COURSE SYLLABUS

Syllabus for: MECH 1200 Mechanical Components and electric motors

Former Course(s): none

Catalog Description: This course is a study of the basic mechanical components and electrical drives in a mechatronics system. Topics covered will include basic functions and physical properties of mechanical components and electrical AC and DC drives; materials, lubrication requirements and surface properties; troubleshooting techniques and strategies to identify, localize and correct malfunctions; and systematic preventative maintenance and electrical component safety. Technical documentation such as data sheets and specifications of mechanical elements and electrical drives will also be covered.

Credit Hours: 4  Contact Hours: 5  Lab Hours: 2

Prerequisite(s): None


Required Supplies/Material(s): calculator

Recommended Supplementary Material(s): handouts as appropriate

Student Group for Whom Course is Required/Intended: This course is intended for students pursuing the following degrees and programs of study.

Certificate: Mechatronics

Associate of Applied Science: Mechatronics Technology

Student Learning Outcomes: Upon completion of this course, students will demonstrate the ability to:

1. Understand and explain the role of mechanical components and electrical drives in complex mechatronic systems, modules and subsystems.
2. Understand and explain the flow of mechanical energy in the system.
3. Understand and explain safety rules while working on mechanical components
4. Explain the role of various mechanical components within a given system or module.
Syllabus: MECH 1200

Student Learning Outcomes (continued)

5. Trace and describe the flow of energy in a given mechatronic system or subsystem.

6. Understand and analyze forces, speeds, torque, and power for mechanical drives such as gears, belt drives, chain drives, and timing drives.

7. Understand and explain differences between different types of AC motors.

8. Understand and explain differences between the different types of DC motors.

9. Correctly apply mechanical material analysis for shafts, couplings, and sealing devices with proper lubrication.

10. Describe and analyze power transmission components such as clutches and brakes and how they are used.

11. Carry out adjustments on mechanical components in a mechatronic system.

12. Read, analyze and utilize the technical data sheets for the mechanical components and electrical drives within a mechatronic system.

Suggested Evaluation Plan:

<table>
<thead>
<tr>
<th>Task</th>
<th>Weight</th>
<th>Student Learning Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid Term</td>
<td>25%</td>
<td>1-6</td>
</tr>
<tr>
<td>Final</td>
<td>25%</td>
<td>1-12</td>
</tr>
<tr>
<td>Quizzes (qty 4)</td>
<td>25%</td>
<td>1-12</td>
</tr>
<tr>
<td>Lab work</td>
<td>25%</td>
<td>1-12</td>
</tr>
</tbody>
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Final Grading Plan: The grading scale for all examinations and the final course grade will be based on the following percentages:

A = 90 - 100%  
B = 80 - 89%  
C = 70 - 79%  
D = 60 - 69%  
F = 0 - 59%
### Instructional Schedule:

<table>
<thead>
<tr>
<th>Week</th>
<th>Student Learning Outcomes</th>
<th>Content to be covered</th>
<th>Student Assignments/Supplementary Material</th>
</tr>
</thead>
</table>
| 1    | 1,2,3                     | Review complete mechatronics system, PLC controls, wiring, electrical elements, pneumatics, and mechanical elements | Chapter 1, 2  
Overview of mechatronics trainer.  
Develop lockout/tagout procedures |
| 2    | 4,5,6                     | Basic mechanical power fundamentals. Study in mechanical forces, accelerations, speeds, and work. Basic troubleshooting strategy | Chapter 2 and 3  
Chapter 2 questions p 34  
Overall mechanical applications in mechatronic system |
| 3    | 4,5,6                     | Continue study in mechanics, torque, horsepower, loads, and efficiencies. Basic troubleshooting strategy QUIZ 1 | Chapter 3  
Questions page 56  
Review mechatronic system and study power applications |
| 4    | 4,5,6                     | Mechanical gear drives. Construction, terminology, types. Introduce gear drive in system. Gear ratios and power transmission | Chapter 14  
Troubleshooting guide p 420  
Questions p 423  
Application of gear drives in the system. Troubleshooting gear drives in the mechatronic system |
| 5    | 4,5,6                     | Mechanical drive chains and sprocket systems. Power transmission and torque. Introduction of pulley drives in the system. | Chapter 11  
Troubleshooting guide p 298  
Questions p 299  
Application of mechanical drives and troubleshooting mechanical drives in the mechatronic system |
| 6    | 4,5,6                     | Mechanical drives using V belts and synchronous Belts. Principles of operation, construction, types. Introduction of synchronous drives in the system QUIZ 2 | Chapter 10  
Troubleshooting guides p 268  
Questions p 271  
Application of sync drive |
| 7    | 7                         | Single phase, three phase, Troubleshooting motors. Introduce ac motor application in the system. | Student handout on AC motor  
Review of AC motors  
Application of AC in the mechatronic system. Troubleshooting techniques for AC Motors |
<table>
<thead>
<tr>
<th>Week</th>
<th>Chapter(s)</th>
<th>Topic</th>
<th>Study Material</th>
</tr>
</thead>
</table>
| 8    | 7          | AC Motors                                                          | Student Handout on AC Motors  
Review AC motor applications in the mechatronic system  
Application of troubleshooting techniques for AC motors |
| 9    | 8          | DC Motors                                                          | Student Handout on DC Motors  
Review DC motor applications in the mechatronic system  
Application of troubleshooting techniques for DC motors |
| 10   | 9          | Mechanical Shafts, coupling of shafts, shaft bushings, and alignment of shafts  
Shaft materials and design, coupling materials, design, and application.  
Troubleshooting and maintenance  
QUIZ 3  | Chapter 7 and chapter 13  
Questions page 148 and 374  
Troubleshooting guide p 372  
Application of shafts and coupling in the mechatronic system |
| 11   | 9          | Seals and Bearings  
Construction and lubrication  
Mechanical application of lubrication  
Viscosity, oils, greases  
Applications and troubleshooting of lubrication problems  | Chapters 8 and 9  
Troubleshooting guide page 163  
Questions page 165 and 236  
Chapter 4  
Questions page 79  
Application of lubrication within the mechatronic system  
Troubleshooting techniques for lubrication and bearing issues |
| 12   | 10,11,12   | Clutches and brakes  
Types and construction, power limitations  
selection  
Troubleshooting clutches  
Introduction of clutches in the mechatronic system  
Quiz 4  | Chapter 12  
Questions page 314  
Troubleshooting page 313  
Review the applications of clutches in the system and troubleshooting problems |
| 13   | 10,11,12   | Linear motion technology  
Types and styles of linear drives and power transmission.  
Discuss linear movement  
Review linear drives in the system  | Chapter 15  
Questions page 443  
Maintenance concerns p 442  
Troubleshooting linear drive in the mechatronic system |
| 14   | 1-12       | Review complete mechatronic system with focus on mechanical components  | Comprehensive system troubleshooting specific problems as designed by instructor |
| 15   | 1-12       | FINAL EXAM |