Hokkaido University Syllabus					
Course Title					
Advanced Continuum and Discontinuum Mechanics					
Subtitle					
English					
Instructor (Institution)					
Shusaku HARADA (Faculty of Engineering)					
Other Instructors (Institution)					
Shusaku HARADA (Faculty of Engineering)					
Course Type				Open To Other Faculties / Schools	OK
Year	2020	Semester	2nd Semester (Fall Term)	Course Number	092929
Type of Class	Lecture	Number of Credits	2	Year of Eligible Students	～
Eligible Department / Class				Other Information	
Numbering Code	ENG_CPRE 6801				
Major Category Code	Major Category Title				
ENG_CPRE	Engineering_Cooperative Program for Resources Engineering				
Level Code	Level				
6	Specialized Subjects (advanced) in graduate level (Master's Course and Professional Course)				
Middle Category Code	Middle Category Title				
8					
Small Category Code	Small Category Title				
0					
Language Type					
Classes are in English.					
Course list by the instructor with practical experiences					

Key Words

Numerical simulation, Transport phenomena, Advection, Diffusion

Course Objectives

The aim of this course is to provide fundamental knowledges on numerical simulation of continuum and discontinuum dynamics to students who are not familiar with this field. Basic equations of mass, momentum and energy transport are introduced along with an overview of recent development in numerical simulation. Each student must make a presentation to show his/her simulation result related to transport phenomena.

Course Goals

Basic knowledge of numerical simulation techniques for transport phenomena of mass, momentum and energy

Course Schedule

1) Mathematical review (3)
Vector, Tensor analysis, differential equation, normalization of equation
2) Time developing and descretization schemes (3)
Explicit and implicit methods, descretization schemes for advection and diffusion
3) Numerical scheme of differential equations (3)
Numerical scheme of advection, diffusion, Laplace and Poisson equations
4) Derivation of government equation of fluid flow (2)
After setting up cell balance of momentum, the differential equations of flow are derived.
5) Simulation methods of fluid flow (3)
Fractional step, SMAC, boundary condition, methods for solving fluid flow
6) Presentation of a simulated result by each student (1)
Each student makes a presentation to explain his/her result of simulation in the class.

Homework

One hour preparation for each class

Grading System

Based on results of presentation (difficulty and quality)

Practical experience and utilization for classes

Condition of tasking the subject

Textbooks

Handouts made by the course instructor will be distributed

Reading List

Transport Phenomena / R.B. Bird et al. : John Wiley & Sons. Inc., 2002, ISBN:0471364746

Websites

Website of Laboratory

Additional Information

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