

Preface

A course on Mathematical Techniques for Engineers does not have a well-defined scope. What the so-called mathematical techniques needed by a well-trained engineer might be is clearly a matter of controversy. There is a direct relation between the mathematics one knows and the mathematics one is likely to use. In other words, it is often the case that the knowledge leads to the usage, rather than the other way around, as many believe. Why is it so? Because if you do not know a mathematical concept (the notion of characteristic lines, for example) you are unlikely to realize that you may need it (to describe shock waves or traffic flow, say), no matter how long you witness the phenomena (sonic booms, traffic jams) or how smart you are.

The question, therefore, is not so much what to include in a course of this nature, but why should one leave out entire mathematical sub-disciplines (graph theory, topology, functional analysis, and so on). It has become a tradition, however, in most engineering schools to expect that engineering students be exposed to at least one course on partial differential equations (PDEs), these being the backbone of various fundamental disciplines (solid mechanics, fluid mechanics, thermodynamics, electromagnetism, control of systems with distributed parameters, gravitation, etc.)

There are many excellent, even outstanding, texts and treatises on PDEs at a variety of levels. On the other hand, when a few years ago I was given the task of lecturing a graduate course on Mathematical Techniques for Engineers, a course that I am still in charge of, I found it both convenient and necessary to develop a set of class notes that would serve as a common foundation while letting each student find the book or books best suited to his or her style of learning and depth of interest. This policy has been amply rewarded by comments from the students themselves over the years. In publishing these notes, barely edited so as to preserve some of the freshness of a class environment, I hope that engineering students in other institutions may find in them some intellectual stimulus and enjoyment.

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