**The University of Jordan**
**School of Engineering**
**Electrical Engineering Department**
2nd Semester – A.Y. 2023/2024

**Course:** **Advanced Communications Lab – 0953528 (2 Cr. – Elective Course)**

**Instructor:** Prof. Mohammed Hawa + Eng. Reem Debs
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Office Hours: Will be posted soon

**Platform:** http://www.hawa.work/528 and Moodle (https://elearning.ju.edu.jo/)

**Catalog description:** Antennas and their main parameters. Using a vector network analyzer to study antenna parameters. Spectrum analyzers. Software-Defined Radio (SDR) systems. Optical fiber systems. Dispersion in optical fiber and the Eye diagram. Multiplexing in telephony and operating a PBX (private branch exchange).

**Prerequisites by course:** **EE 0953422** Communications (II) (pre-requisite)

**Prerequisites by topic:** Students are assumed to have a background in the following topics:
- Analog and digital modulation techniques.
- Continuous and discrete signal and system analysis.
- Probability and Random Processes.
- Additive white Gaussian noise (AWGN).

**Textbook:**

**Lab Manual which can be obtained from the course website.**

1. Modern Digital and Analog Communications Systems by B. P. Lathi and Zhi Ding, Oxford University Press, 5th Edition, 2018.
2. Fundamentals of Communication Systems by John G. Proakis and Masoud Salehi, Prentice Hall, 2nd Edition, 2013.
3. Digital and Analog Communication Systems by Leon W. Couch, Prentice Hall, 8th Edition, 2012.
4. Digital Communications: Fundamentals and Applications by Bernard Sklar, Prentice Hall, 2nd Edition, 2017.
5. Digital Communications, by John Proakis and Masoud Salehi, McGraw-Hill Education, 5th Edition, 2007.
6. Digital Communication Systems by Simon Haykin, Wiley; 1st Edition, 2013.
7. RF Circuit Design by Christopher Bowick, Newnes, 2nd Edition, 2007.
8. Basic Communications Electronics by Jack Hudson and Jerry Luecke, Master

**References:** Publishing, 1st edition, 1999.

**On Campus** [16 Weeks, 10 lectures, 10 lab sessions (3 hours each) plus exams.]

The overall objective is to allow the student to perform a set of experiments to understand advanced topics in digital modulation and demodulation techniques as well as antenna paramters and optical fiber systems.

**Schedule:**

**Course goals:**

## Course learning outcomes (CLO) and relation to ABET student outcomes (SO):

| Upon successful completion of this course, a student will: | [SO] |
|---|---|
| 1. Be able to conduct appropriate experimentation to understand the basic principles of digital modulation, channel coding techniques, antenna parameters, optical fiber systems, as well as designing transmitter/receiver hardware. | [6] |
| 2. Be able to analyze and interpret measured data, and use engineering judgment to draw conclusions. | [6] |
| 3. Know the basics of communications laboratory instruments (including power supplies, function generators, oscilloscopes, spectrum analyzers and network analyzers) and be able to properly use such instruments. | [6] |
| 4. Understand the requirements and pre-requisites for technical reporting, and be able to properly report experimental results. | [3] |
| 5. Be able to effectively function in a team in a collaborative and inclusive manner, to reach the lab goals and objectives. | [5] |

## Course topics:

| | Hrs |
|---|---|
| 1. Understanding and using a vector network analyzer. | 4 |
| 2. Measurement of antenna main parameters using network analyzer. | 4 |
| 3. Spectrum analyzers and measuring transmitted signal parameters. | 4 |
| 4. Software-Defined Radio (SDR) systems. | 4 |
| 5. Optical fiber systems: Transmitters/receivers. | 4 |
| 6. Dispersion in optical fiber and the Eye diagram. | 4 |
| 7. Multiplexing in telephony and operating a PBX (private branch exchange). | 4 |
| 8. Phase-locked loop circuit design (stage 1: Low-pass filter design). | 4 |
| 9. Phase-locked loop circuit design (stage 2: amplifier design). | 4 |
| 10. Phase-locked loop circuit design (stage 3: voltage-controlled oscillator design). | 4 |

**Ground rules:** Attendance is required and highly encouraged. To that end, attendance will be taken every lab session. Eating and drinking are not allowed during the lab, and cell phones must be set to silent mode. All exams (including the final exam) should be considered cumulative. Exams are closed book. No scratch paper is allowed. You will be held responsible for all reading material assigned, even if it is not explicitly covered in lecture notes. Academic integrity must be maintained.

**Assessment & grading policy:** First Exam 0% Assignments 0% Midterm Exam 30% Projects 0% Final Exam 40% Lab Reports 13%

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|---|---|---|---|
| Quizzes | 13% | Teamwork | 4% |
| | | **Total** | **100%** |

**Last Revised:** Feb 2024