Introduction to Engineering and Technology

CCRI ENGR-1020

Spring 2018

Instructor: Jerry Bernardini

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E-mail: jbernardini@ccri.edu

All E-mail must be sent with the subject: ENGR-1020-001
ENGR-1020-xxx  xxx = course section number

Office Hours: Room 2188:
Tuesday 1-2PM, 5-6PM, Thursday 4-6PM (E-mail me a day in advance)

Course Materials:
2. Course Website: https://www.ccri.edu/faculty_staff/engt/jbernardini/ENGR-1020
3. Website assignments
4. Weekly Handouts
5. Online videos
6. 1 GB or larger USB Flash memory: Student must purchase a USB Flash memory device (Jump-Drive) and bring it to all classes.
7. Students must purchase a bound notebooks to used as an Engineering Journal
8. Microsoft Office: The student must have access to Microsoft Word, Excel and Power Point outside of class. Office-360 and Google-Docs will not be used in class or accepted for assignments.

Grading Policies:
Quizzes (2)..............................20%
Progress Reports....................15%
Final Exam............................15%
Journal Evaluations (2)............15%
Homework.............................15%
Team Project .........................20%

100%

Course Objectives:
1. Learn about the major activates of engineers and technicians.
2. Learn the application of engineering principles to a wind turbine design.
3. Use Problem Based Learning (PBL) to develop engineering and critical thinking skills.
4. Learn project management and effective technical team activity skills.
5. Learn to use Microsoft Excel for technical applications.
6. Learn to use Microsoft Word for reports and resumes.
7. Learn to use Microsoft PowerPoint for technical presentations.
8. Learn the benefits of ethical behavior and practices in engineering and business.
9. Learn the engineering design process.
10. Learn how to setup and keep engineering journal.
Course Methodology

1. Project Based Learning applied to course material
2. Bi-weekly one-page progress reports
3. Website for all course material
4. Limited classroom lectures
5. Homework research assignments
6. Classroom discussion of research assignments
7. Readings assignments
8. Hands-on lab projects
9. Classroom project team/instructor meetings
10. Classroom computer applications
11. Computer application instruction and assignments
12. Project Team meetings and activities
13. Project Team construction
14. Project Team testing and analysis
15. Project Team report and presentation

Course Policies

1. The class will be a cell phone free environment. Phones must be on vibrate and if you must take a call, it must take outside the classroom.
2. To receive full credit for class participation, students must attend all classes. If a student misses a class it will be the student’s responsibility to obtain the assignment from the website.
3. Unless specified, all homework assignments are due one week after assigned.
4. Homework will be accepted up to one week after the due date with a maximum of 50% of the normal grade. No assignments will be accepted after a one week.
5. Unless specified all parts of the homework assignments (HW) must be submitted printed and stapled as one package. Often there are multiple parts to a homework assignment.
6. All assignments must be completed in Microsoft Word or Microsoft Excel and submitted in printed form.
7. Students are expected to be prepared to discuss in class an assigned research topic.
8. The project must be completed as a team. Although the project grade is a team grade, members of the team that do not contribute will receive a reduced project grade.
9. If a project team is not functioning it is the responsibility of the team members to resolve the issues. This is an important skill for the work place. If a resolution of team problems this is not possible, the instructor must be informed of the problems before class-7.
10. Students must bring their engineering journal to every class with up to date entries.
11. Students must save their classroom and homework on a USB drive.
## Introduction to Engineering and Technology
### CCRI ENGR-1020 Spring 2018 Outline

<table>
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<tr>
<th>Class</th>
<th>Class Activities and Objectives</th>
<th>Textbook and Readings</th>
<th>Homework and Team Assignments, Quizzes, Evaluations</th>
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</thead>
</table>
| 1 (1/22) | Introductions  
Build a team  
Problem Based Learning (PBL)  
Engineering design process  
Project Overview  
Engineering Journal-EJ (HO1)  
Tools and equipment  
Excel-Introduction (TE1)  
**Lab- Tour and demo** | Chap-1, p.8-39  
Chap-3, 73-79  
Chap-10, 297-301  
Handout-HO1  
Excel-PDF  
Excel-TE1 | p.42, prob. 13 (type the answers) |
| 2 (1/29) | Team Agreement  
One-Page Memo Progress report(TW1)  
Engineering failures and technology ethics  
PowerPoint and Assignment (RP1)  
Generator equation  
Discuss energy and power  
Discuss wind technology  
Measurements and data averaging  
Excel - magnet data  
Using a Gaussmeter  
**Lab- magnets measurements (HO2)** | Chap-2, p.43-53  
Chap-4, 104-105  
Word-TW1  
Handout-HO2  
Rubric-RP1 | p.58, prob. 1-7 ; type the question and your answer  
Complete Progress Report Memo-1  
Start PowerPoint Assignment (due in three weeks) |
| 3 (2/5) | Design Process  
Discuss Faradays law  
Generator electrical model  
Using electrical instruments  
Excel-Coil wire estimates(TE2)  
Intro. Unit conversion-1  
Troubleshooting  
Using a digital Voltmeter (DVM)  
**Lab- Coil winding and testing (HO3)** | Chap-3, p. 61-72  
Excel-TE2  
Handout-HO3 | p.86, prob. 1-10 |
| 4 (2/12) | Turbine prototype frame construction  
Generator modeling  
Introduction to Ohm’s law  
Unit Conversion-1  
Drilling charts  
**Lab-Generator construction (HO4)** | Chap-4, p.91-110  
Handout-HO4 | p.118, prob. 1-7  
Complete Progress Report Memo-2 |
| 5 (2/19) | Project sketching Turbine (HO5)  
Energy and Power  
Scientific and Engineering notation  
Measure voltage and frequency  
Measure rotational velocity  
Excel-Generator Data and Graphing (TE3)  
**Lab-Generator Testing (HO6)** | Chap-5, p. 124-141  
Excel-TE3  
Handout-HO5  
Handout-HO6 | p. 144, prob. 1, 6  
**Quiz-01**  
**Journal Evaluation-01** |
| 6 (2/26) | PowerPoint presentation Group-1  
Team an Instructor meetings  
Turbine wind blade discussion | Chap-6, p. 146-158  
Handout-HO7 | p. 161, ICA 6-7  
**PowerPoint Presentation-01**  
Complete Progress Report Memo-3 |
<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Instructor/Handouts</th>
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</thead>
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| 7 (3/5) | **Lift vs. drag blades**  
**Dimensional analysis**  
**Lab-Prototype turbine construction-1 (HO7)** | PowerPoint presentation Group-2  
Turbine wind tunnel testing  
Wind tunnel data analysis  
Excel-Wind Tunnel Testing (TE4)  
**Lab-Prototype turbine construction-2**  
Chap-7, 168-188  
Handout-HO8  
Excel-TE4  
p. 196, prob. 1, 5  
p. 197, prob. 14  
p. 201, prob. 47  
**PowerPoint Presentation-02** |
| 8 (3/19) | **Spring Break-No Class** | **Chap-8, p. 202-216**  
**Handout-HO8**  
**Rubric-RP2**  
p. 267, prob. 66, 67, 68, 69  
**Complete Progress Report Memo-4** |
| 9 (3/26) | **Betz’s Law Discussion (HO9)**  
**Wind turbine power calculations and measurements**  
**Wind turbine improvements**  
**Wind Turbine Project Rubric-(RP2)**  
**Lab-Prototype wind tunnel testing (HO8)**  
**Turbine testing and modification**  
**Turbine performance metrics**  
**Measure mechanical vs Electrical power**  
**Probability calculations**  
**Statistical calculations**  
**Excel- Wind Turbine Performance (TE5)**  
**Lab-Improved wind turbine design** | Chap-9 p. 269-278  
**Excel-TE5**  
**Wind power problem set** |
| 10 (4/2) | **Turbine testing and modification**  
**Binary Numbers Application of binary**  
**Digital vs. Analog**  
**Internet and Internet of Things (IoT)**  
**Excel-Turbine Power Curves (TE6)**  
**Lab- Wind Turbine Modification and Testing**  
**Chap-10 p. 297-333**  
**ADC-DAC handout**  
**Excel-TE6**  
**Wind Tunnel Excel Calculations**  
**See Website Quiz-02** | Chap-11 p. 361-388  
**Visio-TV1**  
**Wind Turbine performance graphing**  
**Complete Gas Station Flow Chart** |
| 11 (4/9) | **Flow Charting**  
**Project Flow Charting with Visio (TV1)**  
**Gas Station pumping problem**  
**Lab- Wind Turbine Modification and Testing** | Chap-12 p. 412-430  
**Wind turbine analysis**  
**Complete Progress Report Memo-6** |
| 12 (4/16) | **Flow Charting- Gas Station Solution**  
**3D printing**  
**Lab- Wind Turbine Modification and Testing** | **Chap-13 p. 465-471** |
| 13 (4/23) | **Turbine overall analysis**  
**Project report activates**  
**Lab- Wind Turbine Modification and Testing** | **Journal Evaluation-02** |
| 14 (4/30) | **Project Rubric Evaluation (RP2)**  
**Team Project Presentation** | **Journal Evaluation-02** |
| 15 (5/7) | **Final Exam** |  
**Journal Evaluation-02** |