Syllabus 2018 Computer and Mathematical Sciences

Theory of Differential Equations

Japanese

Basic information

held this year:	yes
instructor(s)	Prof. Kazuyuki Tanaka
room	Middle Lecture Room, Second Floor of the Building of Graduate School of Information Sciences
schedule	The first half year (Wednesday) 10:30–12:00
begins on:	04/11

Objectives and outline

1. The differential equations play a very important role in physics and engineering. In this lecture, sutudents study some ordinary differential equations of a complex variable, some partial differential equations and the method of Green's function on the basis of the contents studied in the undergraduate course for the differential equations.
2. The main topics are as follows : integral representations of solutions for second order ordinary differential equations of a complex variable, partial differential equations, heat equations, Laplace's equation, Poisson's equation, the eigenvalue problem of partial differential equations and related Green's function method and so on.
3. Students study those topics by keeping application to engineering in mind, along with their fundamental concepts.

Class plan

1st Linear ordinary differential equations of second order and solutions in power series I
2st Linear ordinary differential equations of second order and solutions in power series II
3nd Legendre's equation and solutions in power series
4rd Bessel's equation and solutions in power series
5th Hypergeometric and confluent hypergeometric equations
6st Integral representation of solutions of linear ordinary differential equations of second order
7th Integral representation of solutions of Legendre's equation
8th Integral representation of solutions of Bessel's equation
9th Integral representation of solutions of hypergeometric equation
10th Integral representation of solutions of confluent hypergeometric equation
11th Fundamental properties of Green's function
12th Green's function of Laplace equations and Poisson's equations
13th Green's function of Helmholtz equations
14th Green's function of Sturm–Liouville equations
15th Summary and Examination

Evaluation

Evaluation is performed comprehensively based on final examinations (80%) and submitted reports(20%).

Textbook(s)

1) E. T. Whittaker and G. N. Watson: A Course of Modern Analysis, Cambridge University Press.
2) R. Courant and D. Hilbert: Methods of Mathematical Physics (Wiley Classics Library), John Wiley & Sons.

Web site

Webpage of the present class http://www.smapip.is.tohoku.ac.jp/~kazu/ODE/2018/
Lecture Note (in Japanese)
http://www.smapip.is.tohoku.ac.jp/~kazu/PhysicalFluctuomatics/2018/PhysicalFluctuomatics2018.pdf

Office hours

Students should visit the office after taking an appointment by e-mail (kazu [at mark] smapip.is.tohoku.ac.jp).

Other information

Differential and integral calculus, complex analysis and Fourier analysis are necessary as background knowledge. This lecture is presented in Japanese.

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