ANTELOPE VALLEY COLLEGE
Academic Affairs
Course Outline of Record

Academic Affairs Only

- ☐ New Course
  - ☐ Effective Date (for articulation)
- ☒ COR Revision 5/13/2010
- ☐ Pre Req/Advisories
- ☐ Other Changes
- ☒ SLOs 5/27/2008

COURSE SUBJECT & NUMBER: ENGR 130

COURSE NAME: Materials Science

COURSE UNITS: 3 **COURSE HOURS:** 3 hours weekly

COURSE REQUISITES: ***(Follow format of similar courses found in the college catalog.)***

PREREQUISITE: Completion of CHEM 110, and PHYS 110.
COREQUISITE: Concurrent enrollment in ENGR 130L.

COURSE DESCRIPTION: ***(Write a short paragraph providing an overview of topics covered. Be sure to identify target audience--transfer, major, GE, degree/certificate, etc. If repeatable, state the number of times at end of description as (R#)***.

Study of production, composition, test methods and properties of important engineering materials. Emphasizes relation of the atomic structure of engineering materials to their physical properties. (CSU, UC, AVC)

COURSE OBJECTIVES: ***(Title 5 requires that courses show evidence of critical thinking skills. Use Bloom's taxonomy to formulate concise, performance-based measurable objectives common to all students. Objectives must be closely aligned with course content, assignments, and methods of evaluation)***

Upon completion of course, the successful student will be able to:

1. *Describe the bravais lattices, predict which one of a given compound will crystallize in on the basis of bonding type and ion size, and match bravais lattices with Bragg diffraction data.

2. *Derive a phase diagram from experimental free energy curves.

3 *Apply the tie line and lever rule to a simple binary system to predict composition and weight fraction at a given temperature.

4 Explain qualitatively variation of yielding, strain hardening, creep, fatigue, and fracture.

5 Explain qualitatively key concepts in manufacture and use of ceramics, polymers, and composites.

6 *Predict electrical properties and corrosion of materials.

7. * Read and apply technical literature to analysis of technical problems.

8. * Listen to technical lectures and apply these lectures to technical problems.

9. * Increase learning skills.

*Denotes application of SCANS competencies.

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COURSE CONTENT: ***(Enter course content in terms of specific topics or a specific body of knowledge that each instructor must cover. Put topics in outline form with major and minor headings. Each instructor must cover all material listed below.)***

I. Material bonding and atomic structure

II. X-ray diffraction

III. Stress and strain

IV. Materials tests (hardness, charpy, fatigue)

V. Steel and aluminum heat treatment

VI. Fick's Law and grain growth

VII. Phase diagrams
- A. Aluminum
- B. Iron-carbon
- C. Copper

VIII. Kinetics of tempering

IX. Hardenability (Jominy test)

X. High alloys, steel, and cast iron

XI. Glass, ceramics

XII. Polymers

XIII. Composites

XIV. Corrosion

XV. Fatigue

XVI. Electrical properties

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TYPICAL HOMEWORK ASSIGNMENTS: (Do not include in-class work, quizzes, or tests)
This information is necessary for all credit courses. Assignments should be closely related to course objectives, content, and methods of evaluation. (See sample of a "Model Outline" in the AP&P Standards & Practices Handbook.) Include a range of assignments (minimum of three) from which faculty may choose when designing their syllabus.

1. ***Describe nature and frequency of typical reading assignments if applicable; note if any are required:***

Reading may include approximately 30 pages from the textbook per week.

2. ***Describe nature and frequency of typical writing assignments if applicable; note if any are required:***

Students are at times required to briefly respond in writing to explain, evaluate or comment on the results of their computations.

3. ***Describe nature and frequency of typical computational assignments if applicable; note if any are required:***

Most of the assignments involve calculations utilizing algebra, trigonometry and elementary calculus.

4. ***Describe other types of homework assignments that students may be asked to complete (oral presentations; special projects; visual/performing arts; etc); note if any are required:***

N/A

For categories 1-4 above, list the estimated hours per week it would take a student to complete assignments. *Title 5 (section 55002)* requires that *each unit must be shown to require three hours of work per week by the student either in or out of class.* Homework formula: 3 hours of class work *times* each unit of credit *minus* classroom hours *equals* required homework hours.

Reading Assignments: 2 ***Writing Assignments***: 0

Computational Assignments: 5-6 ***Other Assignments***: 0

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METHODS OF INSTRUCTION: ***(Methods must be consistent with content and appropriate to objectives; state in terms of what instructor will be doing in order to present course content to students: for example, lecture, demonstration, present audio/visual materials; facilitate group work, etc. Do not list specific instructional equipment.)***

Mainly lecture with some demonstrations.

METHODS OF EVALUATION: ***(These must be clearly related to course objectives and reflect course content and assignments in order to comply with Title 5 requirements. Describe what instructor will be looking for when evaluating various assignments and tests in order to determine whether students have met course objectives. Grades must be based on demonstrated proficiency in subject matter and determined, where appropriate, by essays, objective and essay tests, research papers or projects, problem solving exercises, or skills' demonstrations.)***

Homework assignments will be used to measure the students' ability to relate the theoretical concepts to real life applications (Objectives 1-8).

Homework reading assignments each week, will be evaluated through classroom discussions (Objectives 1-8).

Computational homework assignments will be evaluated by demonstrating problem solving proficiency, calculations, and answers to questions related to the assigned subject matter (Objectives 1-8).

Mid-semester exam will be used to evaluate the accuracy of the students' understanding of the theories and techniques instructed during the first half of the semester (Objectives 1-8).

Comprehensive final examination (Objectives 1-9).

Suggested Texts or Other Instructional Materials
(List several when possible; include title, author, publisher, date, and latest edition. If older than five years, provide brief rationale.)

1. Title: Material Science and Engineering an Introduction, 8th edition
   Author: Callister and Rethwisch
   Publisher: Wiley, 2010