

ELE 212

Linear Circuit Theory

Spring 2026

Administrivia

ELE212 – Linear Circuit Theory

ELE215 – Linear Circuits Laboratory

ELE 212

Kirchhoff's Laws, DC resistive networks, dependent sources, natural and forced response of first- and second-order circuits, sinusoidal steady-state response, phasors, AC power.

ELE 215

Laboratory exercises relevant to ELE212

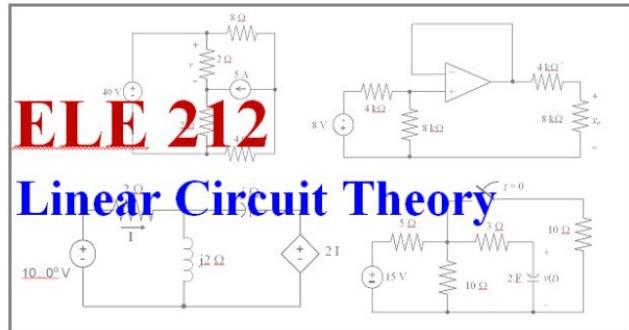
First ELE 215 meeting is this Friday at 2 PM

- Contact info:
 - Prof. Swaszek: office is Fascitelli 492
 - Office hours (nominal):
 - F2F: Mon & Fri 10-11 AM or by appointment
 - Best contact is via email swaszek@uri.edu
- Course websites:

<https://pswaszek.github.io/ELE212/>

class resources

Brightspace: link to the page above; grades will be posted in its gradebook



Kirchhoff's Laws, DC-resistive networks, dependent sources, natural and forced response of first- and second-order circuits, sinusoidal steady-state response, phasors, AC power. (Lecture, 4 credits)

This course is usually taken concurrently with [ELE 215](#) Linear Circuits Laboratory.

NOTICES:

- **none - the info below looks to be correct**

Basic information for Spring 2026:

- Instructor: [Prof. Peter F. Swaszek](#), 492 Fascitelli Center
Office hours: face-to-face Mon and Fri 10:00-10:50 or by appointment; virtual by appointment only
- Lectures:
 - Mon, Wed, and Fri 9:00-9:50 AM, Kirk Aud.
 - Mon 2-2:50 PM, Edwards Aud. (weekly assessment period)

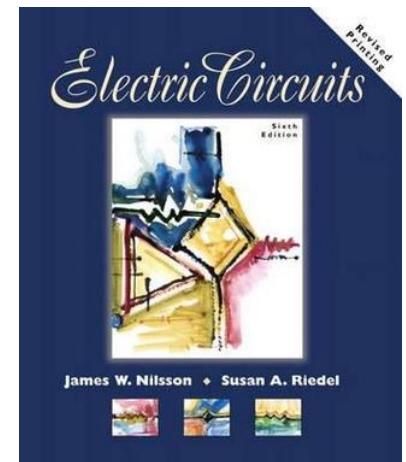
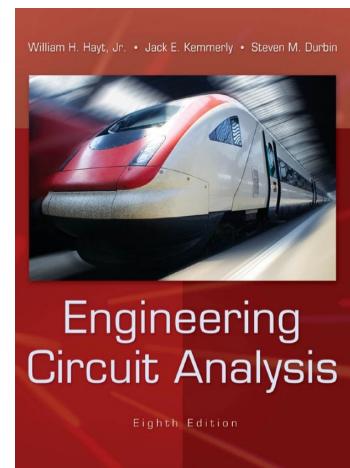
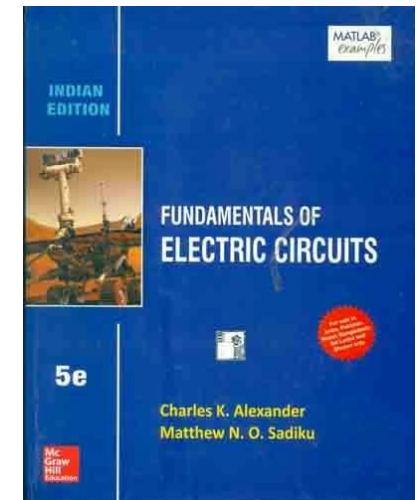
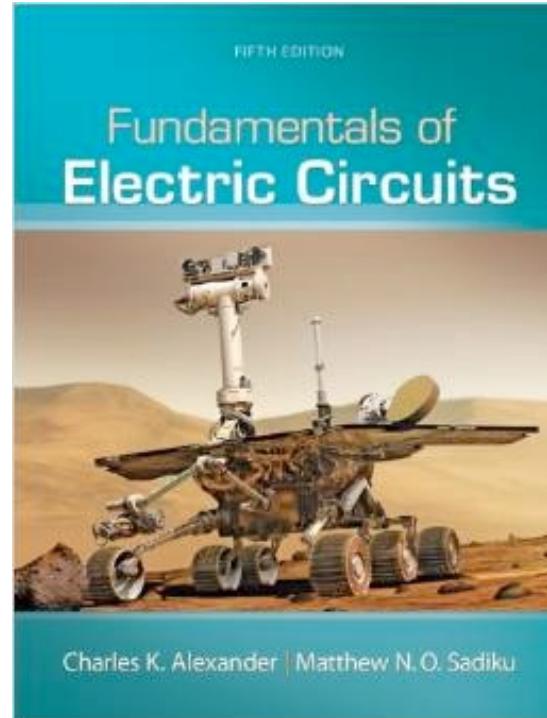
Daily materials and homeworks; additional material:

	Monday	Wednesday	Friday
Week 1	Jan 20	Wed Jan 21 - Lecture 1 Basics 1: administrivia; circuit variables (A&S chap 1) Lecture slides, annotated copy HW 1 on basics - due 8:55 AM Fri Jan 23	Fri Jan 23 - Lecture 2 Basics 2: time variation; sources; resistors (A&S chap 1) Lecture slides, annotated copy HW 2 on basics - due 8:55 AM Mon Jan 26
Week 2	Mon Jan 26 - Lecture 3 Basics 3: circuits; Kirchhoff (A&S chap 1 & 2) Lecture slides, annotated copy HW 3 on basics - due 8:55 AM Wed Jan 28	Wed Jan 28 - Lecture 4 Basics 4: series/parallel resistance; voltage/current division (A&S chap 2) Lecture slides, annotated copy HW 4 on basics - due 8:55 AM Fri Jan 30	Fri Jan 30 - Lecture 5 Basics 5: equivalent resistance (A&S chap 2) Lecture slides, annotated copy HW 5 on basics - due 8:55 AM Mon Feb 2 Outside Topic - solving simultaneous equations: Written material Exercise 1 and Exercise 2 , both due 8:55 AM Fri Feb 6
Week 3	Mon Feb 2 - Lecture 6 Basics 6: circuit analysis; dependent sources (A&S chap 2) Lecture slides, annotated copy HW 6 on basics - due 8:55 AM Wed Feb 4 Outside Topic - Delta-Wye transformations: Written material Recorded mini-lecture Exercise 3 on Delta-Wye (200 pts) - due 8:55 AM Wed Feb 18	Wed Feb 4 - Lecture 7 Basics 7: odds and ends (A&S chap 2) Lecture slides, annotated copy HW 7 on basics - due 8:55 AM Fri Feb 6	Fri Feb 6 - Lecture 8 Node 1: basic concepts (A&S chap 3) Lecture slides, annotated copy HW 8 on nodes - due 8:55 AM Mon Feb 9

Text: Alexander and Sadiku 5th edition; other editions are fine as are **other** books

Review:
Appendices A, B, C

Note:
Appendix D has some answers – **use them!**



- Daily on-line homework: **20%** of the course grade

- Unique login ID

- (in the Brightspace gradebook)

- 5000 total points

- 39 days at 100 pts for each problem set
 - 10 extra problem sets (9 are 100 pts, one is 200)

- Immediately auto-graded

- Typically need both values **and** units for the answer(s)

- Due by the **start** (8:55 AM) of the next class day

- Can resubmit a new answer to get a better score

- Typically, 100%, 100%, 90%, 80%, 60%, 60%, ...
 - Late option at 50% is also available

- Working with classmates is fine

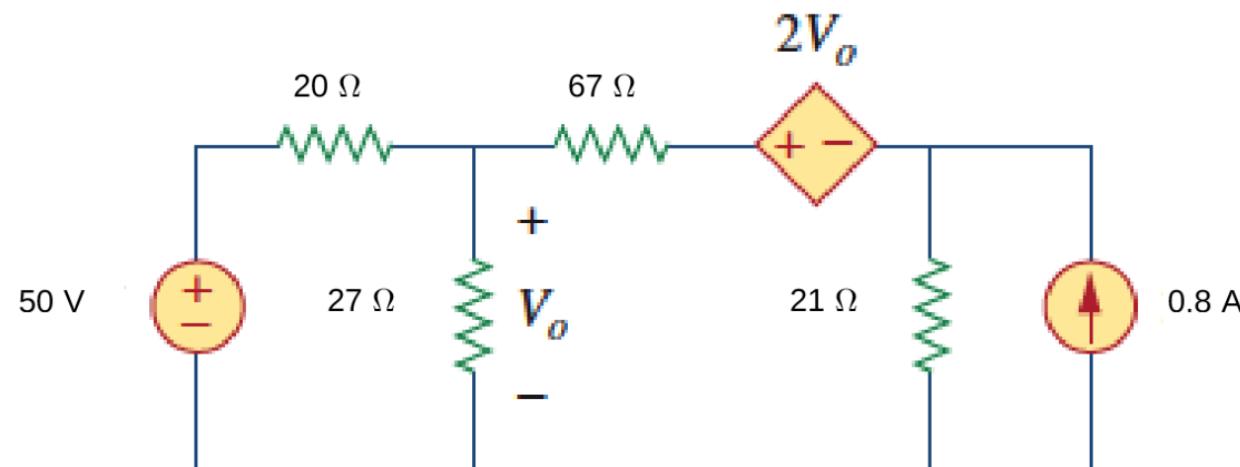
Enter your Homework ID:

Submit

Daily Homework 11

LOGOUT

Part #1 - Score: 0/100



For the circuit shown above, solve for V_o .

V_o :

SUBMIT

- Concern
 - **System crash and non-recovery**
 - Precautions:
 - Me
 - Frequent download of your performance
 - Alternate system
 - You
 - Take screenshots/print pdf of your final scoring



- Weekly quizzes: **80%** of the course grade
 - Mondays at 2 PM in Edward's Auditorium
 - 300 total points:
 - 1st two – 10 pts each
 - Next 11 – 20 pts each
 - 2 during final exam slot (May 4) – 20 + 40 pts
 - Nominally 30-ish minute duration; a problem or two relevant to recent material (prior week or earlier)
 - Closed book; one page (double sided) of notes allowed
 - Bring a **working** scientific calculator; no computers/tablets or phones allowed
 - Grading includes both the answer **and** the process

- Expected existing skills (some reviewed in HW 1):
 - Manipulating and graphing simple functions:
 - Polynomials
 - Sinusoids
 - Exponentials
 - Rooting polynomials (quadratic equation)
 - Complex numbers
 - Simple linear algebra
 - Simple calculus – integration and differentiation
 - Optimizing by setting derivative to zero
 - Knowledge of MatLab

- HW answer submissions:

- 3 significant figures:

12,345 volts → 12300 volts or 12300 v or 12.3 kv

45.678 watts → 45.7 watts or 45.7 w

0.012072 amps → 0.0121 amps or 12.1 ma

0.000040812 amps → 0.0408 ma or 40.8 ua or 40.8 mua

- Occasionally, the question might ask for an integer (whole number) answer (or some other form)

45.678 ohms → 46 ohms

Lecture 1

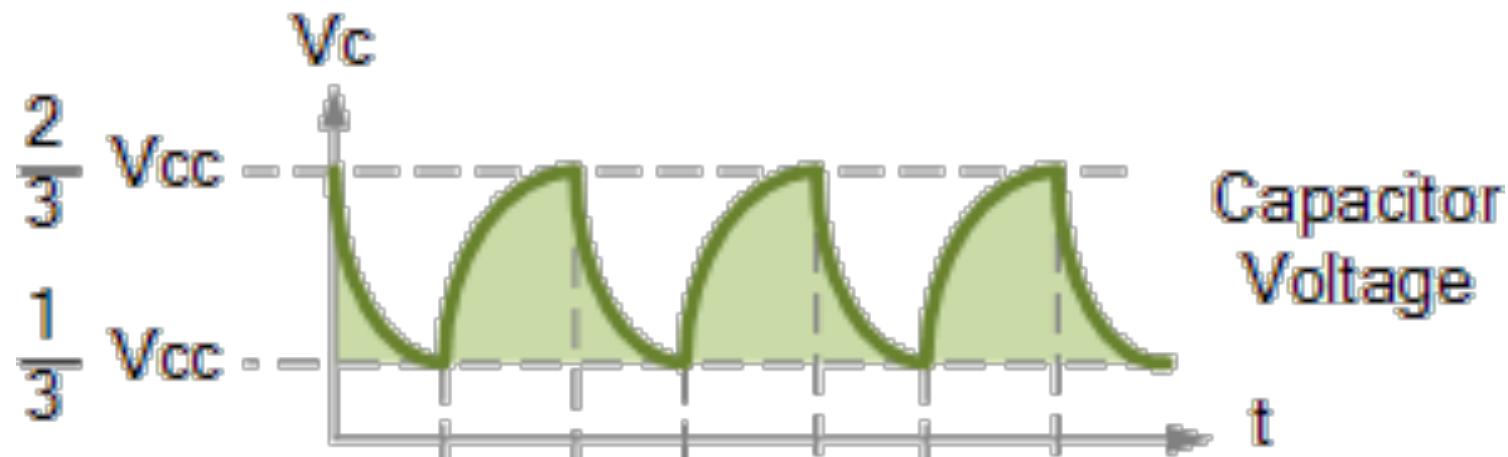
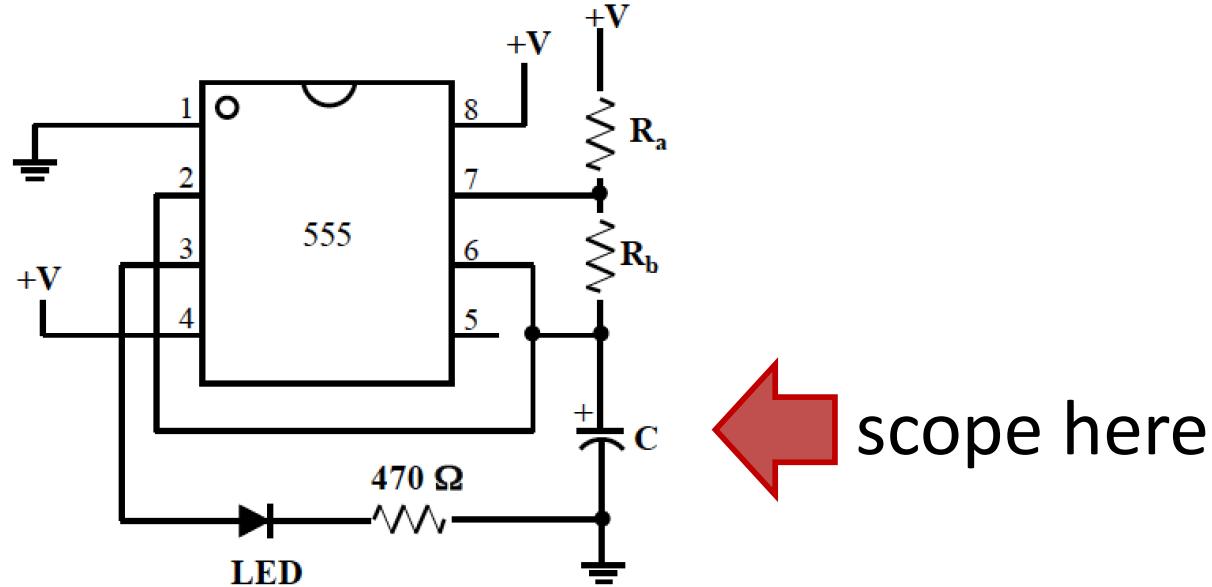
Basics – 1 of 7

intro; circuit variables

Course Contents

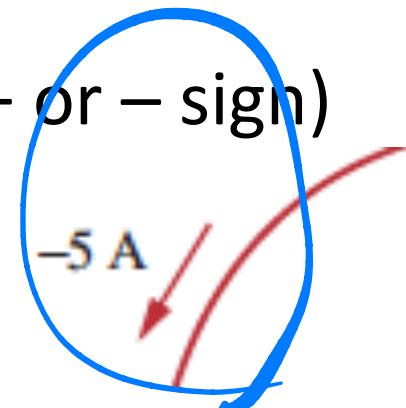
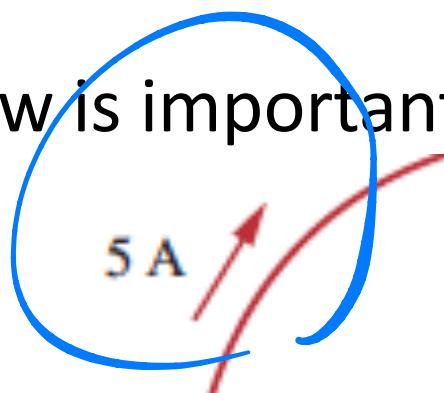
- Learn physical models for some circuit devices
 - “Lumped parameter” paradigm
- Connect these devices into circuits
 - Concerned with electrical interactions
 - Observe interesting (and useful) characteristics
 - Develop analysis tools
- Parallel lab (215) to explore/extend concepts

- Recall the 555 circuit from ELE 202:



Circuit Variables

- Charge $q(t)$: unit is coulomb
- **Current** $i(t) = \frac{dq(t)}{dt}$
 - Flow of charge per unit time
 - Measured at a single point
 - Unit is ampere (A, mA, μ A) $\sim 6 \times 10^{18}$ electrons/sec
 - Direction of flow is important (use + or - sign)

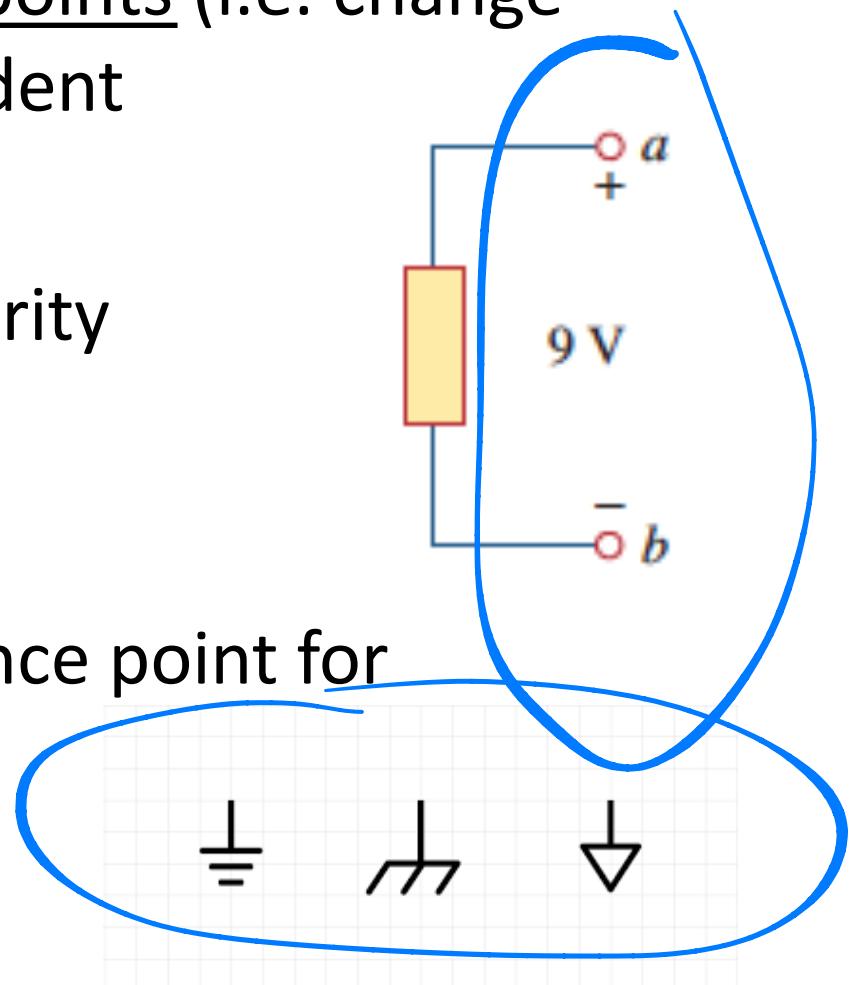


- **Voltage** $v(t) = \frac{dw(t)}{dq}$



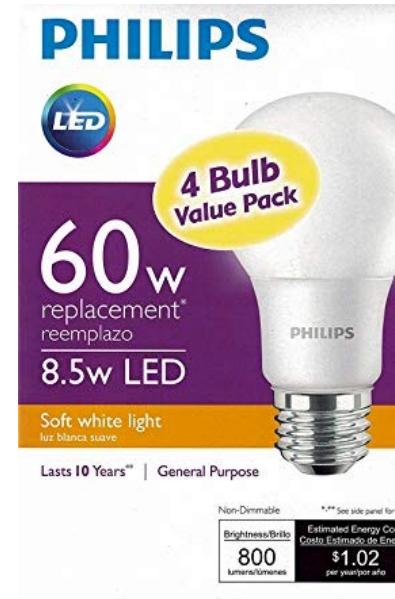
- Potential energy per unit charge
- Measured between two points (i.e. change in energy); path independent
- Unit is volt (V, mV, μ V)
- Also has direction or polarity

- “Ground” – common reference point for measuring voltage (zero)

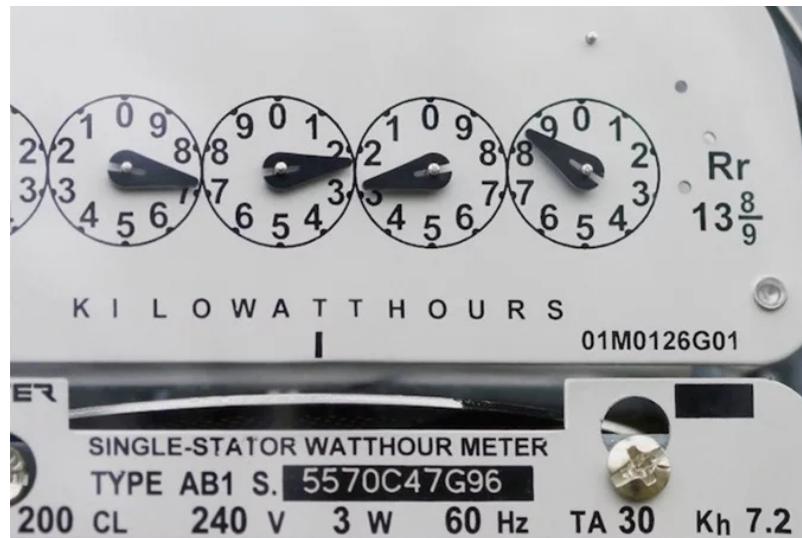


- **Power** $p(t) = \frac{dw(t)}{dt} = \frac{dw(t)}{dq} \frac{dq(t)}{dt} = v(t) i(t)$
 - Energy per unit time
 - Unit is watt = volt ampere (kW, W, mW, μW)
 - Can be absorbed or delivered
 - Is conserved

7200 WATT GENERATOR



- **Energy** $E = \int p(t)dt$
 - Accumulation (integral) of power over time
 - Could be stored, turn into heat, ...
 - Unit is joule = watt second



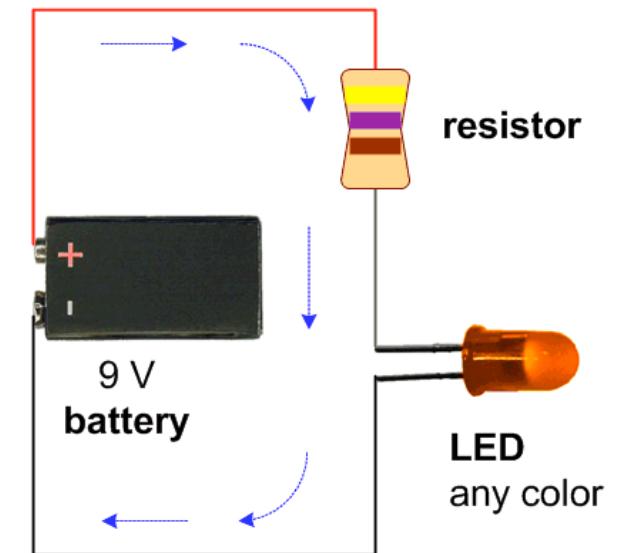
- **Example:** (recall ELE 202, LED + resistor circuit):

- Voltage: 9 V battery
- Current = 10 mA
- Power

$$p = v i = 90 \text{ mW}$$

- Energy

$$E = \int p(t)dt = \frac{90}{1000} T \text{ J}$$



- For $T = 1$ hour, this is 324 J
- For a 10 kJ battery, stops after 31 hours