Provide Early Success Opportunities

Students watch video at home --> 2 minute quiz at start of class
- doesn't necessarily reflect their preformance on future tests
- hard to evaluate their understanding of material from videos
    - not really thinking about video, just copying information from video

Lab component
- Give students a 'challenge' that they can relate Ohm's Law, circuit simplification in the lab

Ask them to evaluate their own performance on exams
- analyze where their mistake were made

On homework assignments, vary the difficulty level
- at first, 'simple' circuits to improve their efficacy expectation
- they see that they really CAN do analysis before moving onto more difficult problems
- offer the 'simple' problems online (students can work on them asynchronously)
    - immediate feedback
    - "low stakes" if they fail - multiple attempts

Strategies to help establish value

Connect the material to students' interest

Student interests:
- Difficult to determine what their interests are (how do we find out what they're interested in)
- Variety of interests (BME students, EE students, etc. have different interests)
    - turn one group on/off if you are too specific

Focus on **common**things
- consumer electronics (capacitive = touchscreens)
- music (dancing lights based on frequencies)
    - let them plug their MP3 player into the circuit
    - introduce frequency response, filtering, amplifiers

May not be helpful for students who aren't as interested in music
- some students may not be 'interested' in anything (stubborn)

Relevance to professional lives

Demonstrate how circuits can be connected to other disciplines/classes
- Communication, heat transfer, etc.

Give them 'real' problems, not just book problems
- sort through a variety of things that must be incorporated in solving a problem
- more about coming up with a variety of solutions, not necessarily THE solution (from book)

New instructors tend to need to focus on items 2, 3 and 4.

Without properly gauging a course level (i.e. exam difficulty and time constraints for exams -- 3X to 4X rule), students may become demoralized.

Instructor should look to the syllabus from pre-req courses to understand the content knowledge that students should have upon entry to course

Through early discussions and quizzes, instructor can gauge the skill level of the class

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Number 2 -- Provide authentic real-world tasks

Jack: Relate what is being taught to what students may be interested in and what they might do on the job

Strain gauge op amp and the weighing of textbooks (non EEs)

Joe: Op amp audio amplifier

Michael: Lab component is the ideal place -- temperature sensor

Jim: Audio lab and PPG circuit

Mohammad: Sensors and waveshaping circuits (electronics course)

Number 5 -- Identify and reward what you value

Michael: Value intergrating concepts: topic approached topic from many directions to foster critical thinking skills

Mohammad: Value integrating concepts and application: students provide examples of applications of circuits that are being studied in class

Jack: Help students handle the inherent abstraction in EE

1. As an instructor, plan tasks so that everything lines up, as far goals, homework assignments, lectures, exams...

2. See 3 below. This impacts motivation. You want them to be successful.

3. Creating appropriate assignments, given the students' backgrounds. You may need to include background concepts in whatever you are teaching and giving assignments on. Be aware that all students are not at the faculty member's level.

5. Give clear expectations to students.

6. Rubrics are a form of precise expectations. The faculty should be clear what determines an A, B, or C grade.

7. Be aware of how the students are doing (don't just rely on your grader). Give the students an idea of how to fix mistakes. Be constructive (helpful).
Having students participate in class will give them feedback orally in class.

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3. Show relevance to students' academic interest

I am constantly discussing circuit analogies in terms of other engineering quantities - water flow, force, friction, pressure, gears

Non-EE's will need to know how to talk with EEs - learning vocabulary. Group work in class helps facilitate developing and using appropriate vocabulary.

6. Show your passion and enthusiasm

Describe how I use concepts in class on research or more advanced coursework.

Extra effort in class, including examples that might not be in the textbook.

We can take notes! Team 5.

Do we tell students it is relevant or do they have to show they can do it?
Get industry board members to give the message.
Technical vs personal skills such as teamwork, writing, speaking.
You get hired for your technical skills. Your lack of people and communication skills will kill your career.

Use personal experience of real applications to illustrate class learning outcomes.
Also typical job interview questions.

Engineering has an input filter that largely brings in motivated students.
Use teardowns. Show power supplies, memory, LEDs. Ask about cost.

Cars, audio are good for examples.

4) Provide early success opportunities.

Provide early, easy to do lab experience.
Progressively more difficult quizzes.

7) Provide targeted feedback.

Failure to provide targeted feedback leaves students without independent self-diagnosis. Provide regular inclass quizzes with instructor immediately going over the solutions. Design the quizzes to be quickly graded and with subparts for partial credit. Less stressful than major exams. Keeps students up to date. and patterns are easier to spot.

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3. Show relevance to students' current academic lives

What is the definition of current (not C/s! :-))?

(a) Ability to logically set up and solve problems.

(b) How it will relate to future classes.
Since I have all majors in my core required circuits class I have to illustrate relevance to the different majors. 30% of my students are typically biomedical engineers of which 1/3 are pre-med. I point out that their EBME 308 Signals and Systems and EBME 310 Biomedical Instrumentation class build upon the principles established in my circuits class. I also point out that Prof. Durand is always reminding me to stress frequency response and Bode plots as being important to biomedical engineering students. My next largest class segment is mechanical/aerospace engineers who are about 25% of the class. There I stress the relevance to their measurement classes where they use strain gages and computer interfaces and the importance of circuits concepts in making modern measurements. I focus less on the other majors because of their diversity but always emphasize measurements and lab work – this is important because many undergraduates are working in research labs.

6. Show your own passion and enthusiasm for the discipline.

Want to be unemcumbered in presenting lectures, walk around, less isolation, more interactivity.

Come up with really odd engineering problems. Present how useful circuits approach is in your research, labs, etc.

This strategy is much harder to document. Get the passion your discipline into the class. Treat circuits problems as puzzles since many engineering students enjoy puzzles.