BURLINGTON COUNTY COLLEGE

Engineering Program

EGR 103

Fundamentals of Engineering Design

SYLLABUS

SPRING 2010

COURSE SYLLABUS SUMMARY for

EGR 103 Fundamentals of Engineering Design

LEC INSTRUCTOR: _____ OFFICE: _____ PHONE: (856)-222-9311 ext. _____

LAB INSTRUCTOR: _____ OFFICE: _____ PHONE: (856)-222-9311 ext. _____

COURSE DESCRIPTION:

This course involves interdisciplinary teams of students working on an engineering design project. Electronic, mechanical, and schematic drawing software - lecture and lab modules, are designed to give students the skills to design, build, document, and present a working project. Projects must have elements of Electronic and Mechanical Engineering design. Each team will prepare a written report, give an oral presentation, and demonstrate their multidisciplinary project.

REQUIRED TEXT & One 3-Ring Binder:

No text is required for this course. Students are expected to use this savings (approximately $100 per student) **toward the cost of project construction**) and a RC car. The group only needs to buy wood, pneumatic parts, sprockets, chains, pulleys, belts etc.

All projects will be kept by the college for ABET Accreditation.

One 3-Ring Binder is required for Lec., HW, Labs and Test Equipment Instruction Guide.

EVALUATION:

A. Two (2) excused absences are permitted per term. Students are expected to be on time and stay for the full duration of the class, otherwise they may be marked absent. If a student's absences are excessive, the instructor may assign the student an "F" grade for the course.

B. Academic misconduct that disrupts the learning process in class, such as excessively leaving the classroom for cell phone conversations, can affect the final grade.

C: The Electronic - Mechanical / Schematic Drawing % of Final Grade

1) Test 1 Grade	12.5%
2) Test 2 Grade	12.5%
3) Test 3 Grade	12.5%
4) HW Average Grade	12.5%

The Project Grade % of Final Grade

5) Lab Average Grade	12.5%
6) Outside Judges Grade	12.5%
7) Project Report Grade	12.5%
8) Self Evaluation Grade	12.5%

CALUATION of FINAL GRADE average

Add up all 8 grades and ÷ by 8

FINAL GRADE based on Final Grade Average

A	100 to 90	C	74 to 70
B+	89 to 85	D	69 to 65
B	84 to 80	F	below 65
C+	79 to 75		

COURSE SYLLABUS

COURSE # /TITLE: EGR103 Fundamentals of Engineering Design

SEMESTER CREDIT HOURS: 3; Pre or Co-Requisite: ENG 101.

COURSE DESCRIPTION:

This course involves interdisciplinary teams of students working on an engineering design project. Electronic, mechanical, and schematic drawing software - lecture and lab modules, are designed to give students the skills to design, build, document, and present a working project. Projects must have elements of Electronic and Mechanical Engineering design. Each team will prepare a written report, give an oral presentation, and demonstrate their multidisciplinary project.

COURSE MEETINGS: - Two days per week for 3 Hours each

PART I – First 2/3 of Term (Project construction is done outside of class)	**1ST DAY**:	2 Hours for Lecture & HW Question/Answer session 1 Hour for Project discussion.
	2nd DAY:	3 Hours for Lab.
PART II – Last 1/3 of Term	**Both Days**	1) Finish project construction, 2) Project Interfacing, 3) Create drawings, 4) Report writing, 5) Preparing presentation, 6) Project presentation before Judges, and 7) The Race.

RATIONALE:

EGR103 Fundamentals of Engineering Design is a 1st Term Freshman Engineering course required for the BCC A.S. Degree in Engineering, Drexel's BS degree in Engineering or Applied Engineering Technology and NJIT's BS degree in Engineering and Engineering Technology.

The BCC A.S. degree in Engineering can be transferred to most local 4-year engineering colleges including Drexel, Temple, Univ. of Penn., NJIT, and FDU to obtain a B.S. Degree in Engineering

ABET Accreditation of Burlington County College's Electronics Engineering Technology Program and Computer Servicing & Networking Technology Option

What is accreditation? Accreditation is used to assure quality of programs in educational institutions. It requires our college and EET program meet certain, defined standards or criteria. There are two types of accreditation, institutional and specialized. Institutional accreditors, such as the Middle States Association of Colleges and Schools, are "regional" accreditors and examine the college as a whole. Specialized accreditors evaluate specific programs such as the engineering and technology programs. The Accreditation Board for Engineering and Technology (ABET) is a professional accrediting organization that accredits Electronics Engineering Technology and Engineering programs across the country.

How does accreditation benefit the student? Accreditation serves to notify parents and prospective students that a program has met accepted standards. Student work, faculty qualifications, laboratory resources and administrative support are evaluated for strengths and weaknesses and a report is issued on ways to improve the program. Employers know that these graduates are prepared to begin professional practice. Students who graduate from an ABET accredited institution have an easier time transferring to other ABET accredited institutions. Also, state licensing boards and certification programs may require graduation from an ABET-accredited program as the first step in the registration or certification process for professional practice. In some instances, ABET accreditation may permit students to receive federal funds in the form of scholarships, loans and grants.

Accreditation Board for Engineering and Technology (ABET)
111 Market Place, Suite 1050
Baltimore, Maryland 21202
(410)-347-7700; (410)-625-2238 (Fax)

The Electronics Engineering Technology Program and Computer Servicing & Networking Technology Option

Program and Option Mission Statement

The mission of the Burlington County College Electronics Engineering Technology Program and Computer Servicing & Networking Technology Option is to produce graduates who are able to obtain employment as a technician or transfer to a four-year college. In addition, our graduates will be technically competent, able to communicate effectively, work well with others and demonstrate professionalism.

Program Educational Objectives

The Electronics Engineering Technology Program and Computer Servicing & Networking Technology Option prepare graduates who, during the first few years after graduation, should be able to:

1. Find employment as a technician or transfer to a four-year college,

2. Apply a broad knowledge of electronics and computer engineering technology to support manufacturing, design, testing, troubleshooting, sales, and field service of electronic and computer systems,

3. Apply knowledge of analog and digital electronics and use mathematics, scientific principles, and critical thinking to creatively solve technical problems,

4. Utilize computers and software in a technical environment,

5. Communicate effectively both verbally and in writing,

6. Work effectively as an individual and as a member of a team,

7. Show a recognition of the need for professional, ethical and social responsibilities and

8. Continue professional training through conferences, seminars, courses and the pursuit of advanced degrees.

Program Outcomes

Graduates of the Electronics Engineering Technology Program and Computer Servicing & Networking Technology Option should demonstrate:

a. an appropriate mastery of the knowledge, techniques, skills, and modern tools of their disciplines,

b. an ability to apply current knowledge to new applications,

c. an ability to conduct, analyze and interpret experimental results and apply results to make improvements where applicable,

d. an ability to apply creativity in the design of systems, circuits or processes,

e. an ability to work effectively on teams,

f. an ability to identify the characteristics of, analyze and solve technical problems,

g. an ability to communicate effectively through writing and oral presentation,

h. a recognition of the need for, and an ability to engage in lifelong learning,

i. an ability to understand professional, ethical, and social responsibilities,

j. respect for diversity and a knowledge of contemporary professional, societal, and global issues, and

k. a commitment to quality, timeliness and continuous improvement.

EGR 103

Course Outcomes with Performance Criteria

Course Learning Outcomes Students should be able to:	**Performance Criteria:** A minimum of 70% of students will achieve at least a 70% for the following activities:
1. Explain the operation of electrical and basic electronic circuits.	a) Test # 1-3 (Imbedded test questions) (Correct ans.) b) Team Capstone Design Project **Electronic Report** (Evaluate with a rubric)
2. Analyze and solve problems of the mechanical part of the project	a) Team Capstone Design Project **Mechanical Report** b) Team Design Project **Mechanical Oral Presentation** Both evaluated with 2 separate Rubrics
3. Use Visio & Electronic Workbench (EWB) software to draw schematics	a) Team Capstone Design Project **Report Drawings** b) Team Design Project **Oral Presentation Drawings** Both evaluated with 2 separate Rubrics
4. Apply knowledge learned in the course to creatively design and build an electronic/mechanical project, interpret and apply results to make improvements.	a) Team Capstone Design Project **Report Final Score** b) Team Design Project **Oral Presentation Final Score** Both evaluated with 2 separate Rubrics
5. Function effectively on teams	a) Team Capstone Design Project **Report Final Score** b) Team Design Project **Oral Presentation Final Score** Both evaluated with 2 separate Rubrics
6. Communicate effectively through a written report and an oral presentation	a) Team Capstone Design Project **Report Final Score** b) Team Design Project **Oral Presentation Final Score** Both evaluated with 2 separate Rubrics
7. Make improvements to project with a quality that it works reliably, and complete project on time.	a) Team Capstone Design Project **Mechanical Report** b) Team Design Project **Oral Presentation** **Project Construction & Demo** Both evaluated with 2 separate Rubrics

Contribution of Course Learning Outcomes to meeting Program Educational Objectives

Course Outcome #	**Program Educational Objectives** Graduates the first few years after graduation should be able to:
1 - 7	**1.** Find employment as a technician or transfer to a four-year college,
1 - 4, & 7	**2.** Apply a broad knowledge of electronics and computer engineering technology to support manufacturing, design, testing, troubleshooting, sales, and field service of electronic and computer systems,
1 - 4, & 7	**3.** Apply knowledge of analog and digital electronics and use mathematics, scientific principles, and critical thinking to creatively solve technical problems,
3	**4.** Utilize computers and software in a technical environment,
6	**5.** Communicate effectively both verbally and in writing, and
5	**6**. Work effectively as an individual and as a member of a team

Relationship of Course Learning Outcomes (#) to Program Outcomes (a, b, c…)

Course Outcome #	**Program Outcomes -** Graduates should have:
3	**a.** an appropriate mastery of the knowledge, techniques, skills, and modern tools of their disciplines,
4, 7	**c.** an ability to conduct, analyze, and interpret experimental results and apply results to make improvements where applicable
4, 7	**d.** an ability to apply creativity in the design of circuits, systems or processes,
5	**e.** an ability to work effectively on teams,
1, 2	**f**. an ability to identify the characteristics of, analyze and solve technical problems,
6	**g**. an ability to communicate effectively through writing and oral presentation
7	**k.** a commitment to quality, timeliness and continuous improvement

EGR103 Fall / Spring Course Outline

Week **Topic** **(The Minimum Pace is 1 Unit per Week.)**

1a **Go over Syllabus, past projects and In Class & for HW -**

Each Student Develops a **Sketch with Description of a Project Idea.**

Instructor starts to **discuss** each student's **Sketch** of Project Ideas **individually**

2a **Lec 1** **Conduction, Current, Voltage, Resistance, Ohm's Law and Power**

Instructor continues to **discuss** each student's **Sketch** of Project Ideas **individually**

2b **Lab 1** **Resistor Color Code**, Measuring Resistance on a DMM and use of Ohms Law to Determine Resistance.

Instructor continues to **discuss** each student's **Sketch** of Project Ideas **individually**

3a **Lec 2** **Alternating Current (AC)** **HW2** due **1st day Next Week** Go Over **HW 1**

Collect Sketches & **Discuss Project Ideas** with **those** that were **absent**.

3b **Lab 2** Introduction to the Function Generator and Use of the **Oscilloscope** to Measure AC Voltage & Frequency.

Collect Sketches from those that were absent.

At Home, **Instructor Groups similar sketches together**

4a **Lec 3A** **Gears, rpm & Torque Calc.** Go Over **HW 2** and **Test 1 Review**

Test 1 on **1st day of Next Week**

Instructor puts grouped **sketches** on **Board** and Class votes on **Final Project Ideas**

Students **Fill out Project Skills Form** and Instructor **Collects Form** in Class.

4b **Lec 3B** **Elec. / HP calc. and Belt-Pulley & Chain-Sprocket systems**

HW 3 due **2nd day Next Week**

For those that were **absent, Fill out Project Skills Form** and **Collect Form** in Class.

At Home, **Instructor forms 4 Teams from the Project Skills Forms**

5a **Lec 3C** **Solenoids, Pistons & Air Valves** **Test 1 on Units 1 & 2**

5b **Lec 4** **Properties of Capacitors, Inductors, and Diodes**

HW 4 due **2nd day Next Week** Go Over **Test 1** and **HW 3**

Instructor Forms Teams for the Projects and Future Labs **- (Swap Cell Phone #'s)**

Instructor gives out grouped similar sketches to each team.

Teams Draw Final sketch of Project & **write** an obstacle **Sequence of Events**.

Week **Topic** **Fall / Spring** **(The Minimum Pace is 1 Unit per Week.)**

6a **Lab 4** Capacitance and Diode Properties (Form Lab Groups according to teams)

Teams Discuss Project Sketch & Sequence of Events with instructor

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6b **Lec 5** **Power Switching using Switches, Transistors, Relays and Transistor Timers**

HW 5 due on 1st day of Next Week

Go Over HW 4 and Test 2 Review; **Test 2 on 2nd day of Next Week.**

Teams Discuss Project Sketch & Sequence of Events with instructor

Instructor **Gives Out Motors** with built-in gear transmission **& Pneumatics**

Teams Start Mechanical Part of Project Construction at Home

7a **Lab 5** The Hi Sensitivity Transistor / Relay Switch with Delay

Go over **HW 5** **Teams Meet** after HW 5

7b **Lec 6** **Opto Electronics, and the Light Activated Switch (Photo Gate)**

HW 6 due on **1st day Next Week** **Bring in project** for Inspection on **1st day Next Week**

Fill out the Individual Task form **Test 2 on Units 3 & 4**

8a **Lab 6** The Light Activated Switch (Photo Gate) **Go over HW 6** **Test 3 Review**

1. Instructor **Project Inspection** of Mechanical Interfacing then bring home

Bring in Lec. and Lab books to Next Class

8b **Lec 7** **Drawing schematics with EWB,** **Bring in project** for Inspection on **1st day Next Week**

Lab 7 **Draw Photo Gate Schematic with EWB** **Test 3 on Units 5 & 6**

---**SPRING BREAK**---

9a **Lec 8** **Basics of Analog to Digital Conversion, Traditional Digital Recording and Digital Recording / Playback using the ISD 25xx Series IC**

2. Instructor **Project Re-Inspection** of Mechanical Interfacing then bring home

Teams Discuss Theme Music selection, **Bring Music to Next class**

9b **Lab 8** Build the Digital Recording / Playback circuit using the ISD 2560 IC

Meet to discuss project and Listen to Final Theme Music. **Bring in project** **1st day Next Week**

10a **Lec 9** **Visio Lec on Drawing the Digital Recorder Schematic**

Lab 9 **½ of group based on the Task form in wk. 7b, Draw the Digital Recorder Schematic and 2nd half of group, Record the Final Theme Music**

3. **On Project,** mount wood board for the Protoboard then unmount & label group name.

10b **Lec 10A** **The 555 Timer IC** **Lec 10B** **Use of Visio to draw the 555 Schematic**

Lab 10 **For Pneumatic Cyl. Proj.,** Electronic people, **Add 555 Timer to Photo Gate Ckt.**

Other Groups **Continue with ÷ up tasks** on Task form & Rest of 555 Groups draw 555 Sch.

Week **Topic** **Fall / Spring** **The Minimum Pace is 1 Unit per Week.)**

11a **Electronic Interfacing (Electronic people Only)**

Move Proto Board to Wood Board with the Barrier Strip
Mount AC relay & connect proto board to Barrier strip using solid wires **Follow the wiring diagrams in the Project Guide packet**.

Others in group continue with **drawings and writing reports based on Task form assignments. (Refer to the Project Guide packet for information on all drawings and report writing.) Draw all Block Diagrams in Word or Visio**

Need 2 People to do drawings and 1 to do reports and Power Point

Bring in the Mechanical Assembly of the project that is

Mechanicaly *Interfaced to motor or Pneumatic Cylinder* for the Next Class Meeting

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11b **4.** **Instructor Re-checks** the **Mechanical *Interface to the motor or Pneumatic Cylinder***. And makes suggestions for improvement if necessary.

Electronic people, temporarily mount wired Wood Board. Wire AC Relay, Motor or Solenoid, Limit Micro Switches if any, & Photo Gate to the Barrier Strip using stranded wire. **When finished Remove Wood Board**

Other people, Continue drawings and writing reports. (**Submit for comments**)

Bring project home to continue construction. **Bring it back for next class meeting**.

12a **5.** **Electronic people**, **temporarily** Mount wired Wood Board containing Protoboard to Project Use the Photo Gate to activate the motor or solenoid in the project. **Remove Wood Board**

Other People Continue drawings and writing reports. (**Submit for comments**)

Bring project home to finish construction & paint. **Bring it back for next class meeting**

12b **6.** **On project continue with Final Electronic Interfacing.** **(Project stays)**

Continue with project, Drawings, Reports and Power Point (**Submit for comments**)

13a **Finishing touches to Drawings, Reports, Power Point and project.** **(Project stays)**

13b **Practice Oral Presentations**

Give Electronic copy of report, all drawings and Power Point to the instructor.

14a **Final Oral Presentation** and Submit Report of Project with Drawings to Outside Judges

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14b **Race for Points**

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15 **Final Exam Week** (Make up tests and Labs)

EGR103 Summer Course Outline

Week **Topic** **(The Minimum Pace is 1 Unit per Week.)**

1a **Go over Syllabus and**

Lec 1 **Conduction, Current, Voltage, Resistance, Ohm's Law and Power**

HW 1 due Monday of 2nd week

In Class & HW - Develop a Sketch with Description of a Project Idea.

Start to Discuss Sketch of Project Ideas individually with each student

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1b **Lab 1** **Resistor Color Code**, Measuring Resistance on a DMM and use of Ohms Law to Determine Resistance.

Lec 2 **Alternating Current (AC)**

HW 2 due Monday of 2nd week

Continue to Discuss Sketch of Project Ideas individually with each student

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2a **Go Over HW 1 & 2 and Test 1 Review; Test Monday of Week 3**

Lab 2 Introduction to the Function Generator and Use of the **Oscilloscope** to Measure AC Voltage & Frequency.

Students **Fill out Project Skills Form** and **Collect Form** in Class.

Discuss Project Ideas from **those** that were **absent.** **Collect All Sketches**
(Instructor Groups like projects together at home)

2b **Lec 3A** **Gears, rpm & Torque Calc.**

Finalize Project Ideas with class on white board.

Class Votes for Final Projects

Students **Fill out Project Skills Form** and **Collect Form** in Class.

Lec 3B **Elec. / HP calc. and Belt-Pulley & Chain-Sprocket systems**

HW 3 due Wednesday of 3rd week

3a **Lec 4** **Properties of Capacitors, Inductors, and Diodes**

HW 4 due Monday of 4th week

Test 1 on Units 1 & 2 **Collect HW 1 & 2 to grade**

For those that were **absent Fill out Project Skills Form** and **Collect Form** in Class.

Week **Topic** **Summer** **(The Minimum Pace is 1 Unit per Week.)**

3b **Give back Test 1**

Go over HW 3

Form Teams for the Projects and Future Labs (Swap Cell Phone #'s)

Lab 4 Capacitance and Diode Properties (Form Groups according to teams)

Teams Meet Give out Individual sketch

Teams Draw final Sketch of Project & **write** obstacle function **Sequence of Events**.

4a **Go Over HW 4 and Test 2 Review** **Test 2 Monday of Week 5**

Lec 5 **Power Switching using Switches, Transistors, Relays and Transistor Timers**

HW 5 due Wednesday of 5th week

Teams Discuss Project Sketch & Sequence of Events with instructor

Instructor **Gives Out Motors** with built-in gear transmission **& Pneumatics**

Teams Start Mechanical Part of Project Construction at Home

4b **Lab 5** The Hi Sensitivity Transistor / Relay Switch with Delay

Teams Meet after Lab

Lec 6 **Opto Electronics, and the Light Activated Switch (Photo Gate)**

HW 6 due Monday of 6th week

5a **Lab 6** The Light Activated Switch (Photo Gate)

Test 2 on Units 3 & 4 **Collect HW 3 & 4 to grade**

Fill out the Individual Task form

1. Bring in project for Instructor Inspection of Mechanical Interfacing then bring home

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5b **Go over HW 5**

Lec 7 **Drawing schematics with EWB,**

Lab 7 **Draw Photo Gate Schematic with EWB**

2. Bring in project for Instructor Inspection of Mechanical Interfacing then bring home

3. Bring in Project and Mount wood board, for Protoboard, to the project

Week **Topic** **Summer** **The Minimum Pace is 1 Unit per Week.)**

6a **Go over HW 6**

Electronic Interfacing **Move Proto Board to Wood Board with the Barrier Strip**

Mount AC relay & connect proto board to Barrier strip using solid wires

4. **Bring in project** to Mount wired Board & Limit Micro Switches to Project

Others in group continue with **drawings and writing reports**

6b **Lab** ***Bring in the Mechanical Assembly of the project that is***

Mechanicaly *Interfaced to motor or Pneumatic Cylinder*.

For Progress discussion with the Instructor.

Use the Light Activated SW to activate motor or solenoid in the project

Bring project home to continue construction.

7a **Bring in Project** Wire AC Relay, Motor or Solenoid, Limit Micro Switches if any, & Photo Gate to the Barrier Strip using stranded wire.

Continue drawings and writing reports. (Submit for comments)

Bring project home to finish project construction and paint.

7b **Draw all Block Diagrams in Word**

Continue with project, Drawings, Reports and Power Point

8a **Bring in project and continue Mechanical Interfacing and Construction**

8b **Start Power Point and continue working on Project, Drawings, Reports**

9a **Finishing touches to project, Drawings, Reports and Power Point**

9b **Practice Oral Presentations**

10a **Final Oral Presentation** and Submit Report of Project with Drawings to Outside Judges

10b **Race for Points**

COURSE MATERIALS

A. Required Text: NO text required for this course. Students are expected to use this savings (approximately $100 per student) toward the cost of project construction and a RC car. The group need only buy wood, pneumatic parts, sprockets, chains, pulleys, belts etc.

All projects will be kept by the college for ABET Accreditation.

B. Required Calculator: (Purchase)

A **Scientific Calculator** will be mandatory for this course.

Cell Phone calculators are not allowed for tests!

C. Lectures: (Purchase in BCC bookstore for a nominal fee.)

D. HW packets: (Purchase in BCC bookstore for a nominal fee.)

The HW Packet will generally include:

Questions and problems to answer that follows the topics covered in Lecture.

E. Laboratories: (Purchase in BCC bookstore for a nominal fee.)

For each unit there will be a laboratory covering the units topics.

Laboratories will generally include:

1. Objectives
2. List of Supplies
3. Introduction / Set Up
4. Protoboard Layout & Check-Off Sheet where applicable.
5. Data
6. Calculations and / or Questions
7. Conclusion

F. Project Guide (Purchase in BCC bookstore for a nominal fee.)

Contains information necessary for project construction, drawings and report writing.

G. Test Equipment Instruction Guide: (Supplied)

H: One 1” Three-Ring Binders (Purchase)

Put in this Binder The lecture, HW and Lab Packets.

Project Selection and Grading

The topic of the team's project will be decided on jointly by the students and the instructor in consultation.

The instructor's concern will be for the safety, size, complexity and appropriate nature of the project.

The project Presentation and Report counts ≈ 40% of the Final Grade.

The Project Grade will be determined by an outside panel of judges.

Projects Theme

The project involves building an interactive obstacle course for a Remote control car rally.
Each group must design and build one obstacle and sponsor one racecar.
The team that completes the course in the shortest time wins the race.

Project Goal and Operation

The goal of the project is to design and build an electronically controlled mechanically moving obstacle that is difficult to navigate for a remote controlled car. The RC car should be able to get thru the obstacle based on driver skill or chance, although multiple passes may be required. Generally 4 obstacles will be built with teams of 4 or 5 students. One obstacle will be allowed to destroy the RC car if it does not successfully make it thru that obstacle.

Projects Ideas from the Past

Elevator, Draw Bridge, Flip Plate, Rotating Turntable(s) or Platter(s), Overhead Tram, Shooting Balls, Car Crusher, Cable Car, Spinning Drum(s), and Rotating Boards (Windmill)

RC Car Specifications

Car must **run on 6V** (4 penlight AA batteries) or 9V (6 AA batteries).

Dimensions: 12" max L x 8" max W x 6" max H ± 1"

Proportional steering and speed control is desirable but not required.
It is preferable to have all groups standardize on one model.
A car used last year was the **Radline RTX-1 from Target** for approximately **$50**.
The car should **have a ground clearance of ≈ ¼ inch from the bottom of the motor housing** to the ground. A SUV, Jeep or truck style is preferable over a conventional car style.

Project Specifications

1. Should have elements of Electronic, & Mechanical Engineering design aspects.
The project can be driven by an electric motor (motor can be reversible), Pneumatic Cylinder, or Solenoid activated spring loaded or gravity driven device.

2. All projects will use a photogate, so that when a RC car drives over, it will activate the electronic control circuitry (turning on the motor solenoid or air valve and will also turn on the digital recorder which will play the theme song for the project.

3. Maximum Project Size is: **24" wide, 30" high , 36" long**, Not including Ramps.
May have two sections (not including ramps) if necessary.
Ramps should have a 10° incline maximum and be 12 t o 15" wide..

4. 1 voice chip, 1 Optoswitch (Photo Gate), and 1 large protoboard shall be used.
A **maximum** of 2 micro switches (for limit end stop SW) & 1 motor (15 to 60 rpm)
(Motor can be reversible) AC motors have more power than DC motors
or 1 solenoid and / or 2 springs
or 2 Cylinders & 1 Air Valve,

5. Electronics must operate off (6 Volts DC) and must use separate DC supply for the DC Motors, except for AC Motors or AC solenoid, which use 120 V_{AC}.
Must use an external Relay Off the protoboard to SW the 120Vac to the motor, Air valve or solenoid.

6. Electronic control circuitry shall have 1 delay circuit
(Controls how long project stays on for or provides a delay until solenoid is activated.
1 555 Timer for cycling ON/OFF operation.

7. Carpet should be glued to the bottom to protect the bench tops.

Instructions for developing Obstacle Project Idea Sketches

Should have:

1) Name of obstacle
2. Isometric or Top, Front & Side view Sketch of Obstacle drawn neatly
3. Sketch of Mechanical Drive system drawn neatly
4. Description of how project works that includes:
   Sequence of events starting with driving over a photo gate & including any delays
   Motor Interface - How attach motor shaft to project?
   (Use of a sprocket / chain drive or a pulley belt drive system?)

EGR103 **Term / Yr. _____/_____**

Project Contributions and Skills Survey (Please Print)

Name:_____ Section #: _____

Major: _____

Project Contributions

Put a check mark if you have any of the following:

1) ___ **Air Compressor** with 5 Gal Tank (120Vac) that can bring to the college.

2) ___ Garage or Basement **Workshop** with a Bench

3) ___ **Power tools** for woodworking

Project Skills

Put a check mark if you have the following:

1) ___ Skills using **Auto CAD or other CAD software** to create Isometric drawings.

2) ___ **Access to CAD Software**

3) ___ **Electronic Skills**, and Protoboard construction

4) ___ **Small Scale carpentry skills /** Construction experience

5) ___ **Mechanical Skills** / Experience

6) ___ Skills using **Visio** to creating drawings

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7) ___ Skills using **Power Point**, Open Office, etc. to create Slide Show presentations.

8) ___ Skills writing **Reports** or technical writing skills

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1st Project Choice: _____

Your Idea?_____

2nd Project Choice: _____

3rd Project Choice: _____

EGR 103 Project Report and Oral Presentation Requirements

Project Title: _____ **Section:** ___

Project Leader: _____

Divide up responsibilities for the following tasks listed below that are applicable to your project.

Note: Each student will type a 1 page report on their contribution to the project for the judges to evaluate.

Task	Name
1. Build mechanical part of project.	Everyone
2. Mechanical Isometric drawing with Dimensions	
3. Schematic Drawings (EWB or Visio) (Photo Gate and 555 Timer)	
4. Schematic Drawing (Word or Visio) (Digital Recorder)	
5. Electronic Block Diagrams (Word or Visio) (Photo Gate and Digital Recorder Diagrams)	
6. Build Electronic Interfacing part of project.	
7. Type report on how project works Mechanically	
8. Type report on how Electronic circuit works	
9. Parts list of Unique Mechanical Components	
10. Write oral presentation of Mechanical Report for slides	
11. Write oral presentation of Electronic Report for slides	
12. Make Power Point slides for # 10 & 11	

EGR 103 Judge's Grading Rubric for Team Design Project Presentation SP10

Project Title: _____ Term / Year: ____

Student's Name(s): _____ Sec#: ____

Course Learning Outcomes #2 thru 7 are partially assessed by the Design Project Oral Presentation

Instructions: 1. Fill in the comments for each outcome. **Judge's Name**_____

2. Choose the score (10 to 0), which most closely describes the quality of each outcome.

Design Project Outcome Scores (where applicable)					
Score	**9.5 ± .5**	**8.5 ± .5**	**7.5 ± .5**	**6.5 ± .5**	**6-0**
Outcomes	**Excellence & originality** of essential elements and related concepts	**Mastery** of essential elements and related concepts	**Acceptable** knowledge of essential elements and related concepts	**Minimal** knowledge of a sampling of related concepts only	**Unsatisfactory**
Mechanical Presentation Content					
Electronic Presentation Content					
Report & Presentation Drawings					
Report Organization & Content					
Presentation - Power Point, Graphics, Speaking Style, Attire & Q/A Session					
Project Construction & Demo					
Total Score =	**Average Score = Total Score / 6 =**		**Final Score in % =**		

Design Project Comments: Strengths & Weaknesses	
Outcomes	**Comments**
Mechanical Presentation Content	
Electronic Presentation Content	
Report & Presentation Drawings	
Report Organization & Content	
Presentation - Power Point, Graphics, Speaking Style, Attire & Q/A Session	
Project Construction & Demo	

Design Project Specifications

The goal of this project is to create an electronically controlled, mechanically moving obstacle for a remote control car that presents a challenge to the driver, but the driver should be able to get thru based on driving skill or chance. The car may or may not be damaged if a car doesn't make it thru.

Oral Presentation: Effectively used PowerPoint, speaking style and dressed appropriately.

Written Report Format

Cover Page

Title Names Course # Sec # Term / Year

Mechanical Report

Introduction / Objective of the project
Sequence of Events (Includes all scenarios)
Design Problems and Improvements that had to make to solve them
Parts List of Unique Parts (Optional)

Drawings

Mechanical Drawings: Top, Front and Side View with Dimensions,
Isometric drawing (Optional)

Electronic Drawings: Photo gate Block Diag. including 555 if applicable,
Photo gate Schematic, 555 Timer Schematic if applicable,
Digital Recorder Block Diag. and Digital Recorder Schematic

Electronic Report

Introduction
Sequence of Events (Optional)
Photo Gate general operation including the 555 Timer if applicable
Photo Gate Part explanation
Digital Recorder General Operation
Circuit problems that had to solve and how solved them

What learned from course and project

At end of Mechanical Report or end of entire report

Project Construction: Consider uniqueness of project,
Methods used to solve problems,
Quality of construction, (Painting is optional)
How well project worked.

EGR 103 Written Report Grading Rubric for Team Design Project SP10

Report Title: _____ Term / Year: _____

Students Names: _____ Sec #: ____

Course Learning Outcomes # 1 thru 7 are partially assessed by the Design Project Written Report

Instructions: 1. Fill in the comments for each outcome. **Evaluator** _____

2. Choose the score whose value most closely describes the quality of the project.

Outcome Scores (where applicable)					
Score	**9.5 ± .5**	**8.5 ± .5**	**7.5 ± .5**	**6.5 ± .5**	**6-0**
Design Project Written Report **Outcomes** Students should be able to develop:	**Excellence** of elements and all are present	**Mastery** of elements and 1 is missing or 1 or 2 poorly done	**Acceptable** knowledge of elements and 2 are missing or 3 or 4 are poorly done	**Minimal** knowledge of elements and 3 or more missing or 4 or more are poorly done	**Unsatisfactory**
a Mechanical Report,					
Drawings and					
an Electronic Report					
Total Score =	**Average Score = Total Score / 3 =**			**Score in % =**	

Outcome Comments: Strengths & Weaknesses			**Max**	**Individual**
Outcomes	**Elements**	**Comments**	**Score**	**Score**
Mechanical Report **Total Score** _____	Introduction/Objective		2.5	_____
	Sequence of Events		2.5	_____
	Unique Features, Parts List & Mech. Calc.		2.5	_____
	Design Improvements		2.5	_____
Drawings **Total Score** _____	Mechanical Drawing w. Dimensions		2.0	_____
	Photo gate Block Diag. including 555 and Digital Recorder Block Diagrams		2.0	_____
	Photo gate Schematic and 555 Timer Schematic if applicable		2.0	_____
	Digital Recorder Schematic		2.0	_____
	Overall Report Organization		2.0	_____
Electronic Report **Total Score** _____	Intro/Photo gate General Operation		2.0	_____
	Photo gate Part Function & 555 Calc. if applicable		2.0	_____
	Digital Recorder General Operation		2.0	_____
	Elec. Interfacing & Ckt. Problems/Solutions		2.0	_____
	What Learned from Course & Proj.		2.0	_____

ATTENDANCE POLICY

Two absences are permitted during the term.
If a student's absences are excessive, he may be assigned a grade of "F".

General Attendance Policy from Board Policy #206
"Students are **expected to attend all classes**, clinical, laboratory, and studio sessions **for the full duration** of each instructional session."

Students are expected to be on time.

Note: Attendance will be taken during Lecture and Lab.
A student who is **Late or leaves Early will be marked accordingly.**
Poor Attendance will affect your grade. See pages 14, 16, and 18.

Excused absences as outlined in the student handbook generally require appropriate documentation.

Students are responsible to complete all missed course work for any type of absence.

Students should set up a buddy system. Get phone # of at least one classmate to find out what is missed if absent, and to go over HW and study together.

1st Person's Name:_____ **Phone #** _____

2nd Person's Name:_____ **Phone #** _____

Absences will not be counted in those cases where alternates to classroom activities are assigned during instructor attendance at professional conferences or meetings (e.g., NJEA Convention).

PROFESSIONAL BEHAVIOR EXPECTATIONS

Students are expected to have a professional attitude in class as indicated by the following:

1. **Good attendance**
2. **Be on time for class and stay for the full duration.**
3. Prepared for class. ie. HW complete
4. Turn in assignments on time
5. Participate in class discussions but not talk out of turn.
6. Be an active lab group participant.
7. Have good lab work habits by:
    1. Turning off equipment.
    2. Putting parts back, and particularly resistors in their proper partition in the resistor drawer.
    3. Cleaning up lab benches and pushing in chairs when done.
8. Be respectful and courteous to other students and the instructor. Give assistance to other lab groups if they ask for help.

UNACCEPTABLE / DISRUPTIVE BEHAVIOR

Disruptive behavior can include but is not limited to:

1. **Excessive talking in class** when the instructor or another student is talking. There should be only one person talking at a time in class. The Instructor or a student...not both.

2. Based on Jan 18, 07 Division meeting with the Academic Vice President, **ALL CELL PHONES ARE to be TURNED OFF During Class** (**Not Set to Vibrate**) If you are expecting an important call, let the instructor know ahead of time and sit by the door.

   Excessive trips out of the classroom for **cell phone conversations,** snacks, bathroom, smoking, etc. during class, can result in a failing grade as covered in the board policy on attendance. These matters should be taken care of outside of class time.

3. **Other Inappropriate activities** include: **computer email**, **chat-rooms, online shopping**, etc.; **cell phone activities, playing games, listening to CD's, radio, or MP3s** during Lecture or Lab.

These items represent Prohibited Conduct as outlined in the BCC Student Code of Conduct. Under the **sanctions**, the student could be **expelled from the class and receive an F grade.**

LAB GRADE

1. **Lab Double Check System**: **Lab Grade Maximum is 10 Points**

   a. **1st Check Off** is worth **5 points** and is given when:
   Initial data and calculations are correct.
   The lab must be set up for first check off so if there are any mistakes, the set up can be checked for errors.

   b. **The conclusion** is worth 2 Pts. of the 2nd Check-off, or 20% of the total lab grade. The conclusion must be typewritten using the format shown on page 15. At the end of the lab turn in your group's conclusion to the lab instructor for evaluation & only leave lab after the instructor returns the marked-up conclusion.

   c. **2nd Check Off** is worth an additional **5 points** and is given when:
   The lab report is complete, correct, neat, and handed in on time.

2. **Attendance**: Attendance will be taken during Lec/Lab. Students **must stay for the full duration** based on Board Policy, unless they complete the **entire** lab and have permission from the instructor to leave early. **Points will be taken off Lab grade for time missed during lab.**

3. **Lab Due Date**: **Labs are due the next lab period for full credit.**
   Labs turned-in 1 week late will be penalized 1 point (1 letter grade).
   Labs turned-in 2 weeks late will be penalized 2 points (2 letter grades).
   Labs more than 3 weeks late will be penalized 3 points (3 letter grades).

   Each student is to turn in their own lab report. Not one per group.

4. **Make-up labs** There will be one day near the end of the semester when make-up labs can be done. Full credit will be given for a make-up lab provided the instructor's signature with the date is on the lab, and if handed in one week after performing the lab. This is important because to receive credit for a make-up lab you must have this signature and date.

5. **Lab Grading:**
   Sample Questions and Calculations will be graded.

   Also, up to 2 Points will be taken off for sloppy work.

   Grading of Labs will be strict in the beginning,
   so put in your best effort to get a good grade.

   For a complete lab, two signatures are required and a maximum of 10 points given. If a lab is not handed-in no points will be given for that lab.

6. **Enter your lab points in table below**:

   1. _____ **2.** _____ **3. (SKIP)** **4.** _____ **5.** _____ **6.** _____ **7.** _____

   8. _____ **9.** _____ **Drop Lowest Score:** _____ **Total Points =** _____

   Lab Average = Total points ÷ Number of labs assigned.

   Lab Grade Average will count 12.5% of the Electronic / Mechanical Grade.

Labs Conclusion Format

The Lab Conclusion is 20% of the Lab Grade.

Use the following format when typing your lab conclusions. Notes relating to the lab conclusion may be handwritten during the lab period for reference when typing the final version. Use proper written English sentence structure & grammar. Discuss all topics on the conclusion page in a relevant and technical fashion. **The length of the conclusion should be between ¾ and 1 page**. After completing the typed conclusion at the end of the Lab session, print it and turn it in to the instructor. Then, wait for instructor's evaluation before leaving the lab.

Document Specs. for Lab Conclusion:

font size: 14 point font **font type:** Arial, Courier

line spacing: 2 (double)

margins: left = 1.0″ right = 1.0″
top = 1.0″ bottom = 1.0″

Note:
Use the paragraph above as an example of the proper format.

Lab Conclusion Instructions

- Each **lab group** will submit **one Conclusion with the names of all group members.**
- Names of lab partners must be put at the top of each member's lab,
- No group may leave early until the lab conclusion is typed, handed-in, evaluated by the lab instructor, returned to the lab group, changes made, and copies made for each lab group member.
- Any group that doesn't get to the conclusion by the end of the lab period should hand it in at the next class session (lecture or lab). The marked-up lab conclusions will be handed back at the following class session.
- Each member of a lab group must hand-in their own lab, with lab partners names at the top, and a corrected copy of the lab conclusion attached at the end.
- **One member must also attach the instructor's marked up conclusion at the end.**
- Conclusions may NOT be shared between groups.

Lab Grading

	# of points deducted
Missed Lab time (late or left early) -1 point for each ½ hour.	**1 – 5**
Excessive consultations with lab instructor (or other lab groups).	1
Your name missing on top of first page of lab	1
Missing lab partner(s) names on top of first page of lab	1
Missing marked up evaluated conclusion	1/2
Sloppy work	up to 2
Calculations missing or incomplete	up to 2
No steps in calculations (answers only)	up to 2
Calculations with missing units	up to 1
Questions not answered or answered incorrectly	up to 2
Graphs/plots not done or labeled improperly	up to 1
No conclusion	2
Conclusion not typed or wrong format	1
Conclusion answered with incomplete sentences and/or incorrect grammar	up to 1
Incorrect or irrelevant statements for Questions or Conclusion	up to 2

Grading may seem strict at the beginning, so put in your best effort to get a good grade.

HOMEWORK GRADE

1. Question/Answer Session Grading: HW Grade Maximum is 5 Points

At the end of the question/answer session, HW will be collected. The HW grade is based on its state of completion, neatness, and that all steps to problem solutions are shown.

If HW is not consistently done by the HW session the instructor may give an **unannounced quiz** at the beginning of the period. The pop quizzes, if given, **will count 5% of the final grade.**

Homework Grading:

HW Grade	for	% Complete
5 to 4 ½ Pts		**100 to 90**
4 ½ to 4 Pts		**90 to 80**
4 to 3 ½ Pts		**80 to 70**
3 ½ to 3 Pts		**70 to 60**
3 to 0 Pts		**60 to 0**

1) HW turned-in 1 week late will be penalized 1 point.

3) HW turned-in 2 weeks late will be penalized 2 points.

4) HW more than 3 weeks late will be penalized 3 points.

5) HW with no calculation steps will loose up to 2 points off HW grade.

6) Sloppy HW will loose up to 2 points off HW grade.

Enter your Homework Points in the table below:

1._____ 2._____ 3. _____ 4._____

5._____ 6._____ 7. _____

Drop the lowest score.

Total Points =_____

HW Grade Average = Total points ÷ Number of HW assignments x 20.

HW Grade average will count 12.5% of the Final grade.

TEST REQUIREMENTS: Test Grade Average Counts 28.6% of the Final Grade

1. **Tests must be taken on time**.

2. All **Cell phones must be off Not Vibrate** and **put in back pack** during the test. You **cannot use cell phone calculators for the test**.

3. You **cannot leave the class during a test**. If you leave the class during the test, **the test will be collected**.

4. You will be allowed to take **one late test** at the end of the term.

5. **For 2 or more late tests 10% will be deducted.**

6. **No low test grades will be dropped.**

7. **One retest** will be given to **replace your lowest grade if below 80%**. at the **end of the term**. The **Maximum Retest Grade is 80%.**

Enter your Test grades in the table below:

1._____ **2.** _____ **3.**_____ **Total Test Points =** _____

Test Average = Total points ÷ (Number of Tests * 100)

Test Average will count 37.5% of the Final grade.

OTHER FACTORS AFFECTING FINAL GRADE:

If a student has attendance, cell phone, or inappropriate computer activity problems during lecture or lab, he/she can loose as much as 5% off the final grade for minor disturbances, or an F Grade for consistent major disturbances.

Items to improve Final grades:

1. **Professional attitude** for: Outstanding Attendance, on time, class contributions, and willingness to help others. **Add** up to ½ **point to Final grade**.

2. **Submit Graded Papers** on the Topics of: Lifelong learning, professional, ethical, and social responsibilities, respect for diversity and a knowledge of contemporary professional, societal, and global issues. **¼ pt for each**

CALCULATIONS OF FINAL GRADE POINT AVERAGE

Add up 1) Test 1 Grade, 2) Test 2 Grade,
3) Test 3 Grade, 4) HW Grade Average,
5) Lab Grade Average, 6) Outside Judges Grade,
7) Project Report Grade, 8) Self Evaluation Grade.

Final Grade Point Average: Calculate by Adding Up All 8 Grades and ÷ by 8

GRADES

A. To pass the course all units must be completed.

All Three conditions must be met to receive a particular grade.

1. **All Tests Taken.**
2. **Minimum Final Grade Point Average, and**
3. **Minimum number of labs completed.**

Grade	Final Grade Pt. Avg	Tests Taken	Minimum Number of Labs or Dwgs. Completed
A	**90 to 100**	**All**	**7**
B+	**85 to 89**	**All**	**6**
B	**80 to 84**	**All**	**6**
C+	**75 to 79**	**All**	**5**
C	**70 to 74**	**All**	**5**
D	**65 to 69**	**All**	**5**
F	**below 65**	**1 or more not taken**	**less than 5**

B. Course Letter Grade Explanation:

For example, for a B grade you must complete all tests and drawings, 5 labs, and have an 80% (minimum) Final grade point average.

If you took all Tests, **had an 83% Final average** (qualifying for a "B" grade) **but only completed 5 labs** your course **grade would be a "C+".**

In other words, all Four conditions must be met; Final grade point average, All tests taken and drawings completed, and a Minimum number of labs completed to receive a particular course grade.

EXPLANATION OF OTHER GRADES

1. If a **D** grade is received it will not satisfy the prerequisite requirement for the next course and it is not transferable to other colleges.

2. An **F** grade is assigned if any one of the Four conditions for a D is not met. An F can also be given for cheating, excessive absences, game playing, or academic misconduct. **Academic misconduct includes any misconduct or behavior of a student which disturbs the learning process in class.**

3. An **"I"** (Temporarily Incomplete) is rarely issued. An "I" grade will only be issued for a student that **was unable to show up for the last week due** to a **documented emergency.**

   The "I" grade can only be assigned upon mutual agreement between the student and instructor if everything except the last week of work has been completed, and the student fills out the "Incomplete" form. The student must complete work within 30 days of the beginning of the next term, otherwise that "I" will automatically become an F.

   The student must fill out the "I Contract" to receive an "I" grade.

4. **Withdraw** - If a student finds it necessary to withdraw from the course he/she **must do so before the ninth week** by notifying the instructor and registrar and by completing the withdrawal form.

   After the ninth week the student will receive a grade based on work in the course. Do not expect to withdraw the "last day" of the course to avoid a failing grade.
   Check with the registration office for the last day to withdraw.

5. An **"X"** or (extended incomplete) grade will be given for a final grade only if a student requests it and **fills out the "extended incomplete" form.** The "X" will become an F if the student does not retake the course within one year.

6. **ST"** (Stopped attending) grade will be given for a student that stopped attending and as a consequence did not complete enough work to Pass. It has the same consequences (i.e. GPA) as an F and is recorded on the transcript. In addition, it can have financial implications with Financial Aid and student loans.

CALCULATORS

Students are **required to own** and know how to operate **a calculator** for HW, **and bring to class for Labs and Tests**.

Cell phone calculators are not allowed for tests.

Useful features to look for when shopping for a calculator:

Common Functions:

1/x , X↔Y,	**EE** for entering a number in scientific notation **+/-** for changing the sign of a number or exponent
x^2 , $\sqrt{x}$,	**SCI, ENG** changes how the display represents powers of 10 notation
y^x , $\sqrt[x]{y}$	
Log X , 10^x ,	D↔R (Conversion between Degrees and Radians)
Ln x , e^x,	π

Trig Functions:

Sin Arc Sin, Inv Sin or Sin^{-1}

Cos Arc Cos, Inv Cos or Cos^{-1}

Tan Arc Tan, Inv Tan or Tan^{-1}

A convenient feature is **Rectangular to Polar coordinate conversion**.
R↔P button

Example of work saved by using this feature:

Rectangular to Polar: $a + jb \Rightarrow M = \sqrt{a^2 + b^2}$; $\theta = TAN^{-1}\frac{b}{a}$

Polar to Rectangular: $M \cos\theta + jM \sin\theta \Rightarrow a + jb$

SUGGESTED STUDY PLAN

1. Attend the lecture, lab and the question/answer sessions and:

2. Bring to all Electronics / Mechanical Classes, Binder #1, Containing the lecture, HW, and Lab Packets.

3. Read over all your lecture notes.

4. Answer the homework questions.

5. Review the Homework, lecture notes, and labs for the test (Study a minimum of 1 Hour). If there are no HW questions on a certain part of the lecture notes, **do not** assume it won't be on the test.

RATIO OF CLASS TIME TO STUDY TIME

The ratio to class time to study time is expected to be 1:2. Therefore, for the 4 credit hours of class time, **8 hours of study time are required**.

A student with **12 course credits** should allocate **24 hours of study time** (outside of class time) for a total time allocation of 36 hours / week.

Do not expect to pass all your classes if you work full time (40 hrs/week) AND have enrolled in a full time class load of 12 or more credits.