Modesto Junior College  
Course Outline of Record  

**INTEC 203**

I. **OVERVIEW**  
The following information will appear in the 2009 - 2010 catalog

**INTEC 203  Industrial Mechanical/Pneumatic Components and Equipment**  
3 Units  

Formerly listed as: INTEC - 203: Industrial Mechanical Components and

An introduction to fluid power, power transmission, and other common mechanical components and equipment found in the manufacturing and processing industry. Content includes basic terminology, operation, calculations, installation, and maintenance of individual components as well as systems.  

Field trips might be required.  
(A-F or P/NP - Student choice) Lecture /Lab  
Transfer: (CSU)

II. **LEARNING CONTEXT**

Given the following learning context, the student who satisfactorily completes this course should be able to achieve the goals specified in Section III, Desired Learning:

A. **COURSE CONTENT**

1. **Required Content:**
   a. Industrial safety in the workplace
   b. Calculations
   c. Rigging
   d. Lifting
   e. Ladders
   f. Fluid power principles
   g. Fluid power components and systems
   h. Power transmission
   i. Lubrication
   j. Bearings
   k. Flexible belt drives
   l. Mechanical drives
   m. Basic electricity

2. **Required Lab Content:**
   a. Ladder safety
   b. Computer based tutorials
i. Power transmission Physics

ii. Basic electricity

iii. Shaft couplings

c. Bearings
   i. Identification
   ii. Installation
   iii. Clearance & runout

d. Mechanical drive principles and components

   e. 6 basic machines
      i. Lever
      ii. Wheel & axle
      iii. Pulley
      iv. Lever
      v. Wedge
      vi. Screw

   f. Gear motor
      i. Install
      ii. Connect
      iii. Operate
      iv. Identify and measure soft-foot, shim requirements

   g. Belt drive
      i. Install
      ii. Align
      iii. Adjust and tension
      iv. Measure and adjust speed

   h. Apply mechanical principles

   i. Shaft systems
      i. Collinear shafts
         a. Install
         b. Adjust
c. Align

d. Identify types of misalignment

ii. Perpendicular offset shafts
   a. Install
   b. Adjust
   c. Align

j. Calculate drive ratios

k. Lubrication
   i. Fundamentals
   ii. Terms
   iii. Oils
   iv. Greases

l. Introduction to pneumatics
   i. Symbology and component identification
   ii. Component connection
   iii. Air conditioning and distribution equipment
   iv. Pressure vs force
   v. Pressure vs volume
   vi. Pressure drop vs flow
   vii. Vacuum generation
   viii. Directional control valves
   ix. Directional and speed control of cylinders
   x. Cylinders in series
   xi. Cylinders in parallel
   xii. Indirect control/pilot operated valves
   xiii. Motor circuits
   xiv. Motor performance

3. **Recommended Content:**

   a. Precision Measurement
b. Printreading

c. Tools and tool safety

d. Hydraulic principles

e. Hydraulic applications

f. Pumps and piping

g. Vibration

B. HOURS AND UNITS

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<tr>
<th>Inst Method</th>
<th>Term Hours</th>
<th>Units</th>
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<td>Lect</td>
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<tr>
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C. METHODS OF INSTRUCTION (TYPICAL)

Instructors of the course might conduct the course using the following method:

1. Classroom lecture.
2. Computer based tutorials.
3. Equipment & technology demonstrations.
4. Laboratory demonstrations and exercises.
5. Video presentations.
6. Plant visits.
7. Guest speakers.

D. ASSIGNMENTS (TYPICAL)

1. **EVIDENCE OF APPROPRIATE WORKLOAD FOR COURSE UNITS**

   Time spent on coursework in addition to hours of instruction (lecture hours)

   - Weekly homework/chapter reading.
   - Weekly workbook assignments.
   - Out-of-class laboratory preparation (reading) prior to lab exercises.
   - Final exam preparation and study.

2. **EVIDENCE OF CRITICAL THINKING**

   Assignments require the appropriate level of critical thinking

   Complete the equation: \( \text{Input Moment Arm} \times \text{Input Force} = \text{Output Moment Arm} \times \text{__________}. \)
   a. Input force
   b. Output force
   c. Input moment
   d. Output moment

   If a block and tackle system has 4-part reeving then the output force will be:
   a. \( \frac{1}{4} \) of the magnitude of the input force
   b. Four times the magnitude of the input force
   c. \( \frac{1}{2} \) of the magnitude of the input force
d. Twice the magnitude of the input force

Complete the formula: $\mu = \frac{F}{\text{________}}$.

a. N, the normal force
b. $x$, the magnitude
c. RPM
d. The coefficient of friction

A directional control valve with two flow-path configurations and three fluid ports is referred to as a:

a. 3-way, 2-position directional control valve
b. 2-way, 3-position directional control valve
c. 2-way, 2-position directional control valve
d. 3-way, 3-position directional control valve

When calculating the total piston area for the rod end (annular area) of a cylinder:

a. The rod area must be added to the piston area
b. The rod area must be subtracted from the piston area
c. The piston area must be subtracted from the rod area
d. The piston area must be added to the rod area

A flow control valve consists of:

a. A needle valve and a check valve connected in series
b. A needle valve and a check valve connected in parallel
c. A shutoff valve and a check valve connected in series
d. A shutoff valve and a check valve connected in parallel

A torque of ________ lb-ft is produced when a 75lb force is applied to the end of a 3-foot lever arm.

a. 25
b. 250
c. 225
d. 255

How many horsepower are required to lift a 500 lb load a distance of 12 feet in 5 seconds?

a. About 10.9 Hp
b. About 1200 Hp
c. About 2.18 Hp

E. TEXTS AND OTHER READINGS (TYPICAL)

4. Other: Industrial Pneumatic Technology, Bulletin 0275-B1, Parker Hannifin Corporation (optional)

III. DESIRED LEARNING

A. COURSE GOAL
As a result of satisfactory completion of this course, the student should be prepared to:

perform calculations to determine area, volume, load, force, pressure, rate, velocity, speed, acceleration, D/d ratio, load capacity, loss factors, work, power, torque and horsepower. Correctly interpret component symbology, identify select and assemble mechanical and pneumatic components. Describe and experimentally verify the operation of components and equipment that demonstrate principles related to the course topics.

B. STUDENT LEARNING GOALS
Mastery of the following learning goals will enable the student to achieve the overall course goal.

1. Required Learning Goals
Upon satisfactory completion of this course, the student will be able to:

a. Perform mathematical calculations to determine area, volume, load, force, pressure, rate, velocity, speed, and acceleration.

b. Perform pneumatic calculations using the appropriate gas laws.

c. Perform calculations to determine work, power, horsepower, and torque.

d. Identify hardware components and perform lifting calculations to determine safe loading using
D/d ratio, load capacity, and appropriate loss factors.

e. Identify the types, properties, limitations, and applications of various industrial lubricants. Identify bearing types and lubrication techniques commonly used in power transmission applications.

f. Identify types, characteristics, and common applications of mechanical drive components including bearings, v-belts, synchronous belts, chains, gears, couplings, brakes, and transmissions.

2. **Lab Learning Goals**

   Upon satisfactory completion of the lab portion of this course, the student will be able to:

   a. Perform calculations using the appropriate gas laws.

   b. Identify the types, properties, limitations, and applications of various industrial lubricants. Identify bearing types and lubrication techniques commonly used in power transmission applications.

   c. Safely install, assemble and operate mechanical drive components including bearings, v-belts, synchronous belts, chains, gears, couplings, brakes, and transmissions.

   d. Applying basic pneumatic principles, read a schematic diagram, safely assemble, operate and troubleshoot a simple pneumatic system that includes filters, accumulators, piping, valves, cylinders, and pneumatic motors.

IV. **METHODS OF ASSESSMENT (TYPICAL)**

A. **FORMATIVE ASSESSMENT**

   1. Hands-on laboratory exercises that demonstrate and reinforce the fundamental principles of each course topic.

   2. Computer based tutorials that demonstrate and reinforce the fundamental principles of selected course topics.

   3. Lab unit quizzes.

B. **SUMMATIVE ASSESSMENT**

   1. Computer based tutorials that demonstrate and reinforce the fundamental principles of selected course topics.

   2. Hands-on laboratory exercises that demonstrate and reinforce the fundamental principles of each course topic.

   3. Written examinations that require the students to demonstrate competencies.

   4. Written homework assignments requiring the student to demonstrate knowledge of terminology and mastery of calculations.