A. **Academic Division:** Business, Industry, and Technology

B. **Discipline:** Industrial Technology, Industrial Maintenance

C. **Course Number and Title:** EMMT1020 – Fundamentals of Mechanical Systems

D. **Course Coordinator:** Randy Storms  
   **Assistant Dean:** Daniel Wagner

**Instructor Information:**
- **Name:** Click here to enter text.  
- **Office Location:** Click here to enter text.  
- **Office Hours:** Click here to enter text.  
- **Phone Number:** Click here to enter text.  
- **E-Mail Address** Click here to enter text.

E. **Credit Hours:** 2
   - Lecture: 1 hour
   - Laboratory: 2 hours

F. **Prerequisites:** EMMT1540

G. **Syllabus Effective Date:** Fall 2017

H. **Textbook(s) Title:** None

I. **Workbook(s) and/or Lab Manual:** None

J. **Course Description:** Fundamentals of mechanical systems includes: introduction to mechanical fasteners, measuring instruments, motors, power transmissions systems. Other topics include: introduction to mechanical fasteners, sensors, and applications of sensors, and piping and piping installation. The laboratory experience consists of hands-on experiments designed to reinforce concepts presented. Contains demonstrations, lab projects and simulations.

K. **College-Wide Learning Outcomes**

<table>
<thead>
<tr>
<th>College-Wide Learning Outcome</th>
<th>Assessments - - How it is met &amp; When it is met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication – Written</td>
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<td>Communication – Speech</td>
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<td>Intercultural Knowledge and Competence</td>
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<td>Critical Thinking</td>
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<td>Information Literacy</td>
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<td>Quantitative Literacy</td>
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</table>
L. Course Outcomes and Assessment Methods:

Upon successful completion of this course, the student shall:

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Assessments – How it is met &amp; When it is met</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Identify the primary functions of mechanical power transmission systems.</td>
<td>Lab exercises and quizzes throughout the semester, midterm and final exam</td>
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<tr>
<td>2. Calculate mechanical power, efficiency, loads, torque and speed given various gear, chain drive and pulley ratios, horsepower ratings, and motor speeds.</td>
<td>Lab exercises and quizzes throughout the semester, midterm and final exam</td>
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<tr>
<td>3. Differentiate between the function, type, and use of various shaft couplings.</td>
<td>Lab exercises and quizzes throughout the semester, midterm and final exam</td>
</tr>
<tr>
<td>4. Construct, calibrate, align, tension and operate various motors, motor mounts, motor couplings, gear boxes, chain drive and pulley systems.</td>
<td>All lab exercises throughout the semester.</td>
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<tr>
<td>5. Choose the most appropriate coupling for a given application.</td>
<td>Lab exercises and quizzes throughout the semester, midterm and final exam</td>
</tr>
<tr>
<td>6. Choose the most appropriate lubricant and lubrication schedule based on the application.</td>
<td>Lab exercises and quizzes throughout the semester, midterm and final exam</td>
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</table>

M. Topical Timeline (Subject to Change):

1. The function of a mechanical power transmission system and give an advantage
2. The five methods of rotary mechanical power transmission and give an application of each
3. The five rules of safe dress for working with power transmission equipment
4. The eight mechanical transmission safety rules
5. The operation of lockout/tagout system
6. The function of a foundation and give three types
7. The function and construction of a bedplate
8. The function and operation of a spirit level and give and application
9. Three types of motor mounts and give an application of each
10. The how fasteners are used to attach a motor mount to a bedplate
11. The how to select fastener size and type for a motor mount
12. The how to mount and level an electric motor
13. Two methods of measuring motor shaft speed and give an application
14. The function and operation of a key fastener
15. The construction of six types of keys and give an application of each
16. The how keys and keyseats are specified
17. The how to measure the actual size of a key and keyseat
18. The six types of set screws
19. The how to assemble a hub to a shaft using a key
20. Two methods of loading a mechanical drive system
21. The how to calculate rotary mechanical power
22. The how to calculate mechanical efficiency and explain its importance
23. Two methods of measuring shaft torque and give an application of each
24. Three methods of measuring electric motor current
25. The function of a shaft and give an application
26. List four types of shaft materials and give an application of each
27. The how shafts are specified
28. The function of a bearing and give an application
29. The three types of bearing loads and give an example of each
30. The how bearings are positioned to support a load
31. The operation of a two categories of bearings and give an application of each
32. Two methods of mounting a shaft bearing and give an application of each
33. The function of a coupling and give an application
34. The function and application of four categories of mechanical couplings
35. The operation of a flexible jaw coupling
36. The purpose of shaft alignment and give two types of misalignment
37. The general procedure for shaft alignment and give four measurement methods
38. The operation of the straight edge and feeler gage alignment method
39. The function of the three basic components of a belt drive
40. The pitch, pitch circle, pitch diameter, and pitch length and explain their importance
41. The how to calculate the pulley ratio and explain its importance
42. The how to calculate the shaft speed and torque of a belt drive system
43. List five types of belt derives and give an application of each
44. List three types of V-belts and give an application of each
45. The operation of a fractional HP V-belt drive
46. The how to install and align a V-belt drive with a finished bore
47. The how to determine belt tension for an application
48. Three methods of adjusting belt tension
49. Three methods of measuring belt tension and give an application of each
50. The function of the three basic components of a chain drive
51. The how to calculate sprocket ratio and explain its importance
52. The how to calculate shaft speed and torque of a chain drive system
53. List four types of chain drives and give an application of each
54. List four types of roller chain drives and give an application of each
55. The operation of a single-strand roller chain drive
56. The how to install, align, and remove a roller chain drive system with adjustable centers
57. The how to determine allowable chain sag for a given application
58. Two methods used to adjust chain sag
59. The how to measure chain sag
60. The function and operation of a master link
61. Two methods of installing a lightweight chain which uses a master link
62. The operation of a chain puller
63. The function of the three components of a gear drive system
64. The gear pitch, pitch circle, and pitch diameter and explain their importance
65. The how to calculate the gear ratio of a gear drive
66. The how to calculate the shaft speed and torque of a gear drive system
67. The functions of four types of gear drives and give an application of each
68. List four types of parallel shaft gears and give an application of each
69. The 11 features of a gear
70. The twelve dimensions of a gear and explain the importance of each
71. The ten dimensions and features of a gear drive and explain the importance of each
72. The operation of a spur gear drive
73. The how to install and align a spur gear drive system
74. The function of backlash
75. The how to determine the allowable backlash in a gear drive
76. Two methods of measuring spur gear backlash
77. The how to calculate the speed and torque output in a multiple shaft gear drive
78. The function of a compound gear drive system and give an application
79. The how to calculate the torque and speed output of a compound gear drive system
80. The how to determine the direction of rotation of a gear drive
81. The how to install and align a multiple shaft drive system
82. The function of a solid coupling an list two types
83. The operation of a sleeve coupling and give an application
84. The alignment procedure of a sleeve coupling
85. The function of a bushing and list three types
86. The construction and operation of a QD busing and give an advantage
87. The construction and operation of Conventional V-Belt drive
88. The construction and operation of a multiple belt V-belt drive
89. The construction and operation of a split taper busing and give an advantage
90. The construction and operation of a wedge v-belt drive
91. The construction and operation of a taper lock bushing and give an advantage
92. The construction and operation of a notched v-belt drive and give an advantage
93. The operation of a variable speed v-belt drive system and give an application
94. The how to install and align a variable speed v-belt drive system
95. The four b-belt configurations and give an application of each
96. The function of a belt idler pulley and give an application
97. The operation of three types of belt idler pulley configurations
98. The how v-belts are specified
99. Three methods of identifying belt size and type
100. The function and operation of v-belt match codes
101. The how bushing and sheaves are specified
102. The how to select bushings, sheaves, and v-belt for an application
103. The preventive maintenance
104. The nine preventive maintenance steps for v-belt drives
105. The how to troubleshoot a v-belt drive system
106. The construction and operation of a timing belt drive system
107. The how to install and align a timing belt drive system
108. The operation of an HTD belt drive system
109. The how timing belts and pulleys are specified
110. The how HTD belts and sprockets are specified
111. The how to select a timing belt and pulleys for a given application
112. The how to select an HTD belt and sprockets for a given application
113. The seven maintenance steps for synchronous belt drives
114. The how to troubleshoot a synchronous drive system
115. The six functions of a lubricant
116. The four types of lubricants and give an application of each
117. The functions of nine types of lubricant additives
118. The operation of five types of lubrication application methods and give an example
119. Three types of oils and give an application of each
120. The viscosity and give its unit if measure
121. The operation of a viscosimeter and give an application
122. The how oils are specified
123. The four types of greases and give an application of each
124. The how greases are specified
125. The function and operation of a grease gun
126. How to use a grease gun to lubricate a pillow block bearing
127. The five lubricant storage rules
128. The function of a material safety data sheet
129. The purpose of recycling lubricants
130. The four methods used to recycle lubricants
131. The how to dispose of spent lubricants
132. The four types of coupling flexibility
133. List two categories of flexible couplings and give an application of each
134. List three types of elastomeric couplings and give an application of each
135. The operation of an elastomer-in-shear coupling
136. The operation of a flange coupling and give an application
137. The operation of the rim and face alignment method
138. The operation of the reverse indicator method
139. The effect of indicator sag on alignment and explain how to correct it
140. The effect of thermal expansion on alignment and explain how to correct it
141. List five types of flexible metal couplings and five an advantage of each
142. The operation of a chain coupling
143. The operation of a grid coupling
144. The operation of a gear coupling
145. The how couplings are specified
The how to select a coupling for an application
Three preventive maintenance steps for couplings
The how to troubleshoot a coupling system
The operation of four types of sprockets and give an application of each
The operation of a silent chain drive
The how to install and align a silent chain drive system
The operation of a multiple strand chain drive
The how to install and align a multiple strand chain drive system
The how to troubleshoot a coupling system
The operation of four types of sprockets and give an application of each
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The how to install and align a multiple strand chain drive system

N. Course Assignments:

1. Homework: Selected problems and questions from weekly reading assignments must be completed.
2. Labs: Various self-paced and computer monitored labs administered in the IST lab.
3. Quizzes: Quizzes will be administered online via LMS.
4. Midterm: The midterm exam will be administered during week 8.
5. Final: There will be a comprehensive final at the end of the semester.

O. Recommended Grading Scale:

<table>
<thead>
<tr>
<th>NUMERIC</th>
<th>GRADE</th>
<th>POINTS</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>93–100</td>
<td>A</td>
<td>4.00</td>
<td>Superior</td>
</tr>
<tr>
<td>90–92</td>
<td>A-</td>
<td>3.67</td>
<td>Superior</td>
</tr>
<tr>
<td>87–89</td>
<td>B+</td>
<td>3.33</td>
<td>Above Average</td>
</tr>
<tr>
<td>83–86</td>
<td>B</td>
<td>3.00</td>
<td>Above Average</td>
</tr>
<tr>
<td>80–82</td>
<td>B-</td>
<td>2.67</td>
<td>Above Average</td>
</tr>
<tr>
<td>77–79</td>
<td>C+</td>
<td>2.33</td>
<td>Average</td>
</tr>
<tr>
<td>73–76</td>
<td>C</td>
<td>2.00</td>
<td>Average</td>
</tr>
<tr>
<td>70–72</td>
<td>C-</td>
<td>1.67</td>
<td>Below Average</td>
</tr>
<tr>
<td>67–69</td>
<td>D+</td>
<td>1.33</td>
<td>Below Average</td>
</tr>
<tr>
<td>63–66</td>
<td>D</td>
<td>1.00</td>
<td>Below Average</td>
</tr>
<tr>
<td>60–62</td>
<td>D-</td>
<td>0.67</td>
<td>Poor</td>
</tr>
<tr>
<td>00–59</td>
<td>F</td>
<td>0.00</td>
<td>Failure</td>
</tr>
</tbody>
</table>

P. Grading and Testing Guidelines:

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Q. Examination Policy:

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R. Class Attendance and Homework Make-Up Policy:

Click here to enter text.
S. **Classroom Expectations:**

Click here to enter text.

T. **College Procedures/Policies:**

**Attendance Requirements:** All students are required to attend all scheduled classes and examinations. Each faculty member has the right to establish regulations regarding attendance that he/she considers necessary for successful study.

Students who do not attend classes may be administratively withdrawn from those classes. However, failure to attend classes does not constitute withdrawal, and students are expected to process a formal withdrawal through the Student Records Office in Kee Hall.

**Student Engagement Requirements:**

Student engagement is based on the “active pursuit” of learning which can be measured by class attendance, class participation (in class or online), taking required quizzes/examinations, and submission of work assignments or papers. Student engagement consists of a student attending at least 60% of the class sessions (there should be attendance throughout the term) and/or completing 75% of the assignments listed on the syllabus at the midpoint in the term. Exceptions can be made when there is on-going communication between the student and faculty member. The communication must be documented and the faculty member and student must be in agreement regarding the exception. Students not meeting the expectation will be administratively withdrawn from class. If a student believes he/she was administratively withdrawn in error, he/she may file an appeal. Being administratively withdrawn may have program and financial aid implications.

**Academic Misconduct** is any activity that tends to compromise the academic integrity of the college, or subvert the educational process. Examples of academic misconduct include, but are not limited to:

1. **Violation of course or program rules** as contained in the course syllabus or other information provided to the student; violation of program requirements as established by departments and made available to students.

2. **Plagiarism** including, but not limited to, submitting, without appropriate acknowledgment, any written, visual or oral material that has been copied in whole or in part from the work of others (whether such source is published or not) even if the material is completely paraphrased in one’s own words. This includes another individual’s academic composition, compilation, or other product, or a commercially prepared paper. Plagiarism also includes submitting work in which portions were substantially produced by someone acting as a tutor or editor.

   Such practices constitute plagiarism regardless of motive. Those who deny deceitful intent, claim not to have known that the act constituted plagiarism, or maintain that what they did was inadvertent are nevertheless subject to penalties when plagiarism has been confirmed.

3. **Cheating and dishonest practices** in connection with examinations, papers and projects, including but not limited to using unauthorized notes, study aids or information on an examination; obtaining help from another student during an examination; taking an exam or doing work for another student; providing one’s own work for another student to copy and submit as his/her own; or allowing another student to do one’s work and then submitting the work as one’s own. Also included would be altering a graded work after it has been returned, then submitting the work for re-grading; or submitting identical or similar papers for credit in more than one course without prior permission from the course instructors.

4. **Fabrication** including but not limited to falsifying or inventing any information, data or citation; presenting data that were not gathered in accordance with defined appropriate guidelines, and failing to
include an accurate account of the method by which data were collected.

5. **Obtaining an Unfair Advantage** including, but not limited to stealing, reproducing, circulating, or otherwise gaining access to examination materials prior to the time authorized by the instructor; unauthorized collaborating on an academic assignment; taking, hiding or altering resource material; or undertaking any activity with the purpose of creating or obtaining an unfair advantage over another student’s academic work.

6. **Aiding and Abetting Academic Dishonesty** including, but not limited to providing material, information or other assistance to another person with the knowledge that such aid could be used in any of the violations stated above, or providing false information in connection with any inquiry regarding academic integrity.

7. **Alteration of Grades or Marks** including but not limited to, action by the student in an effort to change the earned credit or grade.

In addition, cases of academic dishonesty may involve photocopied materials. Materials used may fall under the Copyright Act. Violations of said Act may subject the user and/or the College to sanctions.

**Statement on Disabilities:** Any student who requires reasonable accommodations related to a disability should inform the course instructor and the Coordinator of Specialized Services (Room 138 in Kee Hall; phone 419-755-4727).

Students who encounter difficulty in any of their courses are encouraged to visit the Tutoring Resource Center (Room 119 in Fallerius Technical Education Center) for tutoring assistance, and the Student Success Center (Room 136 in Kee Hall) for academic assistance, advising services, referrals for personal counseling and Learning Disability (LD) Testing.

**Statement on Withdrawals:** As a student, you are expected to attend class. If you are unable or choose not to attend class, or if for whatever reason you are unable to keep up with the requirements of a course, you need to officially drop the class at the Student Records Office. Refund dates and withdrawal dates will vary slightly from term to term. Contact the Student Records Office for applicable dates. Additionally these dates are posted on the academic calendar available on the college’s website, [www.ncstatecollege.edu](http://www.ncstatecollege.edu), under the Academics heading on the home page and are available at the Student Records Office in Kee Hall. Students should go to the Student Records Office (Room 142 in Kee Hall) to process their withdrawal from any class.

If you choose to walk away from your class without officially withdrawing from it, the faculty member teaching the class must grade your classroom performance on the material available to him or her. This normally results in an “F” grade. An “F” grade can lower your grade point average considerably depending on the total credits accumulated.