Title: Bicycle Power and Lighting System  
Students: ECE, ECE, ECE  
Topics: Mechanical Design, Power Electronics, Analog Design, Microcontroller Coding, PCB Design

Description
With transportation costs increasing, people in urban and suburban areas are turning towards cost effective bicycle commuting for their transportation needs. The Bicycle Power and Lighting System (BPLS) will provide features for the bicycle commuter such as always-ready head and tail lights; trip information; and an accessory power port. The central item of the BPLS is the in hub generator, which is used to recharge a battery pack. The battery controller system manages the battery charging profiles, and provides power to the head and tail lights along with the accessory power port. More advanced features include intelligent charging profiles based on bicycle speed, crank RPM, and battery voltage.

Absolute Minimum Requirements
- Rechargeable battery charging system using front wheel hub generator
- Integrated bicycle computer (current time, current speed, average speed, distance, etc.)
- Always-ready headlight and taillight for "being seen" visibility with blink option
- 12 V power port for charging electronic gadgets
- System does not impede safe bicycle operation
- System weighs less than 2 lb
- System must be able to power headlight and tail lights for 30 minutes after only one hour of cycling

Desired Features
- Marketable product
- Intelligent hub generator charging profiles (speed, crank RPM, and battery voltage)
- High visibility headlight for safe bicycle operation in zero ambient light conditions
- Programmable voltage/current direct-connection charging ports and cables (cell phone, GPS, etc.)
- Secure mounts for cell phones and other electronic gadgets
- System weighs less than 1 lb