

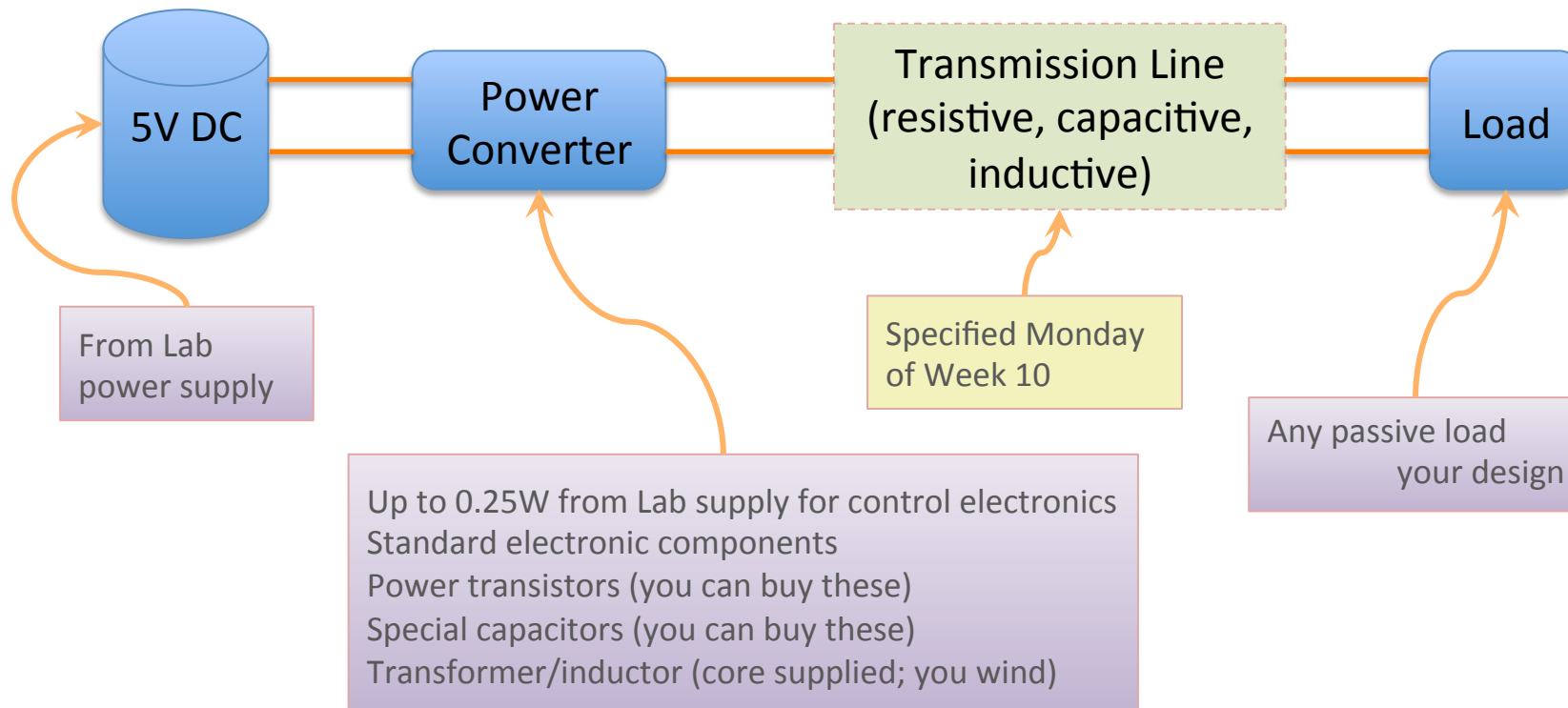
ELEC/TELE/PHTN 4123

Elective Topics

Introduction
Professor David Taubman

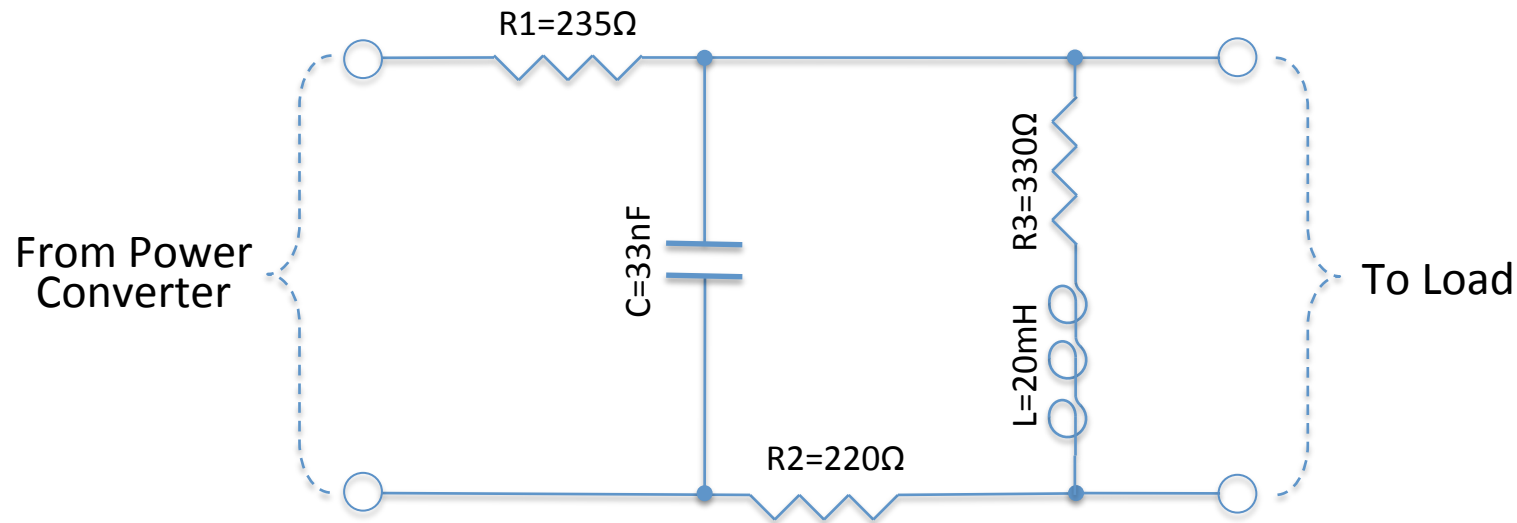
Energy Systems Topic

- Objectives:
 - Transfer as much power to load as possible: P_{load}
 - Maximize overall power efficiency: η
 - Overall performance: $\eta \cdot P_{\text{load}}$
- Constraints:
 - Max 50V rms over transmission line



Elec4123, S1/2017 – Energy Systems Elective Design

Topic: Transmission Line Specs-V2 (18 boxes)



Explanatory Story:

- You are trying to transmit power through cabling in an old disused mine. The inductive component in the cable model comes from rotating machinery which is non-functional, but presents an unwanted load you have to deal with.

Notes:

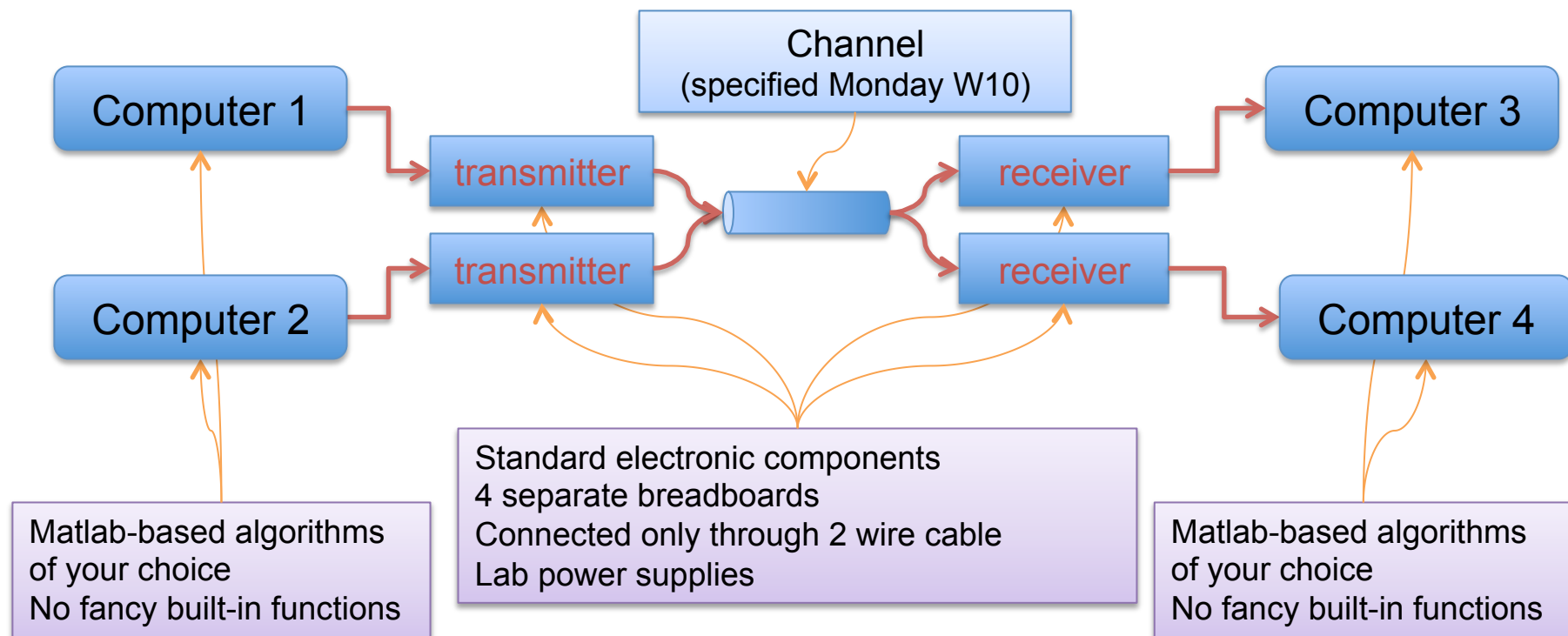
- $R3$ includes nominal series resistance associated with inductor, L
- Nominal values are subject to typical $\pm 10\%$ tolerance

Performance parameters:

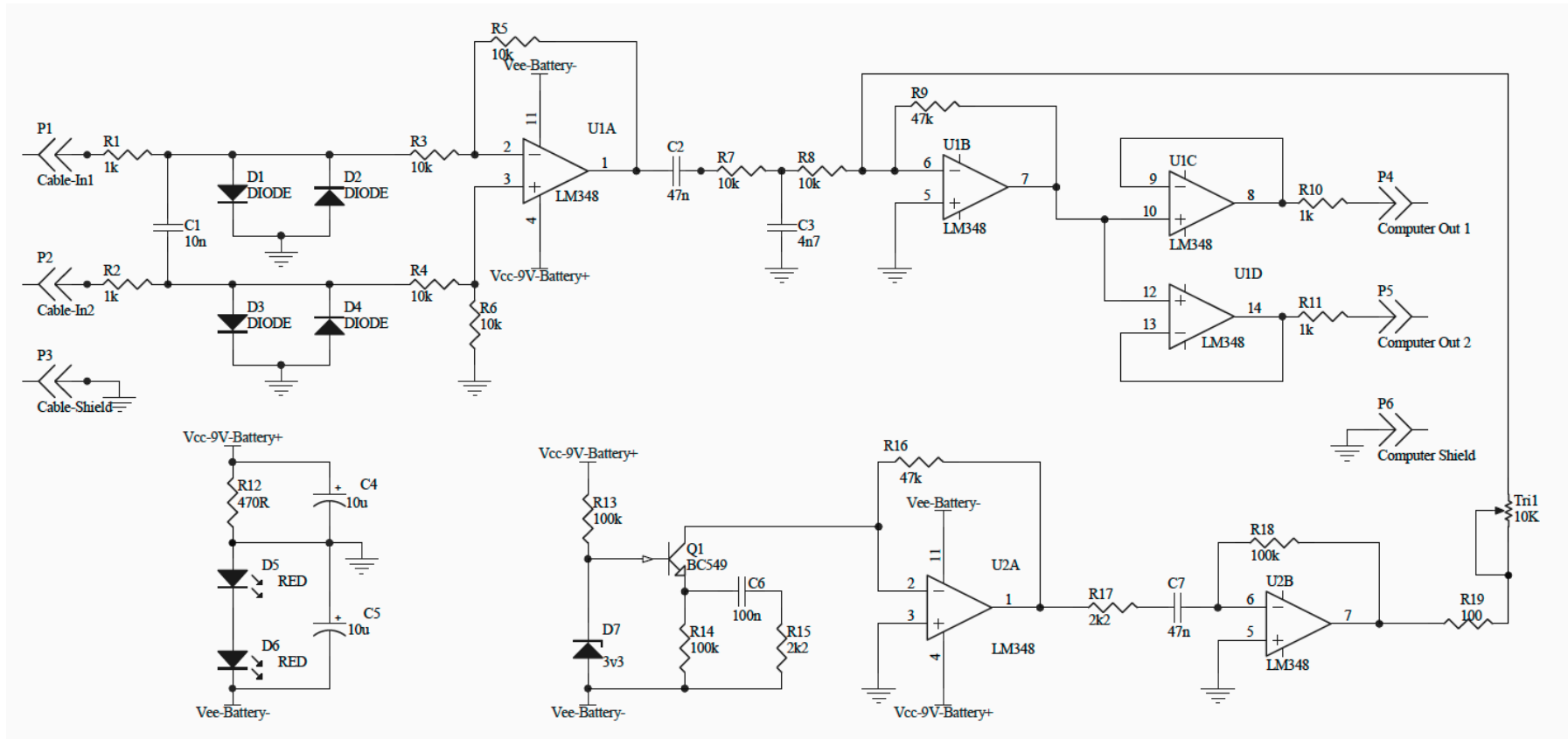
- $X = 0.95\text{W}$ (target power in load) – N.B. it is theoretically possible to achieve at least 1.14W
- $E = 20\%$ (target power transfer efficiency) – N.B. it is theoretically possible to achieve $\sim 32\%$
- We reserve the right to modify the above parameters slightly if warranted, but this is unlikely.

Physical Comms Topic

- Objective:
 - Communicate separate text messages between two pairs of computers, over shared shielded cable, without error
 - Minimize time taken for complete recovery



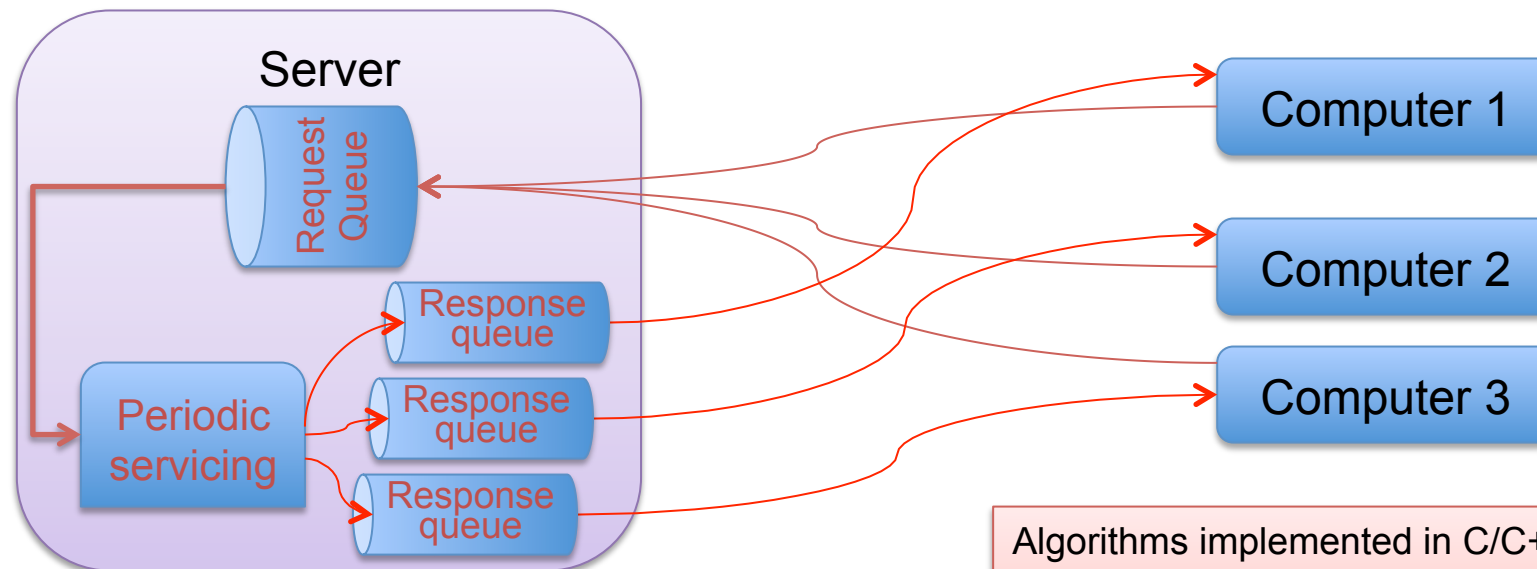
Communication Channel



- -3dB points $\sim 130\text{Hz}$ and $\sim 5\text{kHz}$
 - -20dB at $\sim 22\text{kHz}$
- Noise at output: $\sim 0.2\text{ Vrms}$ – set by staff
- Target: $X = 100\text{ chars/s}$

Data Networks Topic

- Objective:
 - Recover hidden message from server on 3 separate computers, by issuing queries over a UDP-based protocol
 - Receive message as quickly as possible
- Conditions:
 - Additional hidden clients (cross traffic) may exist
 - Request queue shared and easily overflows
 - Each client has a response queue with limited bandwidth (1kB/s)



Protocol released by Monday of Week 10

Algorithms implemented in C/C++

- Using gcc under Linux or
- Microsoft Visual Studio under Windows

Computers may talk to each other

Network Protocol

- Request dgrams have 4 bytes: location L
- Response dgrams have 5 bytes:
 - L (if char present) then C, or
 - L+251 (if char not present) then undefined byte
- Requests/responses might be dropped
 - Cannot be sure requests will be answered in order
- Target: $X = 300$ chars/s

Report

1. Problem statement – central challenge
2. Selected design concept – reason for selection
3. High level block diagram – identify tasks
4. Allocation of tasks to group members
5. One section for each task (written by member)
 - Theory, calcs, diagrams, circuits, code, etc.
6. Risk mitigation strategies
7. Reflection upon design + achieved performance
 - Final report only
- Preliminary report due in Lab, Week 12
 - Individual understanding marks
- Final report due by Friday of Week 13
 - NB: original handout said Thursday of Week 13

Things to Consider

- What is hard about the problem?
 - put most of your effort into this, right from start
- What do you not know?
 - this is where your risks lie
- Develop multiple possible solutions!
- Use/learn theory where possible
- Lab notebooks
 - at least to prove that you understand when you are interviewed in Week 12