**MTSE 3001.001**

*Special Topics in Materials Science and Engineering*

**“Fundamentals of Materials Science and Engineering - II”**

**Spring Semester 2018 – 3 credit hours**

**Instructor:** Dr. Andrey Voevodin, **Office:** E132F, Discovery Park

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**Office Hours:** Tuesday 10:00 am - 11:00 am; Wednesday 3:00 pm – 4:00 pm and by appointment

**Lecture:** Tuesday and Thursday, 8:30 a.m. – 9:50 a.m.

**Location:** UNT Discovery Park, Room B155

**Textbook:** *Fundamentals of Materials Science and Engineering, An Integrated Approach* by William D. Callister & David G. Rethwisch, 4th Edition, John Wiley, 2011

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

*Understanding Solids* by Tilley, Wiley & Sons, any Edition; *The Science and Engineering of Materials*, D. R. Askeland, P.P.Fulay, W.J.Wright, Cengage Learning, any Edition.

**Teaching Assistant:** TBD **E-mail:** TBD

**Study/Tutor Room:** TBD

**Course Description**

Continuation of the MTSE 3000 course which covers in details: metal alloy processing and classification; ceramic structure, properties, and processing; polymer processing and applications; composite material principles, classification, preparation and properties; corrosion degradation mechanisms, electrochemical reactions, and protection methods; electrical properties of metals, semiconductors, and dielectrics; thermal properties of metals and non-metals; magnetic material fundamentals, properties and applications; optical material fundamentals, properties and applications.

***Course (Learning) Objectives*:**

1. Demonstrate knowledge of metal alloy, ceramics, polymers and composite processing, classification and relation to mechanical and physical characteristics.

2. Understand electrochemical reactions and principles for major corrosion, oxidation and degradation mechanisms for metals, polymers and ceramics, as well as major protection and prevention methods.

3. Understand electrical and thermal transport foundations in metals and non-metals with the knowledge of semiconductors, insulators, dielectrics relevant to diode, transistor, and capacitor operations.

4. Understand magnetic property foundations in metals and non-metals and knowledge of hard and soft magnetic material processing for magnetic storage, sensors and electrical energy handling.

5. Understand optical behavior of metals and non-metals and the knowledge of absorption, transmission, reflection in materials with connection to the operation principles of optical fibers, filters and lasers.

6. Exhibit awareness of societal implications associated with structural and functional 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 identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. (Course Objectives 1,2,3,4,5)

2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. (Course Objective 6)

3. An ability to communicate effectively with a range of audiences (Course Objective 7)

4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts. (Course Objective 6,7)

5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives (Course Objective 7)

6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions (Course Objectives 1,2,3,4,5)

7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies. (Course Objectives (1,2,3,4,5)

**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 and sample problems gone over in class.

3. Each exam will include a combination of (A) multiple choice questions, (B) short answer questions, and (C) quantitative problems.

4. There would be three exams, which will be weighted equally to determine the exam average component of the grade. Each exam builds up on understanding previous chapters and, hence, the second and third exams are progressively comprehensive.

5. 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.

**Team Project:**

For the project, there will be a final paper (5%) and a presentation (5%). You will also 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 (ex)

Square Root

xy

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, MTSE 3000.

***Tentative Grading Scheme with weight percent contributions to the final grade (subject to change)*:**

**Homework Average: 10%**

**Quiz Average: 20%**

**Exam Average: 60%**

**Team Project: 10%**

***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.

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| **Specific Course Learning Outcome** |
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| 2. Understand electrochemical reactions and principles for major corrosion, oxidation and degradation mechanisms for metals, polymers and ceramics, as well as major protection and prevention methods. |
| 3. Understand electrical and thermal transport foundations in metals and non-metals with the knowledge of semiconductors, insulators, dielectrics relevant to diode, transistor, and capacitor operations |
| 4. Understand magnetic property foundations in metals and non-metals and knowledge of hard and soft magnetic material processing for magnetic storage, sensors and electrical energy handling |
| 5. Understand optical behavior of metals and non-metals and the knowledge of absorption, transmission, reflection in materials with connection to the operation principles of optical fibers, filters and lasers |
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This course addresses ABET Student Outcome 7