

EE-406 & EE-407

Fundamentals of Electrical Circuits and Systems I & II

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Section of Electrical Engineering

September 19th, 2023

General information

Main objectives of the two courses EE-406 & EE-407

- Acquire/recall the bases of signal processing
 - Analog and digital signals
 - Fourier Transform
 - Sampling and reconstruction
 - Digital Fourier Transform and FFT

- Acquire/recall the bases of electric circuits
 - Basis quantities and fundamental theorems
 - Circuit analysis methods
 - Phasors
 - Three-phase circuits
 - Transient analysis

Table of Content

- EE-406: Signal Processing
 - What is a signal: typology
 - Analysis and synthesis of deterministic signals
 - Projection theorem
 - Fourier series
 - Fourier Transform
 - Sampling, quantization and reconstruction
 - Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT)
- Prerequisites :
 - Linear time-invariant systems, impulse response, convolution, transfer function, etc.

References

- EE-406:
 - John G. Proakis and Dimitris G. Manolakis, «Digital Signal Processing», Prentice All, 2007

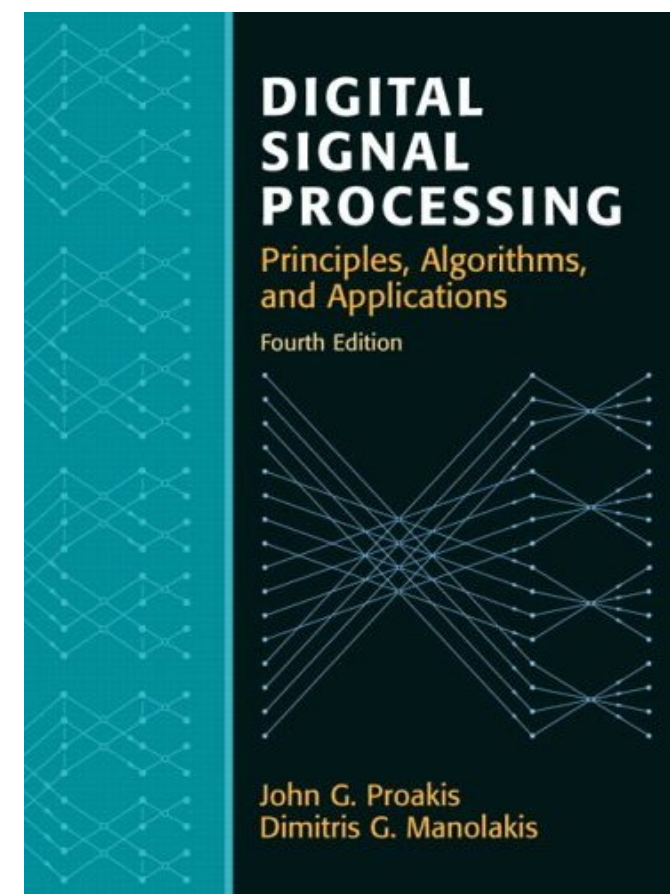
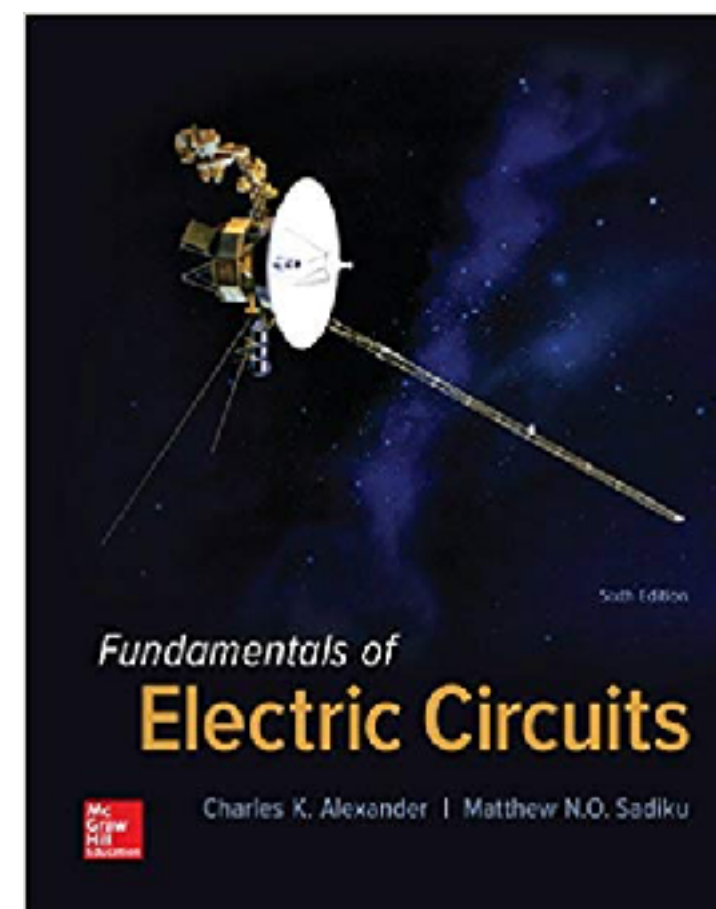


Table of Content

- EE-407: Fundamentals of Electric Circuits
 - Electrical circuit
 - Usual quantities (Charge, current, voltage, power and energy)
 - Usual circuit elements (Resistance, capacitance, inductance, voltage and current sources)
 - Kirchhoff's laws
 - Fundamental Theorems (Superposition, Thévenin, Norton, Maximum Power Transfer)
 - Analysis Methods (Nodal Analysis, Mesh Analysis)
 - Circuit in Sinusoidal Regime (Phasors, impedance)
 - Three-Phase Circuits
 - Transients Analysis

References

- EE-407
 - Charles K Alexander and Matthew Sadiku, «Fundamentals of Electric Circuits», Mc Graw Hill, 2017



Organization of the course

- 4h per week:
 - Tuesday 1:15pm - 5:00pm
 - Lectures, exercises and lab sessions
 - EE-406 : Sept 19 - Oct 31
 - EE-407 : Nov 7 - Dec 19
- Evaluation:
 - Final exams during the winter session
 - EE-406: 70% exam, 30% labs
 - EE-407: 60% exam, 30% LTSpice simulations, 10% lab

Agenda 2023

- EE-406 - Prof. Jean-Philippe Thiran

19.09 @ 1:15pm	Introduction (1h)	Introduction (BC02)
19.09 @ 3:15pm	-	-
26.09 @ 1:15pm	Lecture 1	Deterministic signals - projection theorem (BC02)
26.09 @ 3:15pm	-	-
03.10 @ 1:15pm	Lecture 2	Deterministic signals - Fourier Transform (BC02)
03.10 @ 3:15pm	Lecture 3	Deterministic signals - Fourier Transform (BC02)
10.10 @ 1:15pm	Ex 1	Deterministic signals (BC02)
10.10 @ 3:15pm	Ex 1	Deterministic signals (BC02)
17.10 @ 1:15pm	Lab 1	Discrete Fourier Transform (BC02)
17.10 @ 3:15pm	Lab 1	Discrete Fourier Transform (BC02)
24.10 @ 1:15pm	Lecture 4	Discrete Fourier Transform (BC02)
24.10 @ 3:15pm	Lecture 5	Discrete Fourier Transform (BC02)
31.10 @ 1:15pm	Lab 2	Discrete Fourier Transform (BC02)
31.10 @ 3:15pm	Lab 2	Discrete Fourier Transform (BC02)

Agenda 2023

- EE-407: Prof. Farhad Rachidi (1/2) - Provisional

07.11 @1:15-4:00	Lecture	Introduction, Basic concepts - circuit elements
07.11 @4:15-5:00	LTSpice	LTSpice Exercise 1: Introduction to LTSpice
14.11 @1:15-3:00	Lecture	Kirchhoff's laws, Fundamental theorems
14.11 @3:15-5:00	Exercises	Problem Sets 1 and 2
21.11 @1:15-4:00	Lecture	Nodal analysis, Mesh analysis
21.11 @4:15-5:00	LTSpice	LTSpice Exercise 2 : DC Analysis
28.11 @1:15-3:00	Lecture	Sinusoidal regime: phasors, impedance, admittance
28.11 @3:15-5:00	Exercise, LTSpice	Problem Set 3, LTSpice Exercise 3: Impedance

Agenda 2023

- EE-407: Prof. Farhad Rachidi (2/2) - Provisional

05.12 @1:15-3:00	Lab Session	Circuits in sinusoidal regime
05.12 @3:15-4:00	Lecture	Sinusoidal regime: Thévenin/Norton equivalents, Active and reactive power
05.12 @4:15-5:00	Exercise, LTSpice	Problem Set 4, LTSpice Exercise 4: Cos phi
12.12 @1:15-4:00	Lecture	Three-phase circuits 1
12.12 @4:15-5:00	Exercise	Problem Set 5
19.12 @1:15-3:00	Lecture	Three-phase circuits 2
19.12 @3:15-5:00	Exercise, LTSpice	Problem Sets 6, 7, 8, LTSpice Exercise 5: 3-phase