

# ELE 491

## Senior Design Project Proposal

These slides are loosely based on the book Design for Electrical and Computer Engineers by Ford and Coulston. I have used the sources referenced in the book freely and without re-attribution. Please see the book for full source attribution



# ELE 491

## Senior Design Project Proposal

### Class 9 – Modeling

# Modeling

## Overview

- Project Flow
  - Identify problems
  - Create requirements
  - Generate/evaluate conceptual solutions
  - Decomposition
  - **Modeling and Design**
  - Validation
  - Delivery

# Modeling

## Overview

- Why model
  - Emulate portions of the design that have not been completed
  - Provide input drivers or output loads
  - Reduce system analysis time
    - Calculations
    - Simulations
    - Test
  - Identify Input/output/functional requirements
    - Block Diagrams
    - State Diagrams
    - Flow Charts

# Modeling Types

- Types of models - System
  - Block diagrams
  - State diagrams
  - Flow Charts
  - Object Oriented

# Modeling

## Types

- Types of models - Circuit
  - Passive devices
  - Transistor models
  - Circuit models
  - Behavioral models
  - Abstract models
    - Mechanical
    - Thermal
    - Chemical

# Modeling

## Types

- Types of models - Other
  - Cost
  - Quality/Reliability
  - Usage

# Modeling

## Types

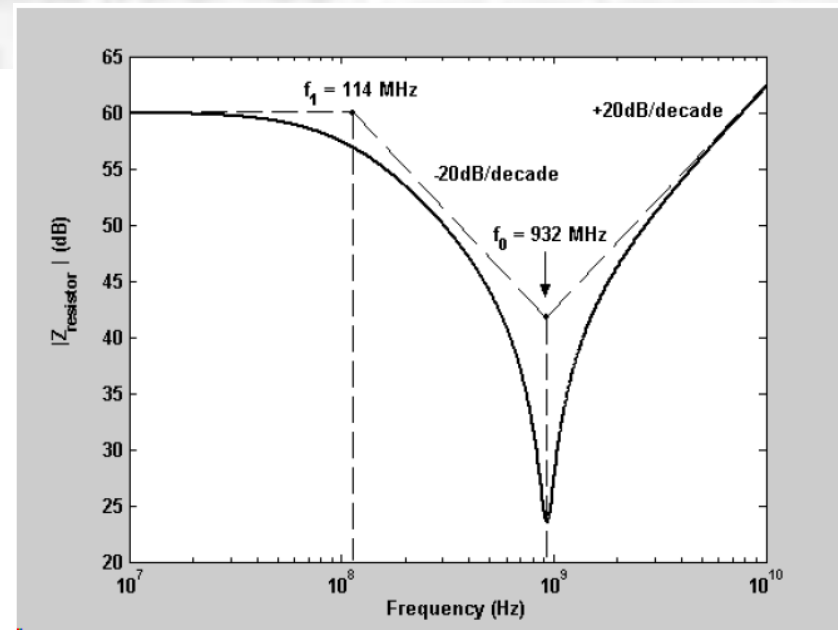
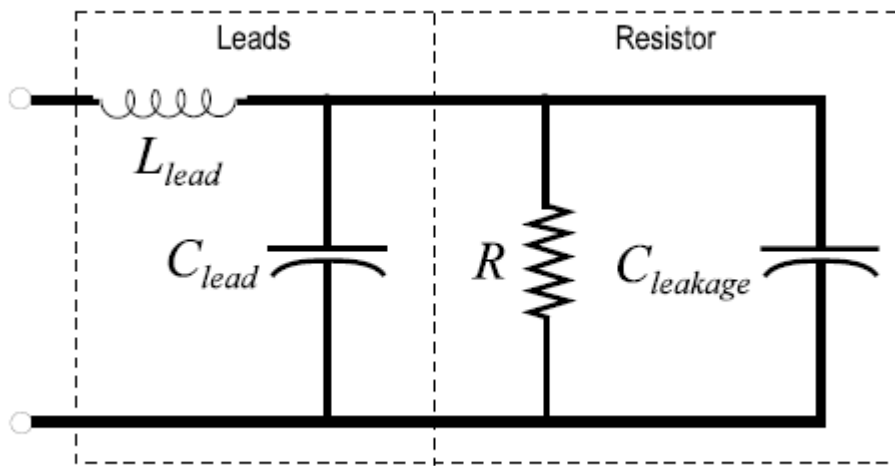
- Types of models - Usage
  - A given block or element may have many different models – each for a specific purpose
    - Behavioral model – just shows first order behavior
    - Parametric model – varies behavior over temperature, voltage, ...
    - Interface model – models I/O but not necessarily functionality
    - Dummy model – nothing inside – used to allow single schematic designs



# Modeling

## Circuit Models

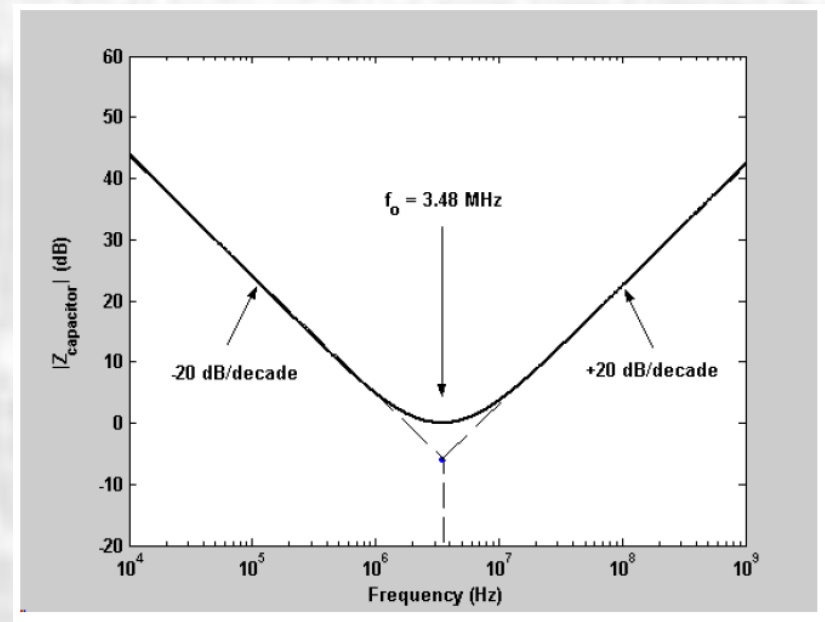
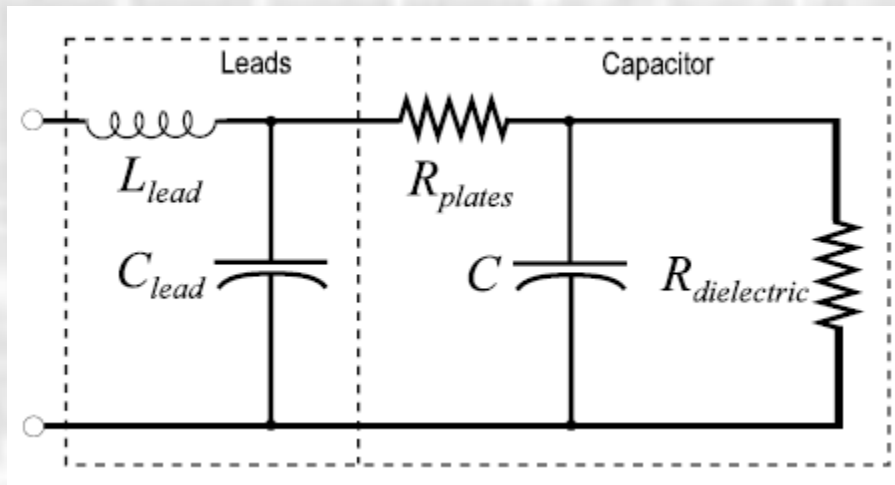
- Passive devices
  - Leaded Resistor



# Modeling

## Circuit Models

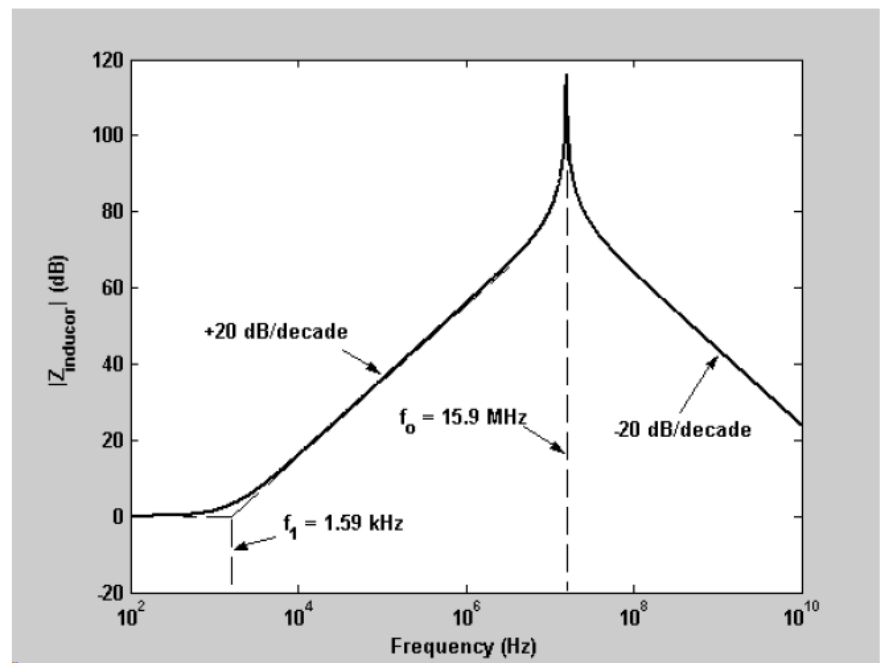
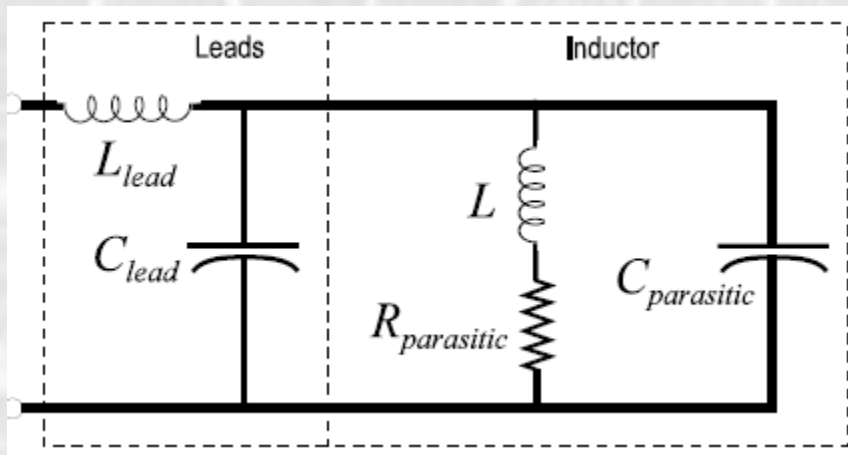
- Passive devices
  - Leaded Capacitor



# Modeling

## Circuit Models

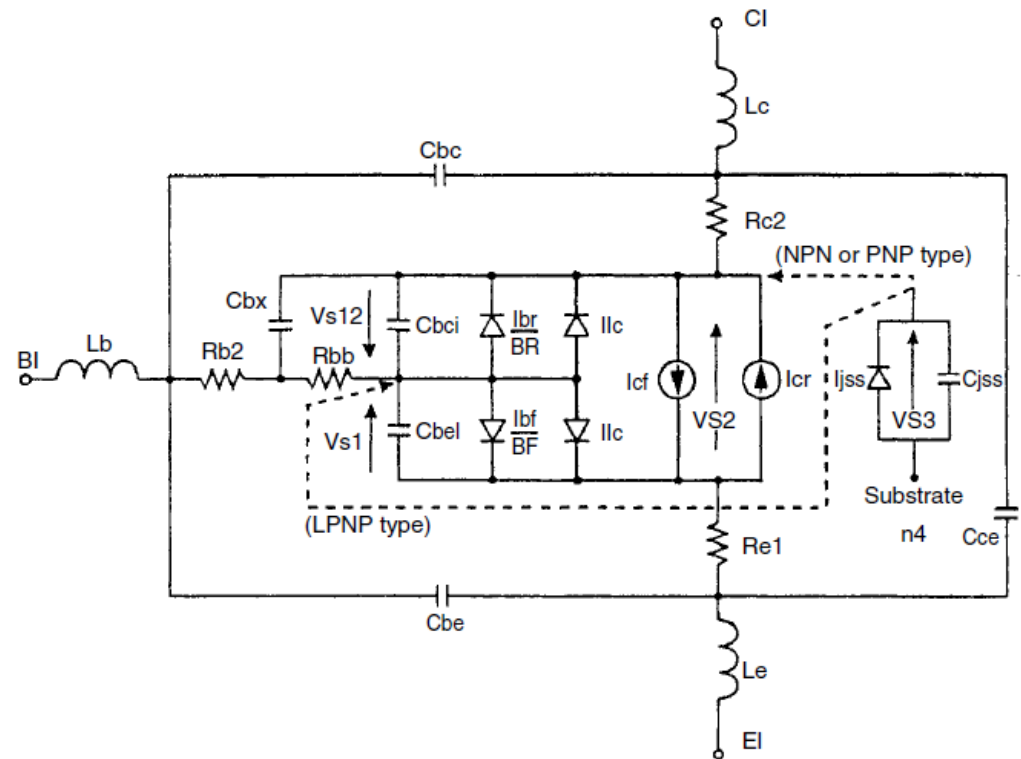
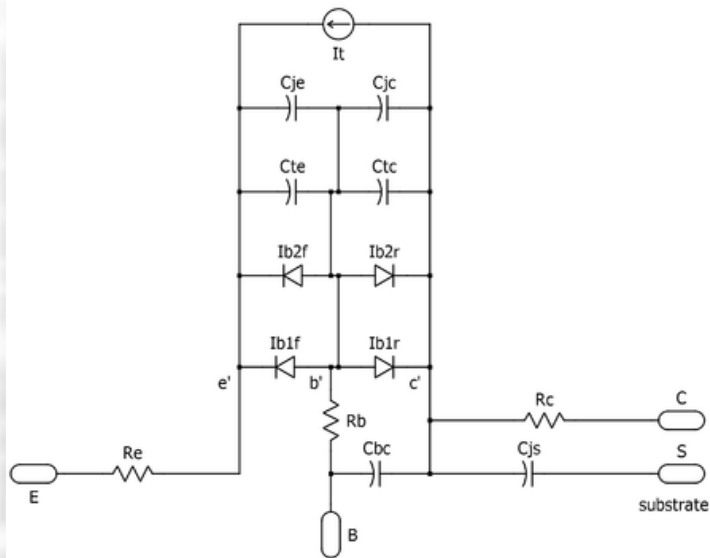
- Passive devices
  - Leaded Inductor



# Modeling

## Circuit Models

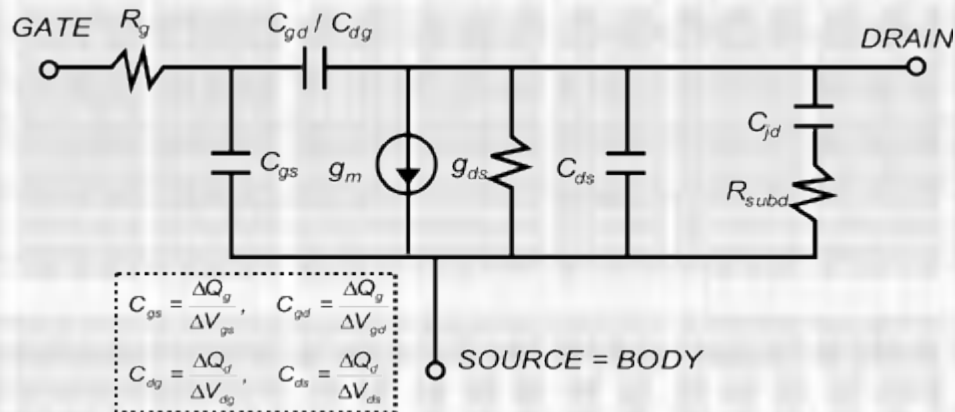
- Active devices
- Bipolar Transistor



# Modeling

## Circuit Models

- Active devices
- MOS Transistor



## In Class Activity