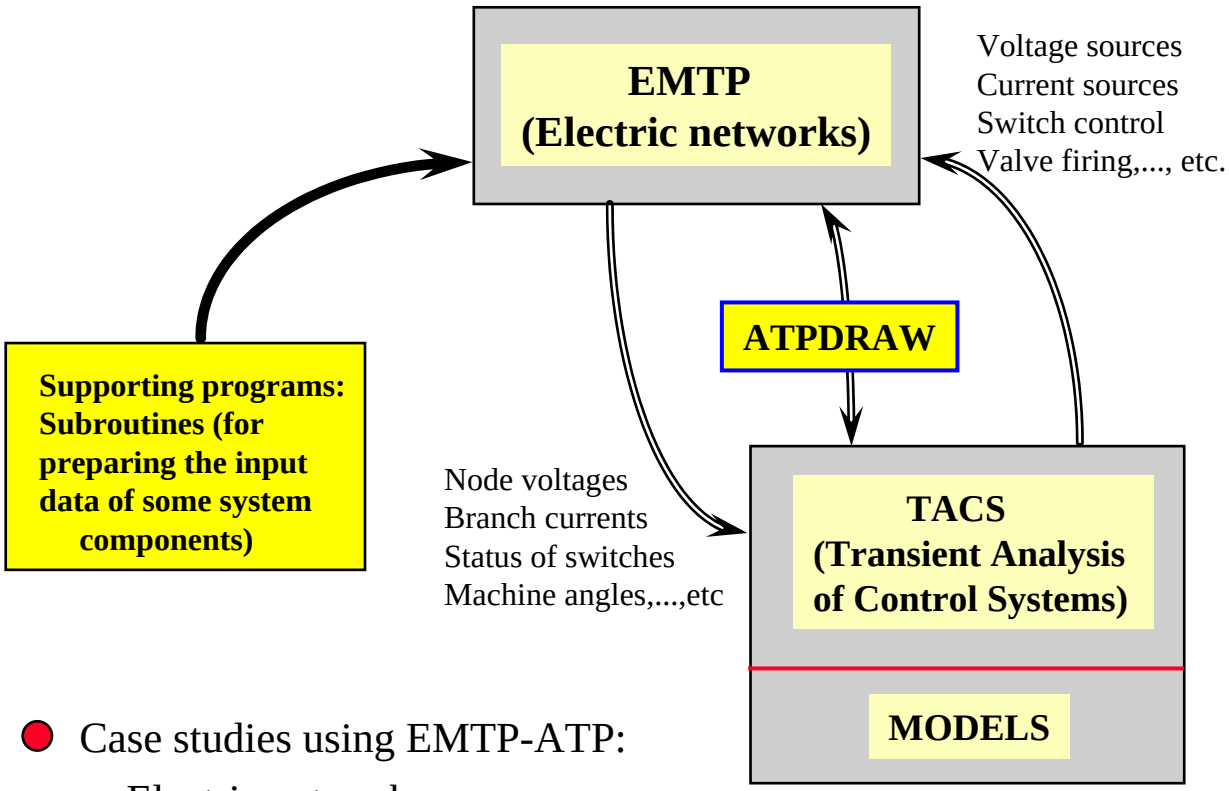
電力系統暫態分析
(Analysis of Power System Transients)

課程講義
(EE5750)

清華大學電機系：廖聰明

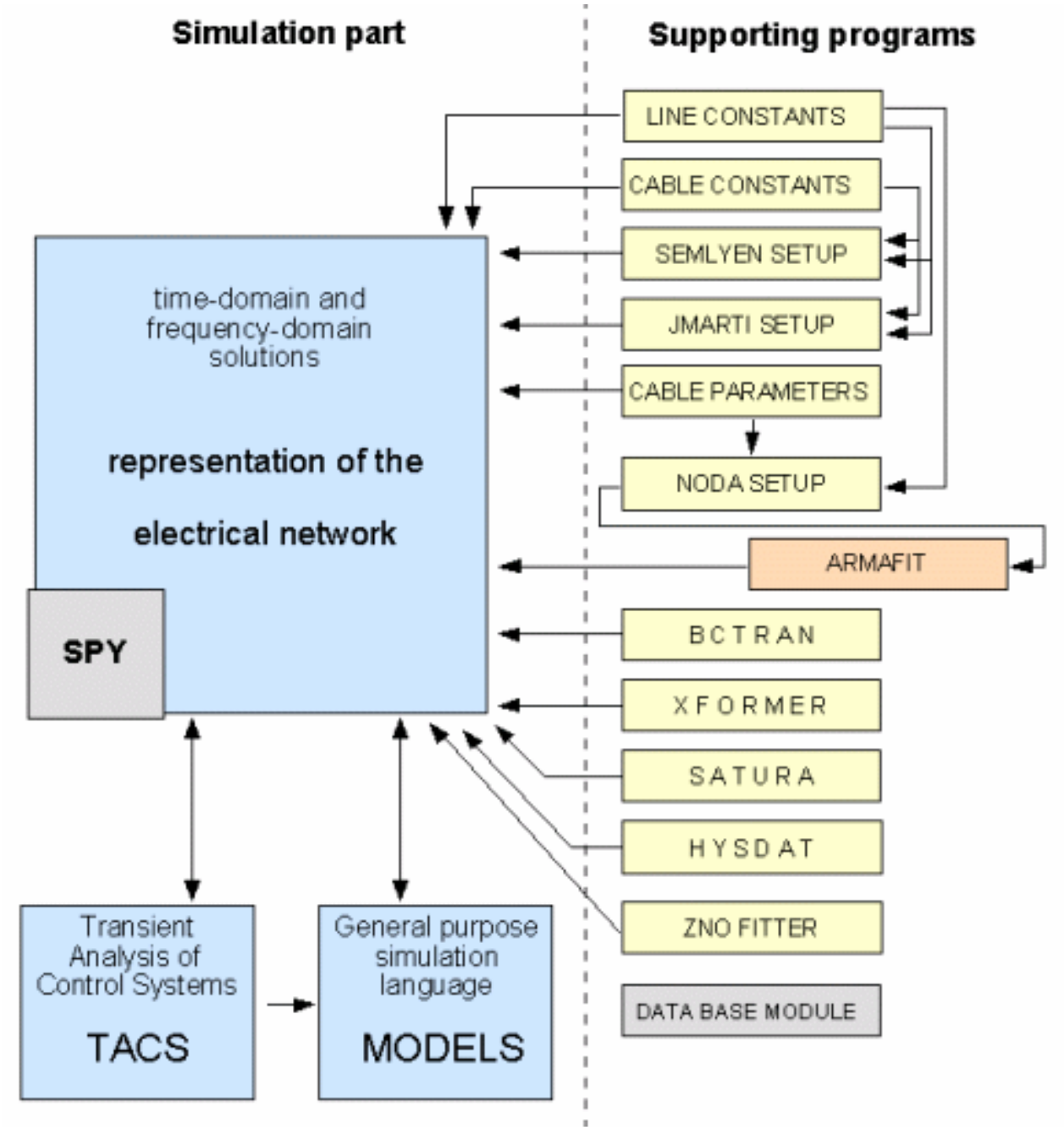
Analysis of Power System Transients (EE5750)

- Transients analysis: General theories
- Simulation tool: EMTP (Electro-Magnetic Transients Program)
  - Solution method
  - Modeling of system components
  - How to use EMTP
- The structure of EMTP



- Case studies using EMTP-ATP:
  - Electric networks
  - Power systems
  - Control systems
  - Power electronic circuits
  - Electromechanical systems

Structure of EMTP



Teaching materials (EE 5750):

- H. W. Dommel, Electro-Magnetic Transients Program (EMTP) Theory Book), 1986.
- Alternative Transients Program (ATP) rule book.
- EMTP 中文簡易使用手冊.
- Allan Greenwood, Electrical transients in power systems, 2nd Edition, 1991.
- Pritindra and Chowdhuri, Electromagnetic Transients in Power Systems, John Wiley & Sons Inc., New York, 1996.
- J. Arrillaga and N. R. Watson, Computer Modelling of Electrical Power Systems, Research Studies Press Ltd. And John Wiley & Sons Inc., New York, 2001.
- Martinez-Velasco, Computer Analysis of Electric Power System Transients: Selected Readings, IEEE Press, 1999.

Contents:

- Introduction to electromagnetic transients in electric power system.
- Solution methods used in electric transient analysis.
- Modeling of electric power system components for transient analysis:
  - Lumped components: R, L, C (decoupled and coupled).
  - Overhead transmission lines with frequency-independent parameters.
  - Overhead transmission lines with frequency-dependent parameters.
  - Underground power cables.
  - Power transformers.
  - Nonlinear and time-varying components.
  - Switches, arresters and protective gaps.
  - Electric machines.
- Transient analysis of control systems (TACS).
- Typical power system transients:
  - Line switching transients.
  - Lightning over-voltages.
  - Fault transients.
  - Capacitance switching, transformer inrush currents, ferroresonance, Sub-synchronous resonance (SSR).
  - Other topics.
- Electronic system transients.
- Interference of telephone line.
- Simulation of power electronic circuits using EMTP.
- Transient analysis of control systems
- Case studies.