

## **A Simple LED Flasher**

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Type: Design Problem for Freshmen  
Student time: 3 to 4 weeks  
Location: Take home

### **Summary**

This is intended to be distributed to freshman students as an introduction to electromagnetics and electronic components.

Students are shown a pair of children's running shoes with LED's which flash on as they step down.

A brainstorming session is facilitated by the teacher where ideas as to how the shoes work are discussed in small groups.

Students work in small groups to see if they can produce a circuit that will operate in the same way.

### **ABET Descriptors**

Engr Sci Content: First Year Engineering, circuits and electronics  
Type: Components  
Elements: Analysis, construction, testing  
Features: Design methodology, open-ended problem, alternative solutions  
Constraints: Economic, reliability  
Effort: Team

## **A Simple LED Flasher**

Students shall work in groups for this project.

A pair of children's running shoes are available for inspection.

Working in groups of 4 or 5, brainstorm ideas as to how you think the lights flash on and off as the shoe hits the ground.

You are required to decide on one method and produce the circuit. It should operate in a similar fashion to the running shoes.

You should present a preliminary design and brief report which describe the method you have decided before continuing with your project.

### **Project Deliverables**

A detailed report which should include a listing of all initial ideas, design methodology, analysis of selected design, selection of components, sketches and testing procedures during lab measurements and a list of references used.

Your prototype design will be tested against the original pair of children's running shoes to evaluate its operation.

### **Evaluation Criteria**

- Preliminary design and brief report.
- Detailed report (word processor)
- Prototype LED flasher
  - Environment and safety
  - Simplicity of design
  - Cost
  - Reliability

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### Engineering Notes:

Intended learning outcomes for students from this project include:

Development of circuit and component selection in electrical engineering science.

Development of skills in determining the specifications for the project, design methodology and investigating alternative solutions.

Application of analysis skills to a problem in a physical context.

Development of designing for cost effectiveness and reliability.

Development of assembly skills.

Application of debugging, test and measurement techniques during evaluation of the prototype.

Enhancement of teamwork skills.

The shoes which are commercially available do not contain any mercury, although mercury contact switches are still available and could be used in this project. Discussions relating to environment and safety could be facilitated here.

I believe that the shoes on sale use a magnet (maybe rare earth magnet for stronger field) suspended in a small coil. As the shoe hits the ground, the magnet bounces through the coil (or visa versa) inducing a pulse of current which drives the LED. Some experimentation would be needed to determine factors such as magnet movement, voltage generated, any clamping zeners, current limiting resistors etc.

Frictional elements, shock and vibration absorbing features could be introduced and related to electronic components selected.