EEC 456 SOFTWARE DEFINED RADIO

**Course Number & Name:** EEC 456 Software Defined Radio

**Credits & Contact Hours:** (2-2-3)

**Course Coordinator:** Dr. Murad Hizlan, Associate Professor of Electrical Engineering

**Textbook:**

**References:**

**Course Information:**
A review of communication concepts and systems, waveform generation, and analog and digital modulation schemes. Use of the hardware elements of an SDR system such as the front-end RF system, analog-to-digital and digital-to-analog conversion, and FPGAs with NI USRP SDR units. Coupling of the hardware elements with the software-defined elements of the radio system through the use of NI LabView environment. Implementation of functioning SDR systems involving modulation, detection, pulse shaping, channel estimation and equalization.

**Prerequisites:**
EEC 450
Elective Course for BEE, BCE and BSCS.

**Expected Outcomes:**
Upon completion of this course, students should be able to:

1. Understand the basic concepts of software defined radio system which integrates RF front-end, ADC/DAC, and software systems.
2. Learn and design not only new SDR solutions but also learn the limitations and issues of SDR as well as the corresponding hybrid solutions.
3. Analyze performance of SDR system to understand bottlenecks and potential solutions.
**Student Outcomes:**

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

**List of Topics:**

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<tr>
<th>Topics</th>
<th>Hours</th>
<th>Total</th>
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<tbody>
<tr>
<td>1. Introduction to digital communications; Introduction to SDR software, hardware and literature</td>
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<td>2. Introduction to NI LabView</td>
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<td>3. Introduction to NI RF hardware</td>
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<td>4. Modulation and detection</td>
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<td>5. Pulse shaping and matched filtering</td>
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<td>6. Synchronization</td>
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<td>7. Channel estimation and equalization</td>
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<td>Tests</td>
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**Additional Information:**

**Grading:**

- Lab reports (4) 60%
- Participation 10%
- Midterm 15%
- Final 15%

**Prepared by:**

Dr. Murad Hizlan

**Date:**

April 2019