Physics is the foundation science of both diagnostic imaging and radiation oncology. Therefore, an extensive knowledge is required for effective and safe use in both types of clinical applications. This knowledge of physics is needed by all medical professionals including medical physicists, physicians, and technologists. While this need applies to all clinical applications this course will concentrate on diagnostic imaging, the author's field of experience, and where there are some major changes, both challenges and opportunities, occurring.

Medical physicists serve two vital roles:one is the practice of clinical physics and the other is that of educator for all of the professions. This second role is often the most challenging for a number of reasons. These include limited time and resources for teaching and limited applied experience in all clinical applications, especially the different medical imaging methods. The overriding challenge is balancing and optimizing the relationship of *effectiveness* and *efficiency* of learning activities. Effective physics education is required to produce desired outcomes in clinical practice. A few examples include: optimized CT protocols, appropriate fluoroscopic practices, knowing the characteristics and limitations of all medical images, and much more. The most *efficient* learning activity, especially for the teaching physicist, is usually the traditional classroom where all learners are brought together for lectures and discussions. While classroom and conference sessions have considerable value for some topics and provide an opportunity for physicists to share their knowledge and experience with the other professionals such as radiology residents, there is a considerable barrier between the classroom activity and effective clinical applications.

The new paradigmthat is evolving, in somewhat varying forms and in different institutions, has the common goal of providing *effective* clinically -focused physics education within the constraints of time and resources that are available.The elements of this model include:

- Classroom instruction for selected general topics (image characteristics, radiation safety, etc.) early in an academic program. Here the learners get to know the medical physicist as a valuable professional resource and member of the clinical team. Also, medical physicists with primary experience in radiation oncology have the knowledge and experience to teach these general topics.
- Integration of applied physics learning throughout the clinical rotations. This is enhanced by the use of modality-specific web-based modules and support by the clinical faculty during various procedures and image interpretation sessions. The value of this is that it brings the learning of physics directly into the clinical environment where the learner can apply, observe, and interact.When physicists with imaging experience are available in the clinical environment they enhance the learning process as resources and consultants to both the clinical faculty and the residents.
- Small group discussion and study sessions, such as reviews for examinations. The physicists can provide structure and guidance for these activities and also be a major knowledge resource.

Each of these types of learning activities has specific characteristics with respect to their effectiveness in producing the required knowledge to enhance clinical applications. Also, each has its challenges and demands with respect to required resources. An appropriate goal is to have a comprehensive program that makes use of the value of each type of learning experience to produce imaging professionals that apply their knowledge of physics in clinical procedures.

<u>Learning Objectives</u>

1. Develop and understanding of the physics knowledge required for conducting effective and safe imaging procedures.
2. Describe a model of the learning process within the human brain as it relates to applied clinical physics.
3. Identify the various levels of learning that can occur and relate each to specific physics related activities.
4. Analyze various types of learning experiences with respect to their potential for producing clinically valuable physics knowledge.
5. Identify and use available resources to develop and conduct a comprehensive and effective educational program on clinically-focused- physics education.