# EC434- Analog Signal Processing

## CREDIT HOURS

3 Hours

## CONTACT HOURS (Hours/week)

Lecture: 2; Tutorial: 2; Lab: 2

## COURSE COORDINATOR

Dr. Khaled Shehata

## TEXT BOOK

Applied Signal Processing, N. Hamdy CRC Press 2008

## COURSE DESCRIPTION

Linear and nonlinear wave shaping, sinusoidal and relaxation oscillators, sweep generator, analog filters.

## PREREQUISITE:

EC 432

## RELATION OF COURSE TO PROGRAM

Required

## COURSE INSTRUCTION OUTCOMES

The student will be able to:

- Analyze and design of linear and non-linear wave shaping circuits.
- Design of non-sinusoidal waveform generators.
- Design of RC active filters

## TOPICS COVERED

- Introduction to signal processing, signals and signal sources, different kinds of analog signal processing. Some practical systems: Radio and Television receivers
- Linear wave shaping, RC circuits, integrators, differentiators, time and frequency response
- Clipping Circuits and their applications, Simple clipping circuits, Biased clipping circuits.
- Diode-Capacitor circuits (Clamping Circuits), Clamping circuits and their applications, Perfect Clamping, Practical Clamping circuits
- Sinusoidal oscillators, Colpitts and Hartly oscillators, phase shift oscillator
- Relaxation Oscillators, Introduction and mechanical analogies, Analysis and design of astable Multivibrators.
- Analysis and design of Voltage to frequency converters, Analysis and design of Monostable Multivibrators.

- Analysis and design of Bistable Multivibrators, Triggering of Bistable Multivibrators, Schmitt Trigger, Op-Amp Astable and Monostable Multivibrators
- The 555 timer, internal structure and Operation as Astable and Monostable Multivibrators.
- Sweep generator Circuits. A basic sweep circuit, Switch-controlled sweep circuits using BJT, UJT and PUT, Constant current sweep generators.
- Miller integrator, Boot-strap sweep generator circuit.
- Analog Filters, Historical review of filters, Ideal filter response, Transfer function of filter functions, Realization of 2nd order sections, Design steps.
- Approximations to the ideal LPF response, Butterworth approximation, Chebyshev approximation, Elliptic approximation, design from the pole-zero distribution.
- Design of active filters using catalogue. Switched capacitance filters.

**CONTRIBUTION OF COURSE TO MEET THE REQUIREMENTS OF CRITERION 5:**

| **Professional component Content** | | | |
|---|---|---|---|
| **Math and Basic Sciences** | **Engineering Topics** | **General Education** | **Other** |
| | ✓ | | |

**RELATIONSHIP OF COURSE TO STUDENT OUTCOMES:**

| Student Outcomes | | Course aspects |
|---|---|---|
| A | An ability to apply knowledge of mathematics, science, and engineering | $a_1$ |
| B | An ability to design and conduct experiments, analyze and interpret data. | $b_1$ $b_2$ $b_4$ |
| C | An ability to design a system, component, or process to meet desired needs within realistic constraints such as economics, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability | $c_2$ $c_3$ |
| D | An ability to function on multi-disciplinary teams. | |
| E | An ability to identify, formulate, and solve engineering problems | |
| F | An understanding of professional and ethical responsibility | $f_1$ $f_2$ |
| G | An ability to communicate effectively | |
| H | The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and social content | |
| I | A recognition of the need for, and an ability to engage in life-long learning. | |
| J | A knowledge of contemporary issues within and outside the electrical engineering profession. | |
| k | An ability to use the techniques, skills, and modern engineering tools necessary for electrical engineering practice. | k |