

Faculty of Engineering & Technology

Radio Frequency Microelectronics

Information :

| Course Code : | ELE 511 | Level | : | Undergraduate | Course Hours : | 3.00- Hours |
|---------------|---------|-------|---|---------------|----------------|-------------|
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Department : Specialization of Electronics & Communication

Instructor Information :

| Title | Name | Office hours |
|---------------------|--|--------------|
| Associate Professor | Hesham Nabil Mohamed Ahmed | |
| Assistant Lecturer | Amiraa Sayed Ahmed Abdallah Elhamshary | |

Area Of Study :

APrepare students to model the passive components in the RF frequency range. ADevelop students askills to analyze and design RF power amplifiers . A rain students to analyze Low Noise amplifiers . A rain students to determine the Model parameters of radio frequency transistors.

Description:

The theory and practice of Radio Frequency (RF) engineering, Transmission lines, and scattering parameters, Design of RF components (low noise amplifiers, power amplifiers, oscillators, RF power detectors, active/passive mixers, power amplifiers), Properties and representation of noise, Passive device design (micro strip lines, diodes, IC resistors, IC capacitors, and IC inductors), Active device design (bipolar and FET's).

Course outcomes :

| a.Knowledg | ge and Understanding: : |
|--------------|--|
| 1 - | Describe the operation of common transceiver architectures for RF transmission and reception. |
| 2 - | Explain the concept of noise figure, non-linearity, blockers, and sensitivity in RF transceivers |
| 3 - | Estimate the performance requirements of different building blocks of RF transceivers such as noise figure, gain and non-linearity |
| 4 - | Describe the concept of impedance matching and impedance transformation in RF circuits |
| 5 - | Identify the operation of low noise amplifiers, mixers, voltage-controlled oscillators, power amplifiers, and phase locked loops. |
| b.Intellectu | al Skills: : |
| 1 - | Analyze RF transceivers and its building blocks. |
| 2 - | Analyze system requirements of RF transceivers. |
| c.Professio | nal and Practical Skills: : |
| 1 - | Perform analysis of RF transceivers and its building blocks. |
| 2 - | Evaluate the different RF building blocks. |
| 3 - | Prepare technical report. |



d.General and Transferable Skills: :

- 1 Work in teams.
 - 2 Search for information and formulate new ideas.

Course Topic And Contents :

| Торіс | No. of hours | Lecture | Tutorial / Practical |
|---|--------------|---------|----------------------|
| Basic Concepts in RF Design. | 10 | 6 | 4 |
| RF Passive Components. | 5 | 3 | 2 |
| Transmission lines and scattering parameters. | 12 | 6 | 6 |
| Active RF Components. | 10 | 6 | 4 |
| RF Power amplifiers. | 18 | 12 | 6 |
| LNA amplifiers and Mixers. | 8 | 6 | 2 |
| Oscillators. | 12 | 6 | 6 |

Teaching And Learning Methodologies : Interactive Lecturing Discussion Problem Solving Experiential Learning

| Project |
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Course Assessment : Methods of assessment **Relative weight % Assess What** Week No Assignments/Lab 10.00 Final Exam 40.00 Final Exam Marks on ILOs 7 First Mid-Term Exam 15.00 Project 10.00 15 Quizzes 10.00 Second Mid-Term Exam 15.00 11

Recommended books :

- B. Razavi, RF Microelectronics, Prentice Hall, 2nd Ed., 2011, USA.

- R. Ludwig, RF Circuit Design Theory and Applications, Prentice Hall, 2nd Ed., 2008, USA.