

EE 3033 Electric Power Systems

DC ELECTRIC MOTOR DESIGN AND CONSTRUCTION PROJECT

OBJECTIVE:

- Demonstrate an understanding of a DC electric motor principles through the design and construction of a DC motor
- Design, construct, and demonstrate a DC motor optimized for maximum speed of rotation over a timed period of operation and connected to a DC generator load.
- Evaluate and report on variations in coil design, component placement, and number of magnets on the speed of the motor

REQUIREMENTS:

- Each team must construct a working DC motor of their design for speed and load measurements.
- A team report detailing the effects of various design factors such as the number of magnets, the coil design (shape, dimensions, number of turns), component placement and applied voltage, the measurement of voltage and current and a calculation of the power. The report must also include a design drawing and parts list.

CONSTRUCTION SPECIFICATIONS:

- The motor must be constructed with the materials listed below. Pre-manufactured subassemblies such as armatures, field structures may not be used.
- All power for operating the motor must come from a DC power supply.
- The motor may be operated through manual electrical controls such as switches, variable resistors or other electrical interface devices, or the system may operate automatically after starting.
- Electrical and electronic components such as switches, variable resistors, or capacitors readily available through local retail or mail order sources may be used.
- There must be a 1" or larger diameter disc attached to one end of the motor shaft and painted black. A reflective tape marker should be attached so the marker may be readily viewed by a tachometer to determine the rotation speed.
- Each entry will have two 1 minute timed runs where the speed will be determined. The higher observed score will be used.
- The motor will also be connected to a DC generator, which is connected to a resistive load and voltage/current to the resistive load measured and power determined.
- No intervention with the motor's operation is permitted during the timed run except through the electrical control panel or for starting. The motor must accelerate to a final stable speed if started by auxiliary means.

CONSTRUCTION MATERIALS:

- Ceramic Magnets (magnets can be supplied)
- Wire, tape, paper clips or construction material

GRADING:

- A maximum of 30 points will be used for grading based on the following:
 - 10 points for motor design and speed construction
 - 10 points for electric power generation
 - 10 points for the report
 - Bonus points will be awarded to the fastest (highest RPM motor) and to the most creative motor design
- The speed score will be the maximum observed stable no-load rotation speed of the motor in rpm reduced by any penalties.

SPEED TRIAL

- The Speed Trials will be held in class.