

COURSE AND SYLLABUS FORM

Syllabus Cover Sheet

Course Discipline Code & No: SCI 102 Title: Applied Science Effective Term Winter 2004
 Division Code: MNB Department Code: PHYD Org #: _____
 Don't publish: College Catalog Time Schedule Web Page

Reason for Submission. Check all that apply.
 New course approval Minor change (Corrections, editing, clarification)
 Five-year syllabus review (Attach assessment results.) Reactivation of inactive course
 Major change Inactivation (Submit this page only.)

Change information:
Minor changes
 Course discipline code & number (was _____) (when changing course number, select "inactivation" to discontinue the old course.)
 Course title (was _____)
 Course description
 Course objectives (minor changes)
Major changes (reviewed by Curriculum Committee.)
 Credit hours (credits were: _____)
 Total Contact Hours (total contact hours were: _____)
 Distribution of contact hours (contact hours were: lecture: _____ lab _____ clinical _____ other _____)
 Pre or co-requisites
 Distance Learning section approval
 General Education Distribution Course: Add Remove
 Honors section approval
 Change in Grading Method
 Objectives
 Other _____

For major changes, consultation with all departments affected by this course is required. Attach "course use in programs" report from Curriculum Database for Faculty.

Rationale for course or course change
 1. Assessment-based:
 2. Non-assessment-based: Science course needed for general education distribution for apprentice pipefitters who wish to receive an AAS degree.

Approvals Department and divisional signatures indicate that all departments affected by the course have been consulted.

Department Review by Chairperson New resources needed All relevant departments consulted
 Print: Scott Klapper Faculty/Preparer Signature Scott Klapper Date: 12-19-03
 Print: Rober Hagood Department Chair Signature Rober Hagood Date: 12/19/03
 Division Review by Dean Request for conditional approval
 Recommendation Yes No M. Showatz Dean's/Administrator's Signature Date: 12/19/03
 Curriculum Committee Review
 Recommendation Tabled Yes No _____ Curriculum Committee Chair's Signature Date _____
 Vice President of Instruction Approval
 Approval Yes No Roger McPalmy Vice President's Signature Date: 12/19/03

Do not write in shaded area.
 ACS Code 115 Entered in: Banner 12/19 C&A Database 12/19 Log File 12/19
 Approved for General Education Area/Group _____ Syllabus Date _____ Basic skills table updated
 Contact fee

COURSE AND SYLLABUS FORM

Course Discipline & No.: SCI 102 Title: Applied Science

Credit hours: <u>3</u> If variable credit, give range: _____ to _____ credits	Instructor contact hours per semester: Lecture: <u>45</u> Lab: <u>15</u> Clinical: _____ Practicum: _____ Other: _____ Total contact hours: <u>60</u>	Class capacity: <u>30</u> Standard capacity is 30 students unless otherwise specified in the Master Agreement.	Grading options: <input type="checkbox"/> P/NP (limited to clinical & practica) <input type="checkbox"/> S/U (for courses numbered below 100) <input type="checkbox"/> Letter grades
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Prerequisites. Select one: <input checked="" type="checkbox"/> College-level Reading & Writing <input type="checkbox"/> Reduced Reading/Writing Scores COMPASS Reading _____ COMPASS Writing _____ <input type="checkbox"/> No Basic Skills Prerequisite (College-level Reading and Writing is <u>not</u> required.) Corequisites (must be enrolled in this class also during the same semester): _____ _____	In addition to Basic Skills in Reading/Writing: Level I (enforced in Banner) <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:40%;">Course/Test</th> <th style="width:20%;">Grade/Score</th> <th style="width:40%;">Concurrent Enrollment</th> </tr> </thead> <tbody> <tr> <td>_____</td> <td>_____</td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/> and <input type="checkbox"/> or _____</td> <td>_____</td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/> and <input type="checkbox"/> or _____</td> <td>_____</td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/> and <input type="checkbox"/> or _____</td> <td>_____</td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table> Level II (enforced by instructor on first day of class) <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:40%;">Course</th> <th style="width:60%;">Grade/Score</th> </tr> </thead> <tbody> <tr> <td>_____</td> <td>_____</td> </tr> <tr> <td><input type="checkbox"/> and <input type="checkbox"/> or _____</td> <td>_____</td> </tr> <tr> <td><input type="checkbox"/> and <input type="checkbox"/> or _____</td> <td>_____</td> </tr> <tr> <td><input type="checkbox"/> and <input type="checkbox"/> or _____</td> <td>_____</td> </tr> </tbody> </table>	Course/Test	Grade/Score	Concurrent Enrollment	_____	_____	<input type="checkbox"/>	<input type="checkbox"/> and <input type="checkbox"/> or _____	_____	<input type="checkbox"/>	<input type="checkbox"/> and <input type="checkbox"/> or _____	_____	<input type="checkbox"/>	<input type="checkbox"/> and <input type="checkbox"/> or _____	_____	<input type="checkbox"/>	Course	Grade/Score	_____	_____	<input type="checkbox"/> and <input type="checkbox"/> or _____	_____	<input type="checkbox"/> and <input type="checkbox"/> or _____	_____	<input type="checkbox"/> and <input type="checkbox"/> or _____	_____
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Enrollment restrictions (In addition to prerequisites, if applicable.) <input type="checkbox"/> and <input type="checkbox"/> or <input type="checkbox"/> Instructor consent required <input type="checkbox"/> and <input type="checkbox"/> or <input type="checkbox"/> Admission to program required Program _____ <input type="checkbox"/> and <input type="checkbox"/> or <input type="checkbox"/> Other (please specify): <u>Member of United Association</u> _____	Please send syllabus for transfer evaluation to: <input type="checkbox"/> EMU <input type="checkbox"/> UM <input type="checkbox"/> _____ <input type="checkbox"/> _____ <input type="checkbox"/> _____ <input type="checkbox"/> _____	Instructional mode <input checked="" type="checkbox"/> On campus <input type="checkbox"/> Online <input type="checkbox"/> Blended (online and on-campus combined) <input type="checkbox"/> ITV <input type="checkbox"/> Other
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Course Options General Education Group I (Select one area) <input type="checkbox"/> Writing <input type="checkbox"/> Nat. Sci. <input type="checkbox"/> Speech <input type="checkbox"/> Soc./Behav/ Sci. <input type="checkbox"/> Math <input type="checkbox"/> Arts/Hum. Courses must meet all criteria. <input checked="" type="checkbox"/> 1. Is a standard introductory course in the discipline <input type="checkbox"/> 2. Has a verified transfer acceptance <input checked="" type="checkbox"/> 3. Meets the critical thinking requirement <input checked="" type="checkbox"/> 4. Assesses academic achievement <input checked="" type="checkbox"/> 5. Covers minimum knowledge/skills	Honors section. Not all criteria are required. Check relevant items. <input type="checkbox"/> 1. Emphasis on primary source materials <input type="checkbox"/> 2. Emphasis on independent study/research <input type="checkbox"/> 3. Greater rigor of course materials <input type="checkbox"/> 4. Interdisciplinary approach <input type="checkbox"/> 5. Development of critical thinking skills <input type="checkbox"/> 6. Additional course objectives <input type="checkbox"/> 7. Additional instructional methods <input type="checkbox"/> 8. Satisfaction of the service component
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List all new resources needed for course, including library materials.

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Syllabus

Course discipline code & number SCI 102	Course title Applied Science	Credit hours 3
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Course description Brief statement of the purpose and content of the course	This course prepares members of the pipe trades to accurately apply principles of physics to their work. Five major areas are studied: water and steam; hydraulics and pneumatics; mechanics; metals, alloys, synthetics; and corrosion. Within each of these areas, apprentices will develop their understanding of the concepts underlying the various aspects of their trade so that they can perform to accepted standards. This course is open only to apprentices in the United Association.	
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Course outcomes List brief statements that indicate what students will know and be able to accomplish as a result of taking the course. Indicate how these outcomes will be assessed for NCA assessment of student achievement.	Outcomes By the end of this course, apprentices will: 1. Solve problems related to the pipe trades by applying their knowledge in the following areas: •Nature and properties of substances transported by piping systems. •Properties of liquids and gases in motion through piping systems •Nature of forces involved in work and machines •Properties of materials used in piping installations. •Causes of corrosion and the means to control it. 2. Use proper techniques to calculate, design, install, and maintain appropriate piping systems.	Assessment Method Instructor observation of student performance using a <u>standard UA</u> checklist. <i>R.M.S.</i>
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Content outline List in sequence the instructional units/modules/clusters of related topics that will be taught, and indicate the major instructional objectives for each unit. Indicate methods that will be used in each unit to evaluate student work for grading.	Unit and Unit Objectives Unit 1 Water and Steam Objectives 1. Describe the structure and components of atom and molecules. 2. Identify the three physical states of matter. 3. Differentiate among substance, matter, element, compound, mixture, and solution. 4. List five elements used in the piping industry. 5. Calculate the volume of a tank in liters. 6. Calculate the density of a substance using the concept of buoyancy. 7. Determine the specific heat of different substances. 8. Explain the effects of heat and pressure on different states of matter. 9. Convert degrees of temperature in the three temperature scales to degrees in the other scales. 10. Differentiate among latent, specific, and sensible heat. 11. Determine the boiling point of water at varying pressures. 12. Calculate the number of BTUs needed to convert a given state	Evaluation Method -Midterm -Final -Lab and other projects -Homework assignments <i>R.M.S.</i> (At least 10 graded assignments will be distributed across the term.) <i>R.M.S.</i> (Each objective will be evaluated in at least one graded assignment.)
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- of matter to another state, at varying pressures.
13. Explain the energy changes involved in freezing and evaporation.
 14. Give an example of the application of Bernoulli's principle.
 15. Differentiate among density, specific gravity, and weight density.
 16. Explain why some substances are more dense than others.
 17. Explain the kinetic theory of temperature.
 18. Give examples of heat transfer, conduction, and radiation.
 19. Contrast superheated steam to saturated steam.
 20. Calculate the saturation temperature of water.
 21. Calculate the temperature and volume of steam at varying pressures.

Unit 2

Hydraulics and Pneumatics

1. Explain how a gas can be heated and cooled by compression and expansion.
2. Describe the function of a barometer in relationship to atmospheric pressure.
3. Solve problems using the concept of fluid dynamics.
4. Explain fluid flow.
5. Explain the relationship of pressure to velocity for a fluid flowing in a pipe.
6. Represent and solve problems related to principles of fluids.
7. Convert inches of mercury to pounds per square inch.
8. Calculate the pressure in piping systems under varying conditions.
9. Calculate the discharge pressure of pumps in psia and psig at varying barometric pressures.
10. Explain how Boyle's law relates to work in the pipe trades.
11. Calculate the absolute pressure in containers, given a certain psig, at varying barometric pressures.
12. Given a cylinder with a certain volume of air at a specified psia, determine the volume of air if it compressed to a lower psia.
13. Explain siphonic action.

Unit 3

Mechanics

Objectives

1. Explain the relationship of the terms work, force, and distance.
2. Differentiate between work and power.
3. Express the relationship of force, distance, time, and power in a simple equation.
4. Calculate horsepower.

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5. Define the term machine.
6. Explain two common uses of machines.
7. Identify the six different types of simple machines.
8. Apply the concepts of work and energy to machines.
9. Describe how each of the three classes of levers handles effort and resistance.
10. Explain the meaning of the statement, "work input equals work output."
11. Describe how friction affects machines (or the work of machines).
12. Identify the standard unit of power.
13. Represent and solve problems related to the use of machines in the pipes trades.
14. Explain the concept of mechanical advantage.
15. Compute the mechanical advantage for simple and compound machines.

Unit 4

Metals, Alloys, and Synthetics

Metals Objectives

1. List the essential characteristics of an elementary metal.
2. Identify the characteristics of the common elemental metals used in piping industry.
3. List the mechanical properties of metals that are the effects of force.
4. List the physical properties of metals.
5. Identify the properties of ferrous metals.
6. Explain how the coefficient of thermal (linear) expansion and contraction is used in designing piping installations.
7. Explain how the differential expansion of metals can be used to monitor and temperature

Alloys Objectives

1. Define the term alloy.
2. Identify the characteristics of the common alloys used in piping installations.
3. Explain the purpose of alloying metals.
4. Define the following properties of metals: ductility, malleability, tensile strength, compressive strength, and shear strength.
5. Explain the following processes: annealing, hardening, and tempering.

Synthetics Objectives

1. Define the term synthetic as it relates to piping materials.

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2. Identify the characteristics of the commonly used synthetics for piping.
3. Describe the effects of commonly used fillers on the physical properties of piping materials.
4. Explain the external factors that affect synthetic piping materials.
5. Compare the three methods for joining synthetic pipes.
6. Describe the effects of temperature on synthetic piping materials.
7. Differentiate among the four different methods used to compensate for expansion and contraction in synthetic pipes.
8. Explain the factors to consider in determining the support necessary for a synthetic piping system.

Unit 5

Corrosion

Objectives

1. Define corrosion.
2. Identify six forms of corrosion.
3. Differentiate among the three types of corrosion.
4. Explain how oxidation and reduction occur.
5. Explain an electrochemical corrosion reaction.
6. Explain how corrosion can be controlled in underground piping systems.
7. Define a galvanic cell.
8. List guidelines for combating corrosion.

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Student Materials

List examples of types		Estimated costs.
Texts Supplemental reading Supplies Uniforms Equipment Tools Software		\$

Equipment/Facilities: Check all that apply. (All classrooms have overhead projectors and permanent screens.)

Check level <u>only</u> if the specified equipment is needed for <u>all</u> sections of a course.	<input type="checkbox"/> Off-Campus Sites <input type="checkbox"/> Testing Center <input type="checkbox"/> Computer workstations/lab <input type="checkbox"/> ITV <input type="checkbox"/> TV/VCR <input type="checkbox"/> Data projector/computer <input type="checkbox"/> Other _____
<input type="checkbox"/> Level I classroom Permanent screen & overhead projector	
<input type="checkbox"/> Level II classroom Level I equipment plus TV/VCR	
<input type="checkbox"/> Level III classroom Level II equipment plus data projector, computer, faculty workstation	