C, C++, C#, Matlab, etc. (Grading can be different from programming language.)
- Presentation of term project

3. Textbook and References

(1) Textbook

- Roh, Myung-Il, "Topics in Ship Design Automation – Optimum Design", Seoul National University, Fall 2016.

(2) References

- Arora, J.S., "Introduction to Optimum Design", Elsevier Academic Press, 2011.

4. Grade Computation

Weighted system is as follows:

- One Exam: 40%
- Term Project: 50%
- Attendance: 10%

In case of an excused absence, the student must make-up any missed test, quiz or homework the following day during a free period, before or after school. Unexcused absences will result in a zero.

5. Website: http://etl.snu.ac.kr

Most assignments, instructions and notice for supplementary lecture will be made only on the website, so check it frequently.

6. Class Expectation

- Late work will be not accepted.
- Show respect to others and their property.
- Come prepared to class.
- It is required to make appointments to see instructor during office hours. Send email for an appointment at least one day in advance.

7. Course Schedule

Week	Course Schedule			
	Thursday		Tuesday	
	Date	Time: 15:30-16:45	Date	Time: 15:30-16:45
1	09/01	Introduction to Optimum Design	09/06	Unconstrained Optimization Method: Gradient Method (1)
2	09/08	Unconstrained Optimization Method: Gradient Method (2)	09/13	Unconstrained Optimization Method: Enumerative Method (1)
3	09/15	**Holiday**	09/20	Unconstrained Optimization Method: Enumerative Method (2)
4	09/22	Constrained Optimization Method: Penalty Function Method (1)	09/27	Constrained Optimization Method: Penalty Function Method (2)
5	09/29	Constrained Optimization Method: LP(Linear Programming) (1)	10/04	Constrained Optimization Method: LP(Linear Programming) (2)
6	10/06	Constrained Optimization Method: SQP(Sequential Quadratic Programming) (1)	10/11	Constrained Optimization Method: SQP(Sequential Quadratic Programming) (2)
7	10/13	Metaheuristic Optimization Method: Genetic Algorithms (1)	10/18	Metaheuristic Optimization Method: Genetic Algorithms (2)
8	10/20	**Mid Exam**	10/25	Case Study of Optimal Dimension Design (1)
9	10/27	Case Study of Optimal Dimension Design (2)	11/01	Case Study of Optimal Dimension Design (3)
10	11/03	Case Study of Optimal Dimension Design (4)	11/08	Case Study of Optimal Route Design (1)
11	11/10	Case Study of Optimal Route Design (2)	11/15	Case Study of Optimal Route Design (3)
12	11/17	Case Study of Optimal Route Design (4)	11/22	Case Study of Optimal Layout Design (1)
13	11/24	Case Study of Optimal Layout Design (2)	11/29	Case Study of Optimal Layout Design (3)
14	12/01	Case Study of Optimal Layout Design (4)	12/06	**Term Project Presentation (1)**
15	12/08	**Term Project Presentation (2)**	12/13	**Term Project Presentation (3)**