1. *Course number and name*

**ENGR 200: Materials of Engineering**

1. *Credits and contact hours*

3 credit hours: two 50-minute lecture sessions/week and one 2-hour-45-minute laboratory session/week

1. *Instructor’s or course coordinator’s name*

Instructor: Kwok Siong Teh, Professor of Mechanical Engineering

Course coordinator: Kwok Siong Teh, Professor of Mechanical Engineering

1. *Text book, title, author, and year*

W. D. Callister. Fundamentals of Materials Science and Engineering, 9th ed., John Wiley & Sons, Inc., 2014.

1. *other supplemental materials*

 Donald R. Askeland, Pradeep P. Fulay. *Essentials of Materials Science and Engineering*. 2nd edition.SI. Cengage Learning, 2010

 James F. Shackelford. *Introduction to* *Materials Science for Engineers*, Eighth Edition,

 Pearson Higher Education Inc., 2015.

1. *Specific course information*

*a. brief description of the content of the course (catalog description)*

Application of basic principles of physics and chemistry to engineering materials; their structure and properties and the means by which these materials can be made of better service to all fields of engineering.

*b. prerequisites or co-requisites*

CHEM 115: General Chemistry I, or CHEM 180: Chemistry for the Energy and the Environment

*c. indicate whether a required, elective, or selected elective course in the program*

Required for Civil Engineering; required for Mechanical Engineering

1. *Specific goals for the course a. specific outcomes of instruction, ex. The student will be able to explain the significance of current research about a particular topic.*

• The student will demonstrate an ability to describe and solve problems on atomic arrangements, geometry of imperfections, and atomic diffusion in solids.

• The student will demonstrate an ability to describe and solve problems on mechanical and electrical behavior of materials.

• The student will demonstrate an ability to submit homework solutions in proper engineering format.

• The student will demonstrate an ability to describe and solve problems on the distinguishing properties of metals, plastics and ceramics.

• The student will demonstrate a familiarity with the effects of thermal, mechanical, and chemical treatments on properties.

• The student will demonstrate an ability to experimentally determine mechanical and electrical properties of materials.

• The student will demonstrate an ability to make oral presentations and write a technical report.

*b. explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.*

Course addresses ABET Student Outcome(s): 1, 2, 3, 4, 5, 6, 7.

1. *Brief list of topics to be covered*

• Atomic structure and bonding

 • Crystal structures and geometry

• Mechanical properties of metals

• Crystal imperfections

• Strengthening mechanisms

• Heat treatment

• Solidification

• Diffusion

• Fracture mechanics

• Fatigue failure

• Creep

• Phase diagrams

• Phase transformation

• Engineering alloys

• Thermal processing of metals

• Polymers

• Composite materials

• Concrete mixing and testing

• Electrical properties of materials

• Semiconductors

• Contemporary topics in materials science