EE 160: Principles of Communication Systems

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Contact information

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**Students are expected to check at least once a week, for
important announcements, homework, exams,
Matlab scripts, Simulink models and reading material.**

This presentation is in Canvas, as is the syllabus.

Textbook and Lab Manual

- **Textbook**
  - J.G. Proakis and M. Salehi, *Fundamentals of Communication Systems*, 2nd ed., Prentice Hall, 2014.

- **Lab manual**
  - Available in Canvas

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Topics covered in EE160

1. Sinusoidal signals

2. Fourier analysis

3. Sampling theorem

4. Spectral density and correlation

5. Amplitude modulation: Up- and down-conversion

6. Binary baseband signaling (line coding)

7. Binary communication systems

8. Wireless communications

Grading

Assignments	20%
Exam 1	10%
Exam 2	10%
Final exam	25%
Laboratory	35%
Total	100%

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Grading Percentage Breakdown

97% and above	A+
94% - 97%	A
93% - 90%	A-
89% - 87%	B+
86% - 84%	B
83% - 80%	B-
79% - 77%	C+
76% - 74%	C
73% - 70%	C-
69% - 67%	D+
66% - 64%	D
63% - 60%	D-
below 60%	F

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Laboratory

- There are four stations in room ENG238

- Every section has a maximum of 16 students, 4 students/group

- Lab kits are available. You will need a breadboard

- Each station is equipped with a PC running Matlab

- Pre-lab and post-lab computations may require simulations of communication system models in Matlab. These models will be discussed in the lab by the instructor and posted in the web site of the course prior to the experiment

- Also provided in the lab, for the AM modulation experiment, are microphones and AM radios

- **The lab manual is available in Canvas**

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Laboratory experiments

- An experiment may require up to three lab sessions

- Please check the lab syllabus for dates

- **<u>Before</u>** each lab session you are required to

  - Read carefully and understand the experiment, the equipment (manual) and the material needed (data sheets)

  - Complete the pre-lab calculations and simulations as specified in the lab manual

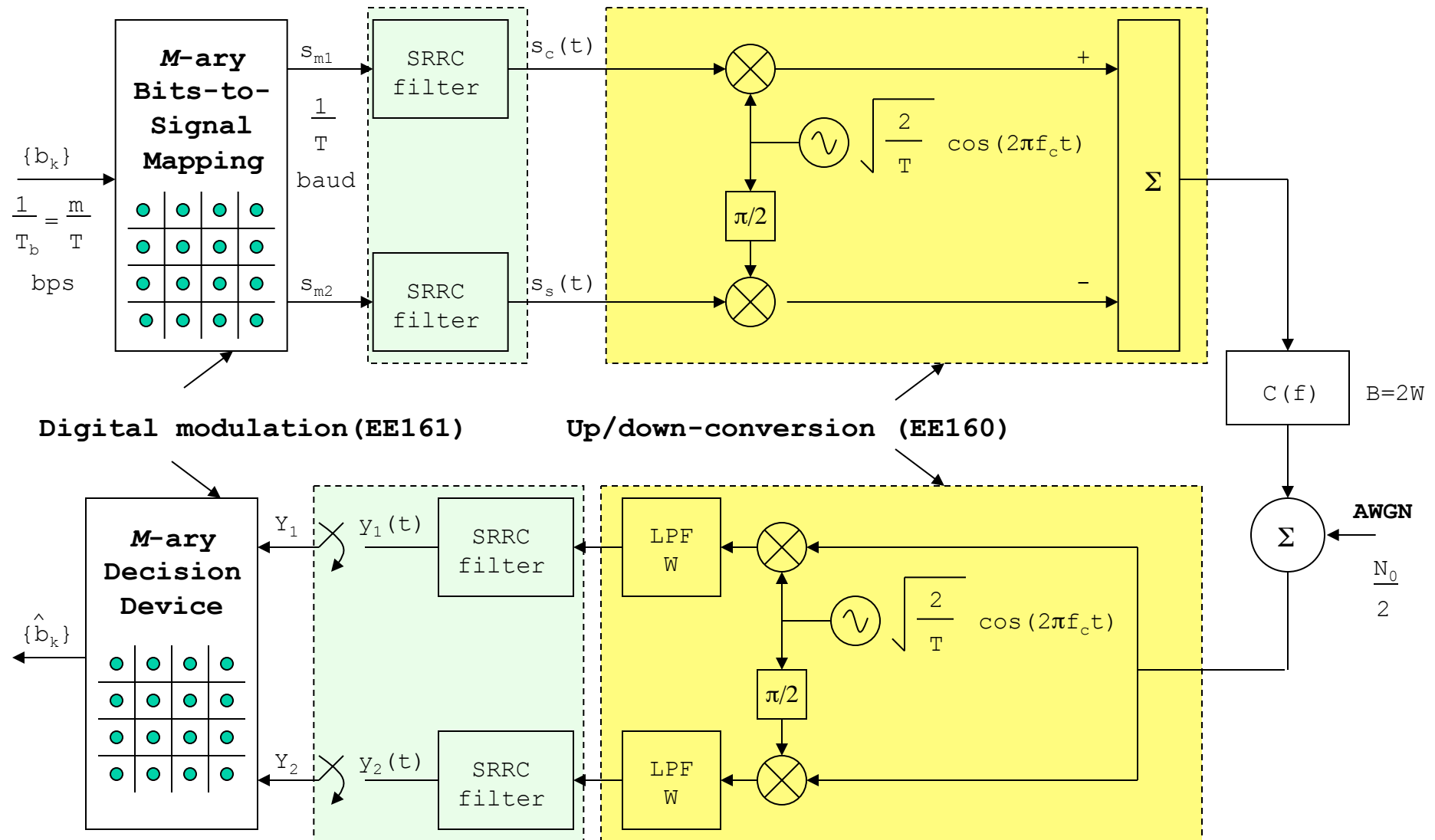## <u>Build as much of the circuit as possible prior to the experiment !!!</u>

Lab experiment report

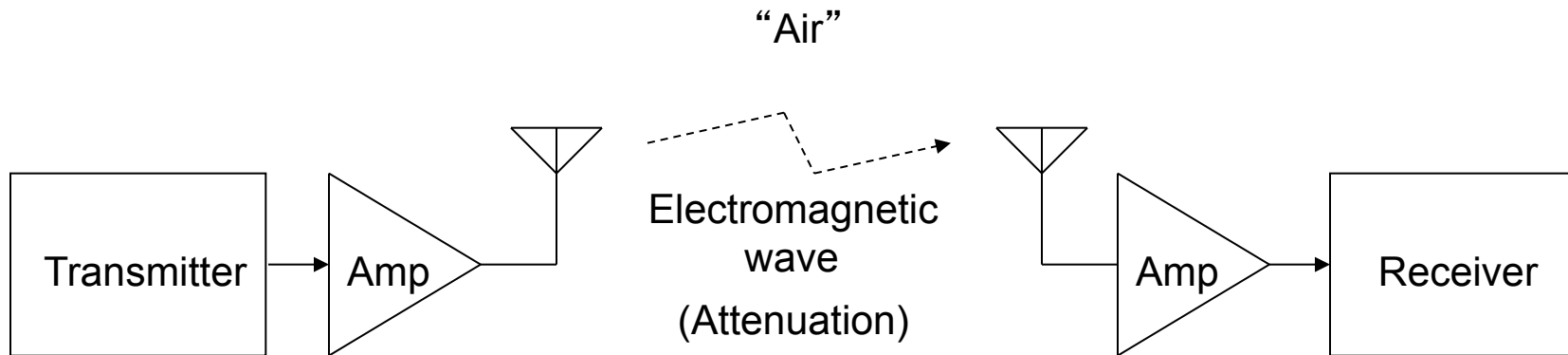Each lab report must contain a cover page (in Canvas) and the following sections:

1. Introduction
2. Modified or additional procedures (optional)
3. Pre-lab computations, simulations and results
4. Measurements
5. Post-lab computations, plots and results
6. Discussion
7. Conclusions

NOTE: A report may be submitted individually, if a student does not work with his/her group

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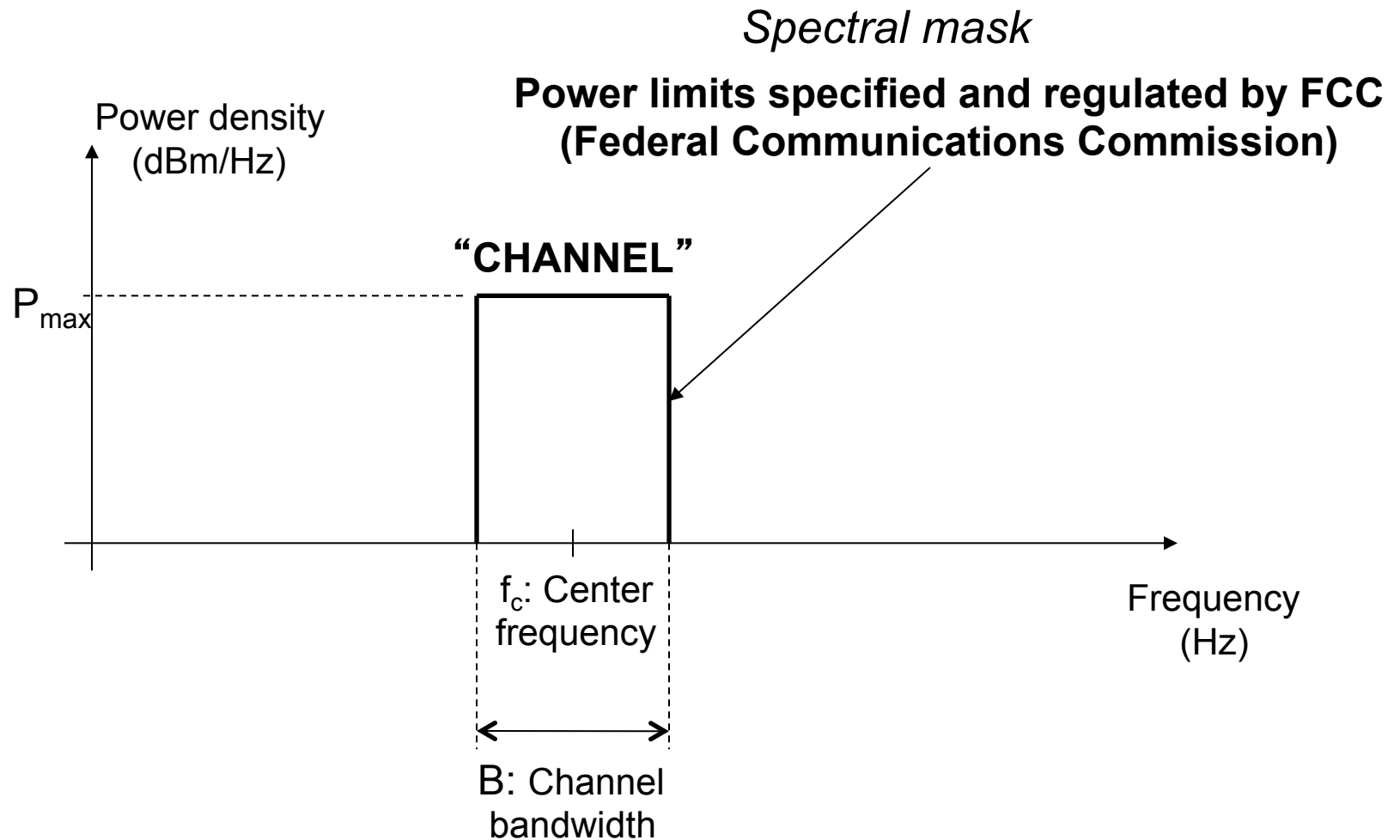# A Modern Communication System

Digital modulation(EE161)

Up/down-conversion (EE160)

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Wireless communication

"Air"

Transmitter → Amp → ▽ antenna · · ·> Electromagnetic wave (Attenuation) ▽ antenna → Amp → Receiver

The "Air" is a national resource.
It's use is regulated by the US government …

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Spectral occupancy

Spectral mask

**Power limits specified and regulated by FCC
(Federal Communications Commission)**

Power density
(dBm/Hz)

"CHANNEL"

P_{max}

f_c: Center
frequency

Frequency
(Hz)

B: Channel
bandwidth

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Nonlinearities and harmonics

- <u>Nonlinearities</u> of RF (radio-frequency) amplifiers may cause additional spectral components (related to harmonics) that fall outside of the allocated channel bandwidth: