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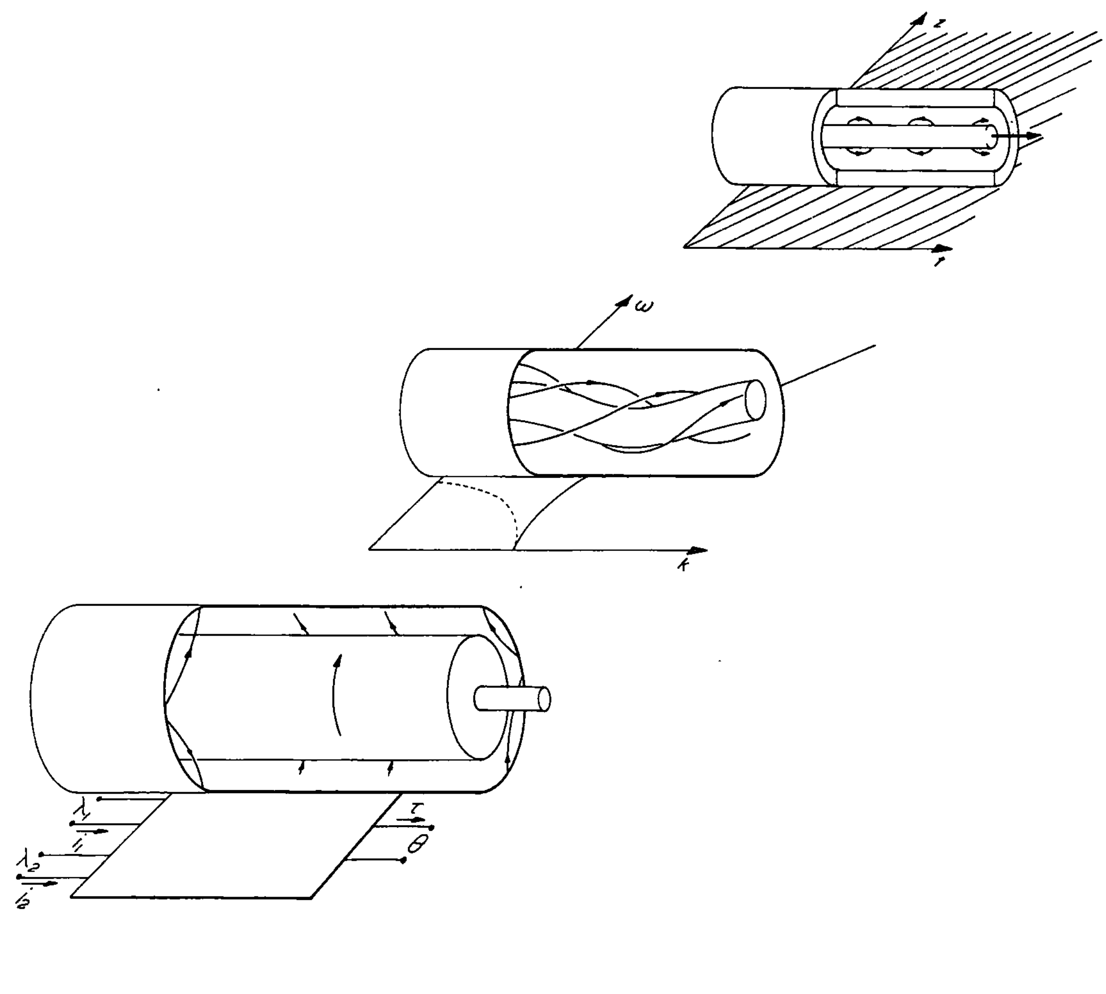
Introduction to Continuum Electromechanics



CONTINUUM ELECTROMECHANICS Used as a Text

Much of Chap. 2 is a summary of relevant background material and care should be taken not to become mired down in the preliminaries. The discussion of electromagnetic quasistatics in the first part of Chap. 2 is a "dry" starting point and will mean more as later examples are worked out. After a brief reading of Secs. 2.1-2.12, the subject can begin with Chap. 3. Then, before taking on Secs. 3.7 and 3.8, Secs. 2.13 and 2.14 respectively should be studied. Similarly, before starting Chap. 4, it is appropriate to take up Secs. 2.15-2.17, and when needed, Sec. 2.18. The material of Chap. 2 is intended to be a reference in all of the chapters that follow.

Chapters 4-6 evolve by first exploiting complex amplitude representations, then Fourier amplitudes, and by the end of Chap. 5, Fourier transforms. The quasi-one-dimensional models of Chap. 4 and method of characteristics of Chap. 5 also represent developing viewpoints for describing continuum systems. In the first semester, the author has found it possible to provide a taste of the "full-blown" continuum electromechanics problems by covering just enough the fluid mechanics in Chap. 7 to make it possible to cover interesting and practical examples from Chap. 8. This is done by first covering Secs. 7.1-7.9 and then Secs. 8.1-8.4 and 8.9-8.13.

The second semester, is begun with a return to Chap. 7, now bringing in the effects of fluid viscosity (and through the homework, of solid elasticity). As with Chap. 2, Chap. 7 is designed to be materials collected for reference in one chapter but best taught in conjunction with chapters where the material is used. Thus, after Secs. 7.13-7.18 are covered, the electromechanics theme is continued with Secs. 8.6, 8.7 and 8.16.

Coverage in the second semester has depended more on the interests of the class. But, if the material in Sec. 9.5 on compressible flows is covered, the relevant sections of Chap. 7 are then brought in. Similarly, in Chap. 10, where low Reynolds number flows are considered, the material from Sec. 7.20 is best brought in.

With the intent of making the material more likely to "stick", the author has found it good pedagogy to provide a staged and multiple exposure to new concepts. For example, the Fourier transform description of spatial transients is first brought in at the end of Chap. 5 (in the first semester) and then expanded to describe space-time dynamics in Chap. 11 (at the end of the second semester). Similarly, the method of characteristics for "first-order" systems is introduced in Chap. 5, and then expanded in Chap. 11 to wave-like dynamics. The magnetic diffusion (linear) boundary layers of Chap. 6 appear in the first semester and provide background for the viscous diffusion (nonlinear) boundary layers of Chap. 9, taken up in the second semester.

This Solutions Manual gives some hint of the vast variety of physical situations that can be described by combinations of results summarized throughout the text. Thus, it is that even though the author tends to discourage a dependence on the text in lower level subjects (the first step in establishing confidence in field theory often comes from memorizing Maxwell's equations), here emphasis is placed on deriving results and making them a ready reference. Quizzes, like the homework, should encourage reference to the text.