Kinetics Methods Classification

G ETTING THE SOLUTION of the space time kinetics equations presents enormous difficulties. For example a complete spatial solution must be found at each time step. Obviously, numerical methods, and very well optimized at that, will have to be used. Computers resources with large memory capacity and fast processors will be necessary.

Obviously, various approximate methods have been invented over the years. The study of these methods, from the simplest to the most complex will constitute the major part of this course. However, in order to understand the approximations, we will adopt a general point of view, with an appropriate mathematical formalism. The introduction of basic numerical integration techniques will also be necessary, since it is impossible to deal in any other way with event the simplest approximations.

The solution methods can be classified along very general categories, which we describe here.

Separation of Variables

The idea behind these methods is to separate the neutron flux into two components, one of space, one of time, using prescriptions that are more or less complicated. We find in this category:

- Point Kinetics
- Adiabatic method
- Quasi-static method

Synthesis Methods

- Modal Expansion
- Space-Time Synthesis
- Nodal method of Avery

Direct Methods

- Finite differences (and other space discretisations) in space and time

In the following chapters, many of these methods will be examined in enough detail to gain a general understanding of them, of their strengths and limitations.