

### 3.9 Unsteady or quasi-steady neutronics

The preceding sections in this chapter referred to steady state calculations, and therefore some mention of the corresponding time dependent processes should be made before concluding this brief introduction to reactor core neutronics. Clearly, it is important to consider the growth or decay rates for the neutron flux when the reactor becomes supercritical or subcritical. This is needed not only in order to design control systems for the reactor but also to evaluate scenarios that would follow reactor transients or accidents. There are two sets of unsteady perturbations that are commonly considered: (1) perturbations caused by changes in the reactor core neutronics, for example the insertion or withdrawal of control rods or (2) perturbations caused by changes in the thermohydraulic conditions such as change in the power level. The former perturbations are governed by what are called the *nuclear reactor kinetics*, whereas the latter are termed the *nuclear reactor dynamics*. The latter therefore involve the response of the entire plant including the steam generators and are not further discussed in this text. Instead attention will be confined to the nuclear reactor kinetics.