



**THE OHIO STATE UNIVERSITY**  
COLLEGE OF ENGINEERING

# Introduction to Radio Frequency and Optical Engineering

## ECE 3010

**Credit Hours:**

3.00

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**Course Levels:**

Undergraduate (1000-5000 level)

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**Course Components:**

Lecture

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**Course Description:**

Waves and pulses on transmission lines; charges, fields, and potentials; inductance and capacitance; Faraday's law; Maxwell's Equations; plane wave propagation, polarization, reflection, and transmission.

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**Prerequisites and Co-requisites:**

Prereq: 2020, 2021, 2100, 2100.02, 2100.06, or 2105; and Physics 1251 or 1261, or both 1240 and 1241; and Math 2415 or 2174; and enrollment in ECE or EngPhysics major; or prereq or concur: 2010 or 2061, and permission of department.

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**Course Goals / Objectives:**

- Become familiar with the theory and application of waves and pulses on transmission lines
  - Learn basic transmission line impedance matching concepts
  - Become familiar with the concepts of capacitance and inductance from a physical standpoint
  - Become familiar with the basic laws of time varying electromagnetic fields
  - Become familiar with the concepts of wave propagation, polarization, attenuation, reflection, and transmission
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**Course Topics:**

- Waves on transmission lines, including reflection and impedance on terminated transmission lines
  - Impedance matching on transmission lines and use of Smith chart
  - Pulses and transients on transmission lines
  - Review of vector calculus using the theory of static fields as example
  - Physical viewpoint on capacitance, resistance, Ohm's law, and inductance
  - Faraday's law and applications
  - Maxwell's equations, the wave equation and plane wave solutions
  - Plane wave propagation, polarization, attenuation, reflection, and transmission
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**Designation:**

Required

Elective