SUBJECT:	Master's Thesis Presentation
BY:	Virginia Maniquis
TIME:	Friday, April 7, 2006, 4:00 p.m.
LOCATION:	Neely Building, Room 118
TITLE:	Monte Carlo Dose Verification of an X-ray beam in a Virtual Water Phantom
COMMITTEE:	Dr. Cassiano de Oliveira, Chair (NRE) Dr. Nolan E. Hertel (MRE) Dr. Tim Fox (NRE)

SUMMARY

Monte Carlo (MC) methods are widely accepted as the most accurate technique for calculating dose distributions in radiation therapy physics. Simulating the particle transport through the treatment head of a linear accelerator utilizing a MC based code is both a widespread and practical approach to determining detailed clinical beam characteristics such as the energy, angular and spatial distribution of particles which are needed to properly quantify dose. A particular and versatile MC code, the Monte Carlo N-Particle (MCNP) transport code, developed by Los Alamos National Laboratories, has been commonly used to model the dosimetry of ionizing radiations for medical physics applications. This thesis models a Varian 2100C linear accelerator (linac) and simulates the electron and photon transport through the primary components of the treatment head using MCNP5_1.3 and characterizes and validates the 6 MV photon spectra in a standard 10 x 10 cm2 field size for subsequent dose calculations in a Virtual WaterT phantom. The linac model can incorporate different beam energies to allow for dose computation of multiple beam treatments and determine dose distribution in phantoms for standard 6 MV treatment plans. The versatility of this MCNP model allows for any number of geometries and sources encountered in medical physics to be computed and applied fairly easily. Future studies will involve adding complex multi-leaf collimator beam shaping and calculating dose in voxelized human phantom models serving as a basis for potential studies involving MCNP modeling and its applications to dose optimization in medical physics applications.