MTSE 3000.003
“Fundamentals of Materials Science and Engineering”
Fall Semester 2016 – 3 credit hours

**Instructor:** Dr. Raj Banerjee, **Office:** C136D, Discovery Park
**E-mail:** raj.banerjee@unt.edu  **Phone:** 940-891-6812

**Office Hours:** Monday 10:00 am - 11:00 am; and by appointment

**Lecture:** Monday and Wednesday, 8:30 a.m. – 9:50 a.m.

**Location:** UNT Discovery Park, Room B158


**Other Suggested Textbooks:** *Introduction to Materials Science for Engineers*, by Shackleford, Prentice Hall

**Teaching Assistant:** Peter Walker  **E-mail:** Peter.Walker@my.unt.edu

**Study/Tutor Room:** Tuesday, 3:30 pm – 5:30 pm and by appointment, Tutor room: TBD

**Course Description**
Principles of bonding, structure, and structure/property relationships for metals and their alloys, ceramics, polymers and composites. Emphasis on properties and how processes change structure and, consequently, properties.

**Course (Learning) Objectives:**
1. Demonstrate ability to relate bond energy to properties of engineering materials.
2. Interpret various crystal structures using Miller Indices for planes and directions.
3. Determine contributions of various strengthening mechanisms, including solid solution strengthening, precipitation strengthening, strain hardening, and grain size strengthening (the Hall-Petch relationship).
4. Demonstrate ability to read a phase diagram, including determining phase diagram type, predict phase compositions (given $c_0$ and $T$), and predict microstructures for given compositions.
5. Interpret mechanical properties, including yield strength, ultimate tensile strength, and elastic modulus from engineering plots of $\sigma$–$\varepsilon$.
6. Exhibit awareness of societal implications associated with various materials, including specifically occupational safety and health and global availabilities of commodity material.
7. Conduct and present a material selection survey as part of a team for current materials applications.

**Course Outcome:**
1. An ability to apply knowledge of mathematics, science, and engineering, and the ability to apply and integrate knowledge of structure, properties, processing, and performance to solve materials selection and design problems within realistic constraints. (Course Objectives 1,2,3,4,5,7)
2. An ability to design and conduct experiments, as well as to analyze and interpret data (Course Objectives 1,2,4,5)
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. (Course Objective 7)
4. An ability to function on multi-disciplinary teams. (Course Objective 7)
5. An ability to identify, formulate, and solve engineering problems. (Course Objective 7)
6. An understanding of professional and ethical responsibility. (Course Objective 6)
7. An ability to communicate effectively. (Course Objective 7)
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context. (Course Objectives 6,7)
9. A knowledge of contemporary issues. (Course Objectives 2,6,7)

Lecture Notes will be posted on blackboard: Lectures, homework assignments, and solutions will be posted on Blackboard http://learn.unt.edu.

Notes:
1. BlackBoard will be used as the primary communication tool. It will be used exclusively for posting homework assignments, homework solutions, formula sheets for exams, and grades.
2. Each quiz will be limited to one or two problems with a time limit of 15 minutes. The content will be based on recent homework problems.
3. There would be two exams, which will be weighted equally to determine the exam average component of the grade. Each exam covers a certain set of chapters.
4. For all exams and quizzes, the only thing you may use during the exam is a calculator (plus a pencil, pen, and/or eraser). Earphones, cell phones, laptops, etc. will not be allowed.
5. There will be a final group project including two parts: Written paper + In class presentation.

Team Project:
For the project, there will be a final paper (15%) and a presentation (15%). On the final examination, you will score your team members according to both their participation and their accuracy.

Calculators: Programmable calculators are not allowed. Sharing of calculators is not allowed. Bring them to quizzes and exams. You must have an inexpensive scientific calculator that can solve:
- Trig functions (SIN, COS, TAN)
- Exponentials (e^x)
- Square Root
- x^y
- Natural Logs (LN)
- Logs (LOG)
- Inverse

Cell Phones: Please remember to turn off phones prior to class. Cell phones are not to be on the desks during quizzes or examinations.

Prerequisites: PHYS 1710. CHEM 1410/CHEM 1430 or CHEM 1415/CHEM 1435.

Tentative Grading Scheme with weight percent contributions to the final grade (subject to change):
- Homework Average: 10%
- Quiz Average: 20%
- Exam Average: 40%
- Team Project: 30%

Makeup Exam Policy: If a student cannot take an exam on the scheduled date due to some unavoidable circumstances, such as out of town business trip, sickness, etc., then he/she must notify the instructor in
writing before the scheduled exam time to schedule a makeup exam. If allowed, a 10% penalty will be assessed.

Class Attendance is Mandatory. Please notify me if you have to miss a class or will be late. Additional pop-quizzes may be given due to overall classroom attendance and participation.

Disabilities Accommodation
The University of North Texas complies with Section 504 of the 1973 Rehabilitation Act and with the Americans with Disabilities Act of 1990. The University of North Texas provides academic adjustments and auxiliary aids to individuals with disabilities, as defined under the law. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring accommodation, please see the instructor and/or contact the Office of Disability Accommodation at 940-565-4323 during the first week of class.

Additional Policies
Authorized Absences and Extenuating Circumstances
Absences due to extenuating circumstances or participation in sponsored must be verified by the Dean of Students. Consideration of such absences will be made for quizzes and examinations, but not homework. For participation in sponsored activities, you must seek approval prior to the absence. For extenuating circumstances, you have 1 week to contact me and/or the Dean of Students to begin the process.

Absence for Religious Holidays
In accordance with state law, a student absent due to the observance of a religious holiday may take examinations or complete assignments scheduled for the day(s) missed, including those missed for travel, within a reasonable time after the absence. The student is responsible to notify the instructor of each class of the date of the anticipated absence as early in the semester as possible. Only holidays or holy days observed by a religion whose place of worship is exempt from property taxation under Section 11.20 of the Tax Code may be included. A student who is excused under this provision may not be penalized for the absence.

Academic Integrity – Plagiarism and cheating will NOT be tolerated.

Statement of Expectations for Student Conduct
You will be expected to conduct yourself in a professional manner. Academic dishonesty such as plagiarism and cheating will NOT be tolerated. Therefore, students are expected to be honest and ethical in their academic work. Academic dishonesty is defined as an intentional act of deception in one of the following areas:
* cheating – use or attempted use of unauthorized materials, information or study aids
* fabrication – falsification or invention of any information
* assisting – helping another commit an act of academic dishonesty
* tampering – altering or interfering with evaluation instruments and documents
* plagiarism – representing the words or ideas of another person as one's own.

For more information about academic integrity and the University's policies and procedures in this area, please see the UNT academic manual. Any student in violation of these policies will be given an overall F grade (Fail). In addition, your case will be forwarded to university administrators, and you may be subject to additional punishments/sanctions according to university policies. When in doubt, please ask me.