1	**Introduction / Organization** Historical introduction / Accelerator applications What is a beam?	2	**Phase Space, Emittance, and Brightness** Liouville's theorem Beam distributions / Moments
3	**Space Charge and Self-Fields** The uniform beam model (K-V) Perveance	4	**Particle Equations of Motion** Orbits and Optics / Centroid Equations Betatron motion / Twiss parameters
5	**The rms Envelope Equation** Equivalent beams Space-charge vs. emittance / Current Limits	6	**Focusing and Lenses / Matrix formulation** Lenses: Electric / magnetic Bending and dispersion
7	**Transverse Envelope Modes** Uniform Focusing Beam Halo / Emittance Growth	8	**Computation for Beams** Particle-in-cell models / Vlasov Codes Envelope / Moment codes
9	**Longitudinal Dynamics and Acceleration** Synchrotron oscillations Types of accelerators / RF / Induction Acceleration Cooling	10	**Periodic Lattices** Floquet's theorem Solenoids vs. alternating-gradient Courant-Snyder theory
11	**Beam Sources and Injectors** Thermionic / Field / Photo emission Secondary electrons and effects	12	**Radiation and Microwave Generation** Radiation processes Types of microwave devices Free Electron Lasers
13	**Circular Accelerators & Resonances**	14	**Experimental Techniques and Diagnostics**

ENEE 686 - Change of Classroom

Rm. 1207 Energy Research Building

(center of second floor)