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| **Course** | ECE 42800 - Modern Communication Systems |
| **Type of Course** | Required for EE Program, Elective for CmpE Program |
| **Catalog Description** | Development of the basic principles of communication systems with emphasis on digital modulated systems. The fundamental characteristics of sources of information, and wired and wireless channels are studied. Upconversion and downconversion techniques are investigated. The performance of binary and M-ary digital modulation is studied and optimum receivers are designed. Multicarrier modulation techniques for cellular, Wi-Fi, and ADSL communications are introduced. The principles of forward error correction are studied. Appropriate software is introduced as a companion technique for communication systems analysis. |
| **Credits** | 3  |
| **Contact Hours** | Class: 3  |
| **Prerequisite Courses**  | ECE 30100 , ECE 30200 |
| **Textbook** | T. Cooklev, *A First Course in Communications Systems,* (preprint) |
| **Course Objectives** | This course provides an introduction to communication system principles with an emphasis on digital communication systems. It develops the basic analysis tools to characterize a communication system’s performance. The use of computer modeling and simulation techniques employed to compliment analysis methods.  |
| **Course Outcomes** | 1. An understanding of how to represent communication signals in time and frequency using complex analysis and Fourier analysis techniques. (1)
2. An understanding of the effects of noise and channel properties on communication system performance. (1)
3. Performing calculations involving source entropy  (1)
4. Evaluation of the performance of analog-to-digital conversion (1)
5. Performing calculations involving signal-to-noise ratio, frequency response, and capacity of a channel (3)
6. Design and analyze circuits to transmit and receive analog signals (2)
7. Performing calculations involving the bit error rate of binary and M-ary modulation techniques (2)
8. Understanding of the basic functions required of multicarrier transmitters and receivers (2)
9. An understanding of block forward error correction encoding and decoding (1)
10. Ability to compare uncoded and coded communications systems (4)
11. The application of computer modeling and simulation techniques to compliment communication system performance analysis (6)
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| **Lecture Topics** | 1. Introduction to modern communications systems
2. Review of signals, linear systems, and probability theory
3. Sources of information and entropy. Analog-to-digital conversion.
4. Introduction to wired and wireless channels
5. Mathematical models of channels. Capacity.
6. Transmission of analog signals: DSB, AM, SSB, and QAM
7. Binary digital modulation and optimum demodulation
8. M-ary digital modulation techniques: PAM, PSK, QAM
9. Multicarrier modulation – OFDM and DMT
10. Linear block codes
11. Galois fields. Circular codes.

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| **Computer Usage** | Medium  |
| **Laboratory Experience** | Low  |
| **Design Experience** | Medium  |
| **Coordinator** | Todor Cooklev, Ph.D.  |
| **Date** | 9/30/2018 |