



2020학년도 2학기 강의계획안

교과목명 Course Title	Numerical Differential Equations	학수번호-분반 Course No.	G10752-01
개설전공 Department/Major	Mathematics	학점/시간 Credit/Hours	3/3
수업 시간/강의실 Class Time/room	Wednesday, 12:30~3:30. SciComplex A315		
담당교원 Instructor	Name: June-Yub Lee	Department: Mathematics	
	E-mail: jyllee@ewha.ac.kr	Office Phone: 02-3277-3451	
면담 시간/장소 Office Hour/room	Mon 2PM at SciComplex A324 OR appointment by e-mail		

I. 교과목 정보 Course Overview

1. 교과목 개요 Course Description

미분방정식의 수치 방법에 대하여 다룬다. 초기치 문제, Stiff 문제, 경계치 문제, 편미분방정식에 대한 well-posed 초기치 문제 등을 중심으로 한다. Norm의 선택과 안정성에 관한 정의, 유한차분법에 대한 Fourier 방법과 energy 방법 등을 논의하며 유한요소법도 다룬다.

2. 선수학습사항 Prerequisites

Ordinary differential equation. Numeral methods. (Preferred but required)

3. 강의방식 Course Format

강의 Lecture	발표/토론 Discussion/Presentation	실험/실습 Experiment/Practicum	현장실습 Field Study	기타 Other
70 %	%	30 %		%

(위 항목은 실제 강의방식에 맞추어 변경 가능합니다.)

강의 진행 방식 설명 (explanation of course format):

- Classroom lecture with numerical programming exercises.
- Online lecture via 'zoom' if enforced by the authorities.

4. 교과목표 Course Objectives

Numerical Solutions of Ordinary Differential Equations : Initial Value Program, Stiff Systems, Boundary Value Problems, Well-posed Initial Value Problems for Partial Differential Equations. The Choice of norms and Stability definitions. The Fourier and energy method for finite difference Schemes. Discussion of finite element methods.



5. 학습평가방식 Evaluation System

중간고사 Midterm Exam	기말고사 Final Exam	퀴즈 Quizzes	발표 Presentation	프로젝트 Projects	과제물 Assignments	참여도 Participation	기타 Other
%	60 %	%	%	%	40 %	%	%

(위 항목은 실제 학습평가방식에 맞추어 변경 가능합니다.)

*그룹 프로젝트 수행 시 팀원평가(PEER EVALUATION)이 평가항목에 포함됨. Evaluation of group projects may include peer evaluations.

평가방식 설명 (explanation of evaluation system):

- Homework or Computational Project : 4-5 times (40%)
- Final Examination : Theory and basic idea methods (60%)

II. 교재 및 참고문헌 Course Materials and Additional Readings

1. 주교재 Required Materials

Michael Celia(MIT/Princeton) and William Gray(Notre Dame), Numerical methods for differential equations, fundamental concepts for scientific and engineering applications. Prentice Hall. [PDE+FDM/FEM]

2. 부교재 Supplementary Materials

Robert Schilling and Sandra Harris(Clarkson), Applied numerical methods for engineers (using Matlab and C), Brooks/Cole, 2000. [Basic Numerical Tools]

John Strikwerda(Wisconsin), Finite Difference schemes and PDEs, Wadsworth & Brooks / Core, 1989. [Finite difference method]

Charles Hall and Thomas Porsching(Pittsburgh), Numerical Analysis of PDEs, Prentice Hall, 1990. [Finite element method / Analysis]

3. 참고문헌 Optional Additional Readings

Tikhonov and Samarskii, Eqs of Mathematical physics, Dover, 1963(1990) [PDE]

Sobolev, PDEs of Mathematical physics, Dover, 1964(1989) [PDE]

III. 수업운영규정 Course Policies

- * 실험, 실습실 진행 교과목 수강생은 본교에서 진행되는 법정 '실험실안전교육(온라인과정)'을 필수로 이수하여야 함.
- * For laboratory courses, all students are required to complete lab safety training.



IV. 차시별 강의계획 Course Schedule (최소 15주차 강의)

주차	날짜	주요강의내용 및 자료, 과제(Topics & Class Materials, Assignments)			
Weeks	Dates	Topic	Text Book Chapters	Pages	Notice
1~3	9/2(W) ~ 9/16(W)	Partial differential equation	1.1 Physical systems 1.2 Defs and Eqs Properties 1.3 Characteristics and BC	1-43	
4~6	9/23(W) ~ 10/7(W)	Finite difference approximation (one-dimensional FDM)	2.1 Discrete approximations 2.3 Analysis of approximation 2.4 Generalized Formulation 2.6 Initial Value Problems	44-90	9/30 (추석)
7~8	10/14(W) ~ 10/21(W)	Finite difference approximation (Multi-dimensional FDM)	2.7 Multi-dimensional problems 2.8 Two dimensional examples	91-108	
9	10/28(W)	-	Review	-	
10~12	11/4(W) ~ 11/18(W)	Finite Element approximation (Theoretical basis)	3.1 Weighted residuals 3.3 Computation Procedures 3.4 Mathematical requirements	114-165	
13~14	11/25(W) ~ 12/2(W)	Finite Element approximation (Computational Methods)	3.5~3.6 Method of weighted residuals in 2D/3Ds 3.7 Galerkin Finite Element method	166-177	
15	12/9(W)	Miscellaneous Topics	4.3 Space-Time Discretization	242-254	
16	12/16(W)	Final Exam Week	Final (Written) Exam	-	12/16 (Final Exam)
Makeup Classes	Date Place				



V. 참고사항 Special Accommodations

* 장애학생은 학칙 제57조의3에 따라, 학기 첫 주에 교과목 담당교수와의 면담을 통해 출석, 강의, 과제 및 시험에 관한 교수학습지원 사항을 요청할 수 있으며, 요청한 사항에 대해 담당교수 또는 장애학생지원센터를 통해 지원받을 수 있습니다. 강의, 과제 및 평가 부분에 있어 가능한 지원 유형의 예는 아래와 같습니다.

강의 관련	과제 관련	평가 관련
<ul style="list-style-type: none"> · 시각장애 : 점자, 확대자료 제공 · 청각장애 : 대필도우미 배치 · 지체장애 : 휠체어 접근이 가능한 강의실 제공, 대필도우미 배치 	<ul style="list-style-type: none"> · 제출일 연장, 대체과제 제공 	<ul style="list-style-type: none"> · 시각장애 : 점자, 음성 시험지 제공, 시험시간 연장, 대필도우미 배치 · 청각장애 : 구술시험은 서면평가로 실시 · 지체장애 : 시험시간 연장, 대필도우미 배치

- 실제 지원 내용은 강의 특성에 따라 달라질 수 있습니다.

* According to the University regulation section #57-3, students with disabilities can request for special accommodations related to attendance, lectures, assignments, or tests by contacting the course professor at the beginning of semester. Based on the nature of the students' request, students can receive support for such accommodations from the course professor or from the Support Center for Students with Disabilities (SCSD). Please refer to the below examples of the types of support available in the lectures, assignments, and evaluations.

Lecture	Assignments	Evaluation
<ul style="list-style-type: none"> · Visual impairment : braille, enlarged reading materials · Hearing impairment : note-taking assistant · Physical impairment : access to classroom, note-taking assistant 	<ul style="list-style-type: none"> · Extra days for submission, alternative assignments 	<ul style="list-style-type: none"> · Visual impairment : braille examination paper, examination with voice support, longer examination hours, note-taking assistant · Hearing impairment : written examination instead of oral · Physical impairment : longer examination hours, note-taking assistant

- Actual support may vary depending on the course.

* 강의계획안의 내용은 추후 변경될 수 있습니다.

* The contents of this syllabus are not final—they may be updated.