# Introduction

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Fall 2021

# Overview

# Course Position

# Position



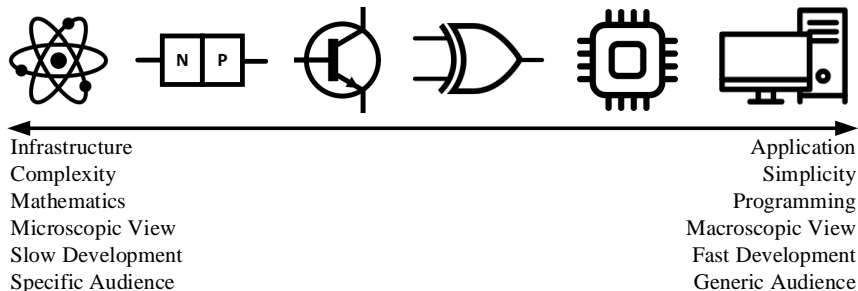| Infrastructure | Application |
| --- | --- |
| Complexity | Simplicity |
| Mathematics | Programming |
| Microscopic View | Macroscopic View |
| Slow Development | Fast Development |
| Specific Audience | Generic Audience |

Figure: Engineering abstraction levels. From left to right, the abstraction level is intended by physicists, device engineers, electronic engineers, digital engineers, hardware engineers, programmers.
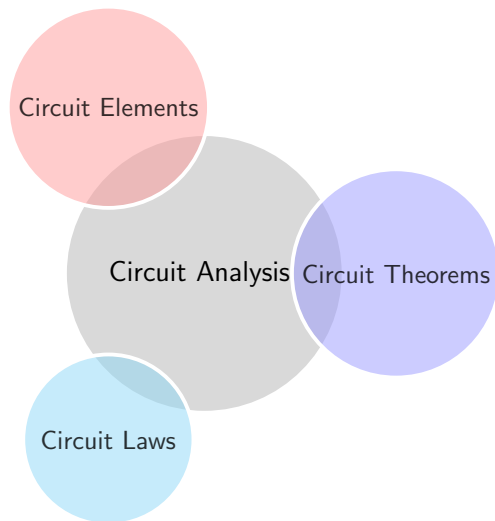
# Course Coverage

Figure: Main items covered in the course.

# Coverage

1. Circuit Laws
   - Kirchhoff's Laws
2. Circuit Elements
   - Basic Elements
   - Coupling Elements
   - Two-ports
3. Circuit Analysis
   - Sinusoidal Steady State Analysis
   - Nodal and Mesh Analysis
   - Cut-set and Loop Analysis
   - Laplace Analysis
4. Circuit Theorems
   - Tellegen's Theorem
   - Thevenin-Norton Theorem
   - Superposition Theorem
   - Substitution Theorem
   - Reciprocity Theorem

# Course Requirements

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1. Basic Knowledge
   - Electromagnetic Theory
2. Mathematical Tools
   - Differential Equations
   - Graph Theory
   - Laplace Transform
   - Linear Algebra
   - Complex Analysis
   - Fourier Transform
3. Simulation Tools
   - PSPICE
   - Proteus
   - CircuitLab
   - PSIM
   - MATLAB

# Course Resources

# Resources

1. Online teaching class on Sundays and Tuesdays, 9:00-10:30 at `https://vc.sharif.edu/ch/mohammad.hadi`
2. Online practicing class on Wednesdays, 18-19:30 at `https://vc.sharif.edu/ch/mohammad.hadi`
3. Course website at `http://cw.sharif.edu`
4. Telegram channel at `https://t.me/joinchat/dDvge01vDt0zNzQ0`
5. Telegram group at `https://t.me/joinchat/SaVZUEk80d85MDk0`
6. Personal email to `mohammad.hadi@sharif.edu`
7. Telegram message to `@MohammadHadiDastgerdi`

# Course Content

# Contents

| Topics | # of Sessions |
| --- | --- |
| Introduction | 0.5 |
| Review | 2 |
| Coupled Circuits | 2 |
| Three-phase Circuits | 2 |
| Network Graphs | 3 |
| Systematic Analysis | 4 |
| State Equations | 1.5 |
| Laplace Transforms | 3 |
| Natural Frequencies | 2 |
| Network Functions | 3 |
| Network Theorems | 2 |
| Two-ports | 3 |

Table: Topics presented in the course. The specified numbers of sessions are tentative.

# Course Assessment

# Assessments

| Item | Frequency | Contribution | Bonus |
|------|-----------|--------------|-------|
| Work Assignments | 11 | 25% | ✓ |
| Short Quizzes | 10 | 25% | ✗ |
| Final Exam | 1 | 25% | ✗ |
| Oral Exam | 1 | 10% | ✗ |
| Software Project | 1 | 10% | ✓ |
| Class Attendance | 28 | 5% | ✗ |

Table: Items involved in the course assessment. The specified contribution weights are tentative.

# Course References

# References

📄 Charles A. Desoer and Ernest S. Kuh (1969)
Basic Circuit Theory
McGraw-Hill Education

📄 William H. Hayt, Jack E. Kemmerly, and Steven M. Durbin (2012)
Engineering Circuit Analysis
McGraw-Hill Education

📄 Robert L. Boylestad (2016)
Introductory circuit analysis
Pearson Education

📄 J. David Irwin and Robert M. Nelms (2010)
Basic engineering circuit analysis
John Wiley & Sons

# The End