Course Category	TBA	Credits	2
Subject Code	TBA	Taking Year	1st Grade, 2nd Grade
Course Title (Japanese)	微分方程式と有限差分法	Course Period	2nd Semester
Course Title	Finite Difference Methods for Differential Equations	Day of the week / Hour	Wednesday / The second period
Registration Code	TBA	Compulsory / Elective	Elective
Instructor(s)	Mayuko Iwamoto	Course Qualification	Students of Postgraduate Mathematics Course

Course Style	Lecture
Course Aim	Differential equations are useful to describe various phenomena in nature, and it is important to solve these equations for understanding these phenomena. Nonlinear Differential equations, which are introduced by complex phenomena, however, are not always solvable. Hence, numerical method is absolutely necessary to realize mathematical approach. We give an introduction of numerical methods for differential equations, Finite Difference Method (FDM), with physical and chemical examples.
Goals and Objectives (Level of Achievement)	To acquire knowledge of Finite Difference Method To understand the features of explicit and implicit method To acquire how to use FDM in numerical calculations
Course Plan	1. Introduction of nonlinear phenomena and models 2. Introduction of Finite-Difference Methods (FDM) 3. Initial value problem for ODE: Euler method 4. Initial value problem for ODE: Runge-Kutta method 5. Introduction of Boundary Condition 6. Introduction of heat equations (Diffusion problem) 7. Explicit difference scheme for heat equations 8. Crank-Nicolson method 9. Explicit difference scheme and stability 10. Implicit difference scheme 11. ODE for Chemical Reaction 12. Nonlinear chemical reaction and numerical solutions 13. PDE: Reaction diffusion equations 14. Reaction diffusion models and Instability induced by diffusion 15. Numerical calculation for PDE 16. Evaluation
Teaching Methods	There will be exercises of programing with a computer.
Key Words	Numerical method, Ordinary differential equation, Partial differential equation
Texts	None
Reference Books	Some references are given in class.
Other Teaching Materials	There will be lecture notes available.
Performance Evaluation	Grading is based up on some reports.
Notes on the Course	It is recommended to bring your personal computer (note PC) if you have it.
Office Hour	Wednesday, 14:30-16:00
Other Notes	None