Currently there is no nationally recommended protocol for performing monitor unit calculations. In 1997, the European Society for Therapeutic Radiology and Oncology (ESTRO) published the IAEA's recommendations for photon beam calculations. Although highly detailed, this document is limited to photon calculations on the central axis, and does not cover asymmetric fields, dynamic wedges or multileaf collimators. Furthermore, it is likely that the ESTRO methodology is scarcely utilized within this country, due to its extensive use of new nomenclature and lack of formal AAPM endorsement.

Recognizing the need for the practicing clinical physicist to perform these calculations, the Southeast Chapter of the AAPM sponsored a monitor unit calculation symposium in the spring of 1999. The proceedings of this symposium and the ensuing discussions have been recently published in the book Monitor Unit Calculations for External Photon and Electron Beams (Advanced Medical Publishing, 2000). Contributors from ten different clinics imparted their expertise in specific aspects of monitor unit calculations. Rather than recommending a standard formalism, however, each contributor described the calculation method he uses in a specific clinical situation. Each chapter represents a review of the basic concepts for a particular type of treatment, and an example of the methodology currently in use in each contributor's department.

The objective of this course is to present an overview of the techniques presented in this book. For photon beams, the need for a single depth of normalization, regardless of the magnitude of this depth is emphasized. Also of primary importance is the need to separate phantom and collimator components of scatter. Monitor unit calculations performed in open fields will be discussed, including a review of the components of head or collimator scatter to the total dose. Photon calculations with fields modified with physical attenuators, dynamic wedges and/or multileaf collimators will be discussed. For these modified fields, the influence of field size, depth and SSD must be considered. The determination of monitor units for asymmetric fields will be reviewed, along with calculations in the presence of tissue heterogeneities. Calculations for electron beams will also discussed, including irregularly shaped fields and/or those made at extended distances. Monitor unit calculations for some special procedures such as total body irradiation or total skin electron treatments will also be reviewed. However, calculations for intensity modulated radiation therapy will not be covered.

Finally, the need for a consistent national formalism will be discussed.

Educational Objectives:

1. To develop a basic understanding of the physics underlying dose calculations.
2. To understand the limitations of existing algorithms in handling new and/or complex field arrangements.
3. To become familiar with the magnitude of dosimetric parameters as well as their dependence on treatment variables.