

**UNIVERSITY COURSE No:** TLEN 5300

**COURSE TITLE:** Telecommunication Theory and Application

**INSTRUCTOR:** Roger Hall  
Interdisciplinary Telecommunications Program  
University of Colorado  
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Boulder, CO 80309

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**CLASS DAYS/TIMES ON CAMPUS:** Fridays 2:00 to 4:30 PM  
Tape/Streaming Video  
**Recitation** None

**REQUIRED TEXT:** None

**Optional References:**

Any College Level Math book

Noll, Introduction to Telecommunication Electronics, 2nd ed., 1995, Artech House, Inc., ISBN 0-89006-828-3

Bellamy, Digital Telephony, 3rd ed., ISBN 0-471-34571-7

Stallings, Data and Computer Communications, 7th ed., 2004, Prentice Hall, ISBN 0-13-100681-9

Gerald Mitchell's 5310 class notes (available at the CU bookstore)

**PREREQUISITES:** College Algebra

**COURSE OBJECTIVE:**

To provide a useful review of telecommunication mathematics and physics for engineers and as an introductory course for those without a technical background, but are interested in advancing their career in Telecommunications.

**COURSE DESCRIPTION:**

This course deals with certain fundamentals needed for the Telecommunication program. It is required for all participants who do not have a good current grasp of basic concepts related to a range of topics including: physical units, trigonometric functions, logarithms, decibels, attenuation, power, field strength, linear algebra, Boolean algebra, binary Arithmetic, complex numbers, analog circuit analysis, transmission line characteristics, and elementary calculus.

**LECTURE TOPICS:**

LECTURE 1: Algebraic Functions, Set Theory, Number Classifications, Field Postulates and Theorems, 1<sup>st</sup> Degree Linear Equations, 2<sup>nd</sup> Degree Quadratic Equations  
LECTURE 2: Exponential functions, 3<sup>rd</sup> to Nth Degree Polynomials, Binomial

	Expansion
LECTURE 3:	Significant Digits, Logarithms, Decibels, SNR
LECTURE 4:	Scientific and Engineering Notation, Conversions (units of measure)
LECTURE 5;	Trigonometry basics: unit circle model, angle model, degree-radian Conversions, trigonometric functions
LECTURE 6:	Trigonometry: Inverse Functions, Circular functions, solving real-world problems with trig
LECTURE 7:	Review, Polar Coordinate Systems,
LECTURE 8:	Waveform analysis: coincident waveforms, Phase difference, modulation methods
LECTURE 9:	Waveform analysis: practical applications. (Optical fiber, electromagnetic spectrum, wave propagation), reflection and refraction, the complex plane.
LECTURE 10:	Calculus fundamentals: limits, differential equations
LECTURE 11:	Calculus fundamentals: 2 <sup>nd</sup> , 3 <sup>rd</sup> , and Nth order differential equations
LECTURE 12:	Integral Calculus fundamentals. Fourier analysis
LECTURE 13:	Boolean algebra, binary arithmetic
LECTURE 14:	Modulo 2 arithmetic, error correction coding. Analog Circuit analysis: Impedance vs. resistance, conductance vs. inductance, RC & LC Circuits, transmission line modeling.
LECTURE 15:	Final review

### **COURSE REQUIREMENTS:**

Homework: There are 11 homework assignments. None will be graded, but may be submitted for credit.

Examinations: There are 4 quizzes for each of the seven modules. There is one final.

### **CLASS ATTENDANCE: N/A**

**GRADING POLICY:** Grades will be based on performance on the four quizzes, on the final (50% of grade), and on homework submitted for credit.

### **Required Text**

There is no required text.