

Course Category	TBA	Credits	2
Subject Code	TBA	Taking Year	1 <sup>st</sup> Grade, 2 <sup>nd</sup> Grade
Course Title (Japanese)	楕円型偏微分方程式論	Course Period	2 <sup>nd</sup> Semester
Course Title	Elliptic partial differential equations	Day of the week / Hour	Monday / The third period
Registration Code	TBA	Compulsory / Elective	Elective
Instructor(s)	Toshihiro Nakanishi	Course Qualification	Students of Postgraduate Mathematics Course

Course Style	Lecture
Course Aim	This lecture explains several ways to approach the boundary value problems for Laplace equation in plane domains.
Goals and Objectives (Level of Achievement)	The participants are expected to master potential theoretic methods to Dirichlet problems at the end of the course.
Course Plan	<ol style="list-style-type: none"> <li>1. Introduction – Dirichlet problems</li> <li>2. Harmonic functions and their basic properties</li> <li>3. Poisson integral, Dirichlet problem on a disk</li> <li>4. Superharmonic functions and subharmonic functions</li> <li>5. Perron families and solutions to Dirichlet problems</li> <li>6. Barrier and the Wiener test</li> <li>7. Green functions</li> <li>8. Harmonic measures</li> <li>9. Relation of conformal mappings to boundary problems</li> <li>10. Conformal mappings to canonical domains</li> <li>11. Normal families and Montel's theorem</li> <li>12. The Riemann mapping theorem</li> <li>13. Boundary correspondence, Caratheodory's theorem</li> <li>14. Conformal mappings of multiply connected domains</li> <li>15. Moduli of doubly connected domains</li> </ol>
Teaching Methods	The lectures mainly rely on Aikawa's textbook. Certain portion of the time is devoted to exercises.
Key Words	Laplace equations, Dirichlet problems, Harmonic functions, Conformal Mappings
Texts	[1] H. Aikawa, Dirichlet problems on Non-smooth Domains, Iwanami (Japanese). [2] L. L. Helms, Introduction to Potential Theory, Wiley Science.
Reference Books	L. V. Ahlfors, Complex Analysis, McGraw-Hill
Other Teaching Materials	Handouts and other teaching materials are given as needed.
Performance Evaluation	Grading will be based on class attendance and reports.
Notes on the Course	Prerequisite for this course is knowledge of basic calculus of functions in real and complex variables.
Office Hour	Tuesday 16:15-17:45, Room 720 of Bldg 1 of Faculty of Sci. and Tech.
Other Notes	None