

Preface

For more than 15 years, I have been lecturing about environmental engineering to master's degree students specializing in engineering and science. Probably because the school I work for is an interdisciplinary graduate school, the background the students acquired during their undergraduate years ranges widely, from mechanical, civil, and architectural engineering to pure science such as physics and applied mathematics, and even to architectural design. On the question of what a graduate student who starts studying environmental issues must learn, I would like to say it is not so widely diverse but, rather, is narrow. It comprises fundamental knowledge of how one mathematically builds the so-called physical balance equations on transferring heat, mass, and momentum, which are usually dealt with in heat and mass transfer theory and fluid dynamics, and also how one achieves practical solutions through a series of numerical procedures, which may be crucially important when he or she becomes a working engineer. I have noticed that, unfortunately, there is not a very appropriate book for students at the master's degree level, while many specialized books for research fellows including Ph.D. students have been published. This is because the fundamentals span several fields, as mentioned above. Therefore, this book brings together all the topics I believe that students at the master's level should know to start studying environmental subjects.

The course for which I am responsible was revised a couple years ago. The new lecture series, entitled "Mathematical Analysis of Environmental System," is given entirely in English. Ironically, I have found it necessary to prepare a Japanese book to make it possible for Japanese students to understand and to be able to learn on their own even if they can understand none of what I am saying in the classroom. Now, to my great pleasure, it has been possible to publish an English version. That is exactly how this book came about. Readers of the whole text will, I hope, appreciate the usefulness of this book.

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