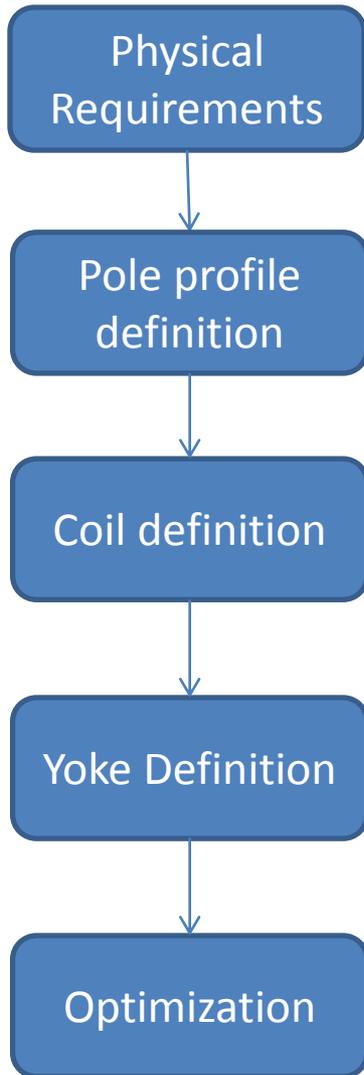


Summary

Mauricio Lopes – FNAL

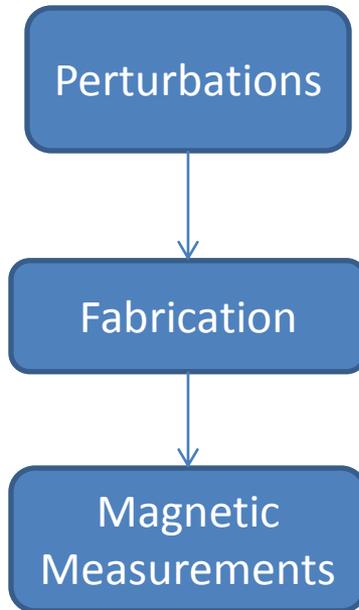


- Gap/Aperture
- Field requirements
- Field uniformity

- Total current
- Conductor definition
- Current density
- Coil cross-section

- Avoid saturation

- Meet the requirements while minimizing the overall size of the magnet
- Conformal map can help



- Mechanical specifications
- Predicts magnet alignment

- Fabrication techniques
- Production tests

- Magnet performance

Class Closure

- Although electromagnets with iron yokes is a small subset in the field, which includes superconducting magnets, magnets using permanent magnet material, fast pulsed magnets, the area covered in these lectures have ranged over a large spectrum of subjects.
- Fundamental mathematics derived from Maxwell's equations have been reviewed.
 - Properties of magnetic fields are derived from the understanding of these mathematics.
 - The electronics required to characterize magnetic measurements rely on these mathematics.
 - Theories which identify and quantifies the effects on magnetic fields of mechanical and electrical errors which are inevitable in the manufacture of magnets are discussed.
- Fabrication and assembly processes and principles which, if followed, assure good magnet performance in the synchrotron environment are reviewed.
- Principles which allow the computation of magnetic forces and electrical properties of magnets are reviewed.
- Previous versions of this class were provided by hardcopies of the lecture notes.
 - Although these lecture notes provide a good (if cryptic) reference for future work of the student in this broad field, the opportunity to write a book compiling and summarizing the past classes has been a huge, but rewarding effort.
 - The book format allowed the author to supplement the essential details of the principles of magnet design and fabrication with words which provide the color and texture and fills out the details left out in lecture notes.
- It is hoped that the course, along with book supplied with this course, will provide the student with the tools to perform a complete analysis and design of magnets which will be used in the future for the next generation of particle accelerators.