1. **1998-2007 Catalog Data:** ChE 594-01 Special Topics in Chemical Engineering. Credits 3.

2. **Prerequisites by Topic:**
   - Undergraduate or Graduate Thermodynamics
   - Undergraduate Reactor Design
   - Undergraduate or Graduate Transport Phenomena
   - Undergraduate Course on Materials Science

3. **Textbooks:** No prescribed text book. Class notes, chapters from several books and handouts.

4. **Course Objectives:** Following this course students will:
   - Understand the concepts involved in the deposition of thin and thick films using various Chemical Vapor Deposition (CVD) methods.
   - Apply chemical kinetics (gas phase, gas-solid and plasma), thermodynamics and transport concepts to understand and design the chemical vapor deposition process.
   - Understand the nucleation and growth aspects of the vapor grown films, thin and thick films science.

5. **Topics Covered:**
   - Overall review of various CVD Systems and vacuum environments
   - Thermodynamic principles involved with gas phase and gas-solid systems in CVD reactors
   - Chemical kinetics of gas phase and gas-solid reactions
   - Chemistry of plasma systems
   - Transport considerations in CVD reactors
   - Thin and thick films science
     - Stresses in Films
     - Single crystal surfaces and epitaxy
     - Nucleation, Growth & Morphology
     - Texturing of polycrystalline films
     - Role of defects during growth and on the film properties
   - Laboratory assignments using CHEMKIN III & SAMPR programs (Licensed from Reaction Design, Inc. & NASA)
     1. Equilibrium analysis of gas phase reactions and gas-solid reactions
     2. Sensitivity and steady state analysis
     3. Modeling of plasma gas phase chemistry
     4. Written term paper in a proposal format

6. **Class Schedule:** Two lecture sessions per week, each of 75 minutes duration.

7. **Contribution of course to meeting the professional component:**
   - Fifth year and graduate elective course
   - Applications of chemical kinetics & transport processes to vapor phase materials synthesis
   - Focus on practical applications of CVD reactors, processes, electronic & amorphous materials

8. **Relationship of course to program objectives:**
   - Helps fulfill Program Outcomes

9. **Prepared by:** M.K. Sunkara  
   **Date:** May 2000