

Communication Systems (55:050)
(Required: Electrical and Information Engineering Tracks)

Catalog Description:

Communication system fundamentals: sampling, quantization, filtering, modulation, frequency conversion, rate, bandwidth; common digital communication operations: pulse amplitude modulation, pulse shaping, receive filtering, automatic gain control, carrier synchronization, timing recovery, equalization, coding; design of software defined receivers.

Pre(co)requisites:

55:043 [P] and 55:039 [C]

Textbook:

Telecommunications Breakdown: Concepts of Communication Transmitted via Software Defined Radio, C.R. Johnson and W.A. Sethares, 2004, Pearson Prentice Hall

References:

None

Topics (Class Hours):

- | | |
|---|--|
| 1. Sampling, filtering, digital Fourier transform and digital filtering (7) | 4. Automatic gain control (4) |
| 2. Transmitter and receiver architecture, corruption modeling (3) | 5. Pulse shaping and receive filtering (5) |
| 3. Analog modulation and demodulation, pulse amplitude modulation (5) | 6. Carrier and timing recovery (6) |
| | 7. Equalization (7) |
| | 8. Coding (5) |
| | 9. Examinations |

Laboratory Projects

Throughout the semester students develop component blocks for a software-defined radio. In a final project at the end of the semester, students are required to assemble a complete, software-defined digital receiver.

Class/Laboratory Schedule:

Three 50 minute lectures per week

Writing Assignments and Oral Presentations:

None

Design Component:

Throughout the semester, students are required to use MATLAB to develop and evaluate component blocks for a software-defined radio. At the culmination of the semester, students are required to use these component blocks to assemble a robust, working, software-defined digital receiver.

Contribution to the Requirements of Criterion 5:

Engineering topics: 3 s.h.

Course Goals: Basis for Assessment and Mapping onto Outcomes

Course Goal	Basis For Goal Assessment	Supports ABET Outcomes
1. Understanding of sampling, filtering, digital Fourier transforms and digital filtering.	HW, exams, project report, instructor evaluation	a(●), c(●), e(●)
2. Understanding of transmitter and receiver architecture and transmission corruptions.	HW, exams, project report, instructor evaluation	a(●), c(●), e(●), h(○), j(●)
3. Understanding of analog modulation and demodulation, and pulse amplitude modulation.	HW, exams, project report, instructor evaluation	a(●), c(●), e(●), k(●)
4. Understanding of automatic gain control.	HW, exams, project report, instructor evaluation	a(●), c(●), e(●), k(●)
5. Understanding of pulse shaping and receive filtering.	HW, exams, project report, instructor evaluation	a(●), c(●), e(●), k(●)
6. Understanding of carrier and timing recovery.	HW, exams, project report, instructor evaluation	a(●), c(●), e(●), k(●)
7. Understanding of linear equalization.	HW, exams, project report, instructor evaluation	a(●), c(●), e(●), k(●)
8. Understanding of source and channel coding.	HW, exams, project report, instructor evaluation	a(●), c(●), e(●), k(●)
9. Ability to design and test a software defined receiver.	HW, exams, project report, testing of receiver with test signals, instructor evaluation	a(●), c(●), e(●), g(○), j(●), k(●)

○ denote moderate contribution to the outcome; ● denote substantial contribution to the outcome

Performance Criteria:

Instructor completes a Course Outcome Rating (COR) that quantitatively evaluates student performance for each course goal-related outcome using a standard scale (4.0 = outstanding ability; 3.0 = good ability; 2.0 = adequate ability; 1.0 = poor ability; 0.0 = no ability). Instructor chooses appropriate graded course artifacts (homework questions, exam questions, etc) for each outcome rating. COR scores below 2.5 are indicative of problems with meeting course goals/outcomes and COR scores below 2.0 indicate failure to adequately meet course goals/outcomes.

Prepared By:

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