PHYS 460 – ADVANCED TOPICS IN MAGNETIC RESONANCE IMAGING

Syllabus: The second semester for the imaging track addresses advanced topics such as electromagnetic coil and hardware design, parallel imaging, spectroscopy topics, sequence design and debugging, artifacts, fast imaging, diffusion imaging, blood flow and functional MRI (brain function), rf heating issues, chemical shift studies, and rf pulse design. Theoretical description is accompanied by specified examples of spin Hamiltonians.

Goals: This second semester is provided for the imaging track, and satisfies graduate requirements for a subject "cluster." The combination of this second semester with EBME/PHYS 431 is of special value to interdisciplinary students with overlapping interests in radiology, biomedical engineering and physics.

Prerequisite: EBME/PHYS 431

Typical Semester Weekly Subject Schedule:

1. Review of basic MR physics
2. MR hardware systems
3. Coil design and parallel imaging
4. Spectroscopy I
5. Spectroscopy II
6. Sequence design and debugging I
7. Sequence design and debugging II
8. Fat saturation techniques
9. Artifacts: identification and elimination (two weeks)
10. Rapid imaging sequences I
11. Rapid imaging sequences II
12. Applications: from blood flow to perfusion and tagging (two weeks)
13. RF pulse design