Summary:

In food technology, investigation of food composition and characteristics is very important not only to find the suitability of use for a particular application in food industry, but, also to comply with the government regulations. Trends and demands of consumers, food industries as well as national and international regulations have made it challenging for researchers who work for food analysis to ensure its quality and safety. Every food processing and production sector has, therefore, made it mandatory to conduct a quality management programme throughout the development and production process. The analysis of both physical properties and chemical composition is carried out in order to find nutritive value, functional characteristics and acceptability of the food product. Several analytical techniques have been developed and endorsed by different non-profit scientific organisations for quantitative and qualitative determinations, to identify the presence of any bioactive compound and/or a physical, biological or chemical hazard.

This module has been developed to describe some of the more advanced instrumental methods which may be used for the determination of nutrients, major ions and trace elements, together with the analytical techniques for total, inorganic and organic carbon. Some of these techniques are particularly useful for the detailed analysis of sediments, particularly those that are suspended and for the chemical analysis of biota. The different kinds of techniques used in this regard are listed as below:

- Nuclear magnetic resonance spectroscopy (NMR).
- X-ray spectroscopy (XRS).
- Atomic absorption spectroscopy (AAS).

- Flame photometry (FP).
- Gas chromatography (GC).
- High performance liquid chromatography (HPLC), etc.

All the techniques are known for their diverse as well as specific applications in different fields of food technology. Although these techniques have been classified here as "advanced instrumental analysis" some, such as flame photometry, do not require expensive equipment and are often reliable and appropriate methods for some specific application like water quality monitoring. The nature of the sample and specific reason for analysis commonly dictate the choice of analytical methods. The success of any analytical method relies on proper selection and preparation of the food sample, carefully performing the analysis, appropriate calculations and interpretation of data.

The nuclear magnetic resonance spectroscopy (NMR) has been discussed in detail in this chapter, including the principles involved, instrumentation and the applications in food industry and other sectors as well.