Course : 457.649 Advanced Structural Analysis

Credits	Department	Representative Instructor		
		Position	Name	Email
3	Civil and Environmental Engineering Major	Professor	Kim, Ho-Kyung	hokyungk@snu.ac.kr

Attachment(Korean)	Attachment(English)

Prerequisite Course	
Consult Time	35-404 advanced reservation

1. Goals

This course teaches a computer-assisted structural analysis with the emphasis on the direct stiffness matrix formulation. The discretized modeling concepts with 2D/3D truss and frame elements are provided. The assemblage of the global stiffness matrix and load vectors are explained and several solvers are introduced to obtain the displacement and member forces of structures. Some special modeling techniques can be covered including end release and rigid offset. During the coursework, a MATLAB-based analysis program will be developed which can be applied to the static analysis of wire-frame structure with 3D truss and frame elements. The students are required to complete his/her own program with the basic knowledges obtained in the class. The analysis results by the developed program are requested to be verified by any structural analysis software. The cable structures is also included in the coursework with the formulation of elastic catenary cable element. The calculation of buckling load and assessment of stability problem for elastic beam-column in steel structures is also covered.

The main goals of the course are:

1) Understanding a direct stiffness procedure in computer-assisted structural analysis
2) Developing programming skills and securing a own structural analysis program which can be extended to students' master and doctorial research activities
3) Understanding modeling technologies of structures and increasing analysis capacity and enhancement in use of structural analysis softwares
4) Practice the modeling of cable-supported bridges
5) Understanding stability of steel structure and calculation of buckling loads

2. Texts and References

Materials-Computer-Assisted Structural Analysis and Modeling-Marc Hoit-Prentice Hall-1995

3. Evaluation

Attendance(%)	Task(%)	Medium(%)	Final(%)	Random Evaluation(%)	Attitude(%)	Others(%)	Total(%)
10%	30%	30%	30%	0%	0%	0%	100%

Attendance Policy : Students who are absent for over 1/3 of the class will receive a grade of 'F' or 'U' for the course. (Exceptions can be made when the cause of absence is deemed unavoidable by the course instructor.)

Remark of Others :

4. Lecture Plan

[1 Week]
.Course description
.Fundamentals of displacement method
-Stiffness by definition
[2 Week]
.Direct stiffness
-Stiffness by direct stiffness
-Stiffness matrices for 2D/3D truss/frame elements
-Direct stiffness assemblage
[3 Week]
.Direct stiffness
-Beam element loads
-Force recovery
[4 Week]
.Solvers
-Gauss elimination, bandwidth and numbering sequence
[5 Week]
.Formulation of special modeling
-End release, Shear deformation
-Semi-rigid connections, Rigid end offsets, Symmetry and antisymmetry
[6 Week]
.Geometric stiffness: P-Δ
[7 Week]
.Mid-term exam
[8 Week]
.Cable structures
-Cable equations (Parabolic vs Catenary)
-Equivalent modulus
-Elastic catenary cable element
[9 Week]
.Static modeling of cable-supported bridge
-Shape-finding analysis of suspension bridge
-Modeling of deck
-Modeling of cable
[10 Week]
.Dynamic modeling of cable-supported bridge
-Mass matrix
-Natural frequency and mode shapes
[11 Week]
.Elastic buckling of planar columns
-Differential equations and solutions
[12 Week]
.Elastic buckling of planar columns
-Effect of imperfections
-Stability of rigid frames
[13 Week]
.Beam-columns
-Elastic limit interaction relationships
[14 Week]
.Lateral-torsional buckling
-Beam subjected to uniform moment
[15 Week]
.Final exam.

5. Guideline for Students

6. Support Services for Students with Disabilities

For Lectures	○ Visual Impairment: Make textbooks(digital textbook, braille textbook, enlarged textbook etc.), Allow note takers ○ Physical Disability: Make textbooks (digital textbook), Allow note takers and assistants ○ Hearing Impairment: Allow note takers and translators, Allow lecture recording ○ Health Impairment: Excuse absence due to health problems, Allow note takers ○ Learning Disability: Allow note takers ○ Intellectual Disability / Autism Spectrum Disorder: Allow note takers and mentors
For Assignments & Evaluations	○ Visual Impairment / Physical Disability / Hearing Impairment / Health Impairment / Learning Disability: Extend assignment deadlines, Offer alternate assignment submission and response method, Extend testing period, Offer alternate testing method, Offer different testing room ○ Intellectual Disability / Autism Spectrum Disorder: Offer individualized assignments and alternative evaluations
Others	Students who take this course can get appropriate level of support service including the support listed above depending on the students' individual characteristics and needs through consultation with professors and the Support Center for Students with Disabilities. If you have any questions concerning support service for students with disabilities you can contact Professor Kim, Ho-Kyung(02-880-7365) or Support Center for Students with Disabilities (02-880-8787).