MME 4303 Metals Processing (Fall 2022, CRN 11276)

Instructor: Guikuan Yue, Ph.D., gyue@utep.edu, 747-6934
Office Hours: M201-D Tuesday (13:30-15:00 PM) and Thursday (10:30–11:30 AM) or by appointment (In-person or Virtually online)
Class Days: Tuesday and Thursday, 12:00-13:20, Quinn Hall 103

References:

Prerequisites: MME 2305, MME3308, each with a grade of "C" or better.

Course description: Analysis of the unit operations involved in metal and mineral production using the principles of material and energy balance, fluid flow, heat transfer, reaction kinetics, and thermodynamics. A chemistry review of the fundamentals specifically involved in pyrometallurgy and hydrometallurgy will be included. Survey of processing operations for specific metals such as copper, iron, aluminum, etc.

Course objective: At the end of this course, students will have a solid grasp of fundamentals in the principles of pyrometallurgy and hydrometallurgy, as well as of the flow sheet of industrial metals production (copper, iron and aluminium), and can apply them to analyze and address the practical problems of most of the metals’ production.

Topics: Units and unit analysis; stoichiometry; conservation of mass; mass balances; First law of thermodynamics; energy balances for closed systems; specific heat, sensible heat and enthalpy increments; heats of formation and reaction; adiabatic flame temperature; fuels and combustion; liquid, solid and gaseous fuels; combustion stoichiometry, excess air; heating values; gas reforming and substoichiometric combustion; reactors for pyrometallurgical unit processes; fixed and fluidized beds; shaft furnaces; rotary kilns; reverberatory furnaces; electric furnaces; pneumatic reactors; balance reactions; stoichiometric calculation; solution chemistry; equilibrium constant; introduction to leaching; mineral processing; copper production by pyrometallurgy and hydrometallurgy; iron production by blast furnace; aluminium production by Bayer process and Hall-Heroult process.

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<th>Grading</th>
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<tr>
<td>Assignments</td>
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<td>Midterm Exam</td>
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<td>Group Project</td>
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<td>Final Exam</td>
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LECTURE OUTLINE

Introduction
Extractive metallurgy; Pyrometallurgy; Hydrometallurgy; Electrometallurgy;
Unit operations and Unit processes; Process flow sheets.

1. Chemistry Review
   1.1 Pyrometallurgy: Mass Balance, Heat Balance, etc.
   1.2 Hydrometallurgy: Balance Reactions, Equilibrium, Kinetics, etc.

2. Introduction to Mineral Processing
   2.1 Mineralogy
   2.2 Size Reduction
   2.3 Particle (mineral) Selection
   2.4 Screening.

3. Introduction to Extractive Metallurgy
   3.1 Pyrometallurgy
   3.2 Hydrometallurgy
   3.3 Electrometallurgy

4. Case Studies
   4.1 Copper Production by Pyrometallurgy
   4.2 Copper Production by Hydrometallurgy
   4.3 Iron Production by Blast Furnace and Direct-Reduction
   4.4 Aluminium Production by Bayer Process and Hall-Heroult Process

Course Withdrawal Policy: If a student withdraws from a course prior to the official
census date of any semester, the course will be deleted from the student’s record.
Withdrawal from a course initiated by a student after the census date but prior to the
course drop deadline, will result in a grade of “W.” After the course drop deadline,
withdrawal from a course initiated by a student will result in a grade of “F.”

Attendance: University policy dictates that all students attend all scheduled classes,
meaning that attendance to both the class and laboratory sessions is mandatory.
However, I understand if you have conferences or other school-related activities to
attend. Please notify me of any commitments you may have prior to you being absent
from class. “Emergency” absences will be handled on a case by case basis

According to UTEP Curriculum and Classroom Policies, “When, in the judgment of the
instructor, a student has been absent to such a degree as to impair his or her status
relative to credit for the course, the instructor may drop the student from the class with
a grade of “W” before the course drop deadline and with a grade of “F” after the course
drop deadline.” See academic regulations in the UTEP Undergraduate Catalog for a list
of excuse absences. Therefore, if I find that, due to non-performance in the course, you
are at risk of failing, I will drop you from the course. I will provide 24 hours advance
notice via email.
OR

I will not drop you from the course. However, if you feel that you are unable to complete the course successfully, please let me know and then contact the Registrar’s Office to initiate the drop process. If you do not, you are at risk of receiving an “F” for the course.

Homework: Homework assignments will normally be due two weeks after they are assigned. No late homework will be accepted.

E-Mail Policy: Please do not send e-mails regarding the course to me with an account other than your UTEP account. Do not turn in homework assignments via e-mail unless directly instructed to do so.

Use of Electronic Devices: As a courtesy to me and the other students in class, the use of cell phones, and pagers is not allowed while class is in session.

Cheating, Plagiarism, Scholastic Dishonesty, and Student Discipline: Students who engage in scholastic dishonesty will be subject to disciplinary action as stated in the UTEP-HoOP:

“Scholastic dishonesty (which includes the attempt of any student to present the work of another as his or her own, or any work which s(he) has not honestly performed, or attempting to pass any examination by improper means) is a serious offense and will subject the student to disciplinary action. The aiding and abetting of a student in any dishonesty is held to be an equally serious offense. All alleged acts of scholastic dishonesty should be reported to the Dean of Students for disposition. It is the Dean of Students’ responsibility to investigate each allegation, dismiss the allegation, or proceed with disciplinary action in a manner which provides the accused student his or her rights of due process.”


Cite, reference, or quote information obtained from other sources and give credit where credit is due. In addition, when it is specified that a task needs to be performed individually, soliciting your classmates’ help is considered scholastic dishonesty. Do NOT copy any material regardless of where you obtained it into your own work. Do NOT submit work under your name if you did not complete it entirely yourself; you may not submit work you completed for another class, unless specifically stated otherwise. In accordance with university policy, any instances of plagiarism and dishonesty will be reported to the Dean of Students Office. If you are caught cheating you will be subject to the disciplinary action defined by UTEP’s Standards of Conduct and Dishonesty.
including the receiving of an incomplete “I” for the class and adjudication by the Dean of Students.

**Disabilities:** UTEP seeks to provide reasonable accommodations for all qualified individuals with disabilities, including learning disabilities. This university will adhere to all applicable federal, state, and local laws, regulations and guidelines with respect to providing reasonable accommodations as required affording equal educational opportunity.

If you have a disability and need classroom accommodations, please contact The Center for Accommodations and Support Services (CASS) at (915) 747-5148, or by email to cass@utep.edu, or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at www.sa.utep.edu/cass.

It is the student's responsibility to register with The Center for Accommodations and Support Services and arrange the appropriate accommodations.

**COVID-19 Precaution:** Please stay home if you have been diagnosed with COVID-19 or are experiencing COVID-19 symptoms. If you are feeling unwell, please let me know as soon as possible, so that we can work on appropriate accommodations. If you have tested positive for COVID-19, you are encouraged to report your results to covidaction@utep.edu, so that the Dean of Students Office can provide you with support and help with communication with your professors. The Student Health Center is equipped to provide COVID-19 testing.

The Center for Disease Control and Prevention recommends that people in areas of substantial or high COVID-19 transmission wear face masks when indoors in groups of people. The best way that Miners can take care of Miners is to get the vaccine. If you still need the vaccine, it is widely available in the El Paso area, and will be available at no charge on campus during the first week of classes. For more information about the current rates, testing, and vaccinations, please visit epstrong.org.

**Technology Requirement:** Course content is delivered via the Internet through the Blackboard learning management system (LMS) or email. Ensure your UTEP e-mail account is working and that you have access to the Web and a stable web browser. Mozilla Firefox and Google Chrome are the most supported browsers for Blackboard; other browsers may cause complications with the LMS. When having technical difficulties, update your browser, clear your cache, or try switching to another browser.

You will need to have access to a computer/laptop, scanner, a webcam, and a microphone. You will need to download or update the following software: Microsoft Office, Adobe Acrobat Reader, Windows Media Player, QuickTime, and Java. Check that your computer hardware and software are up-to-date and able to access all parts of the course.
If you do not have a word-processing software, you can download Word and other Microsoft Office programs (including Excel, PowerPoint, Outlook and more) for free via UTEP’s Microsoft Office Portal. Click the following link for more information about Microsoft Office 365 and follow the instructions.

IMPORTANT: If you encounter technical difficulties beyond your scope of troubleshooting, please contact the UTEP Help Desk as they are trained specifically in assisting with technological needs of students. Please do not contact me for this type of assistance. The Help Desk is much better equipped than I am to assist you!

Netiquette: As we know, sometimes communication online can be challenging. It’s possible to miscommunicate what we mean or to misunderstand what our classmates mean given the lack of body language and immediate feedback. Therefore, please keep these netiquette (network etiquette) guidelines in mind. Failure to observe them may result in disciplinary action.

- Always consider audience. This is a college-level course; therefore, all communication should reflect polite consideration of other’s ideas.

- Respect and courtesy must be provided to classmates and to the instructor at all times. No harassment or inappropriate postings will be tolerated.

- When reacting to someone else’s message, address the ideas, not the person. Post only what anyone would comfortably state in a face-to-face situation.

- Blackboard is not a public internet venue; all postings to it should be considered private and confidential. Whatever is posted on these online spaces is intended for classmates and professor only. Please do not copy documents and paste them to a publicly accessible website, blog, or other space.

Blackboard Online Sessions: You may participate in scheduled Blackboard Online sessions. The purposes of these sessions are for you to view live demonstrations of the course material and/or to participate in small discussion groups with your classmates.

The sessions may be recorded and provided so that they can be reviewed by classmates at a later time. Students should not record the sessions and post them to any sites outside of Blackboard.

Alternative Means of Submitting Work in case of Technical Issues: I strongly suggest that you submit your work with plenty of time to spare in the event that you have a technical issue with the course website, network, and/or your computer. I also suggest you save all your work (answers to discussion points, quizzes, exams, and essays) in a separate Word document as a back-up. This way, you will have evidence that you
completed the work and will not lose credit. If you are experiencing difficulties submitting your work through the course website, please contact the UTEP Help Desk. You can email me your back-up document as a last resort.

Incomplete Grade Policy: Incomplete grades may be requested only in exceptional circumstances after you have completed at least half of the course requirements. Talk to me immediately if you believe an incomplete is warranted. If granted, we will establish a contract of work to be completed with deadlines.

Scholastic Integrity: Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, cheating, plagiarism, and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying research data on laboratory reports. Plagiarism occurs when someone intentionally or knowingly represents the words or ideas of another as one’s own. Collusion involves collaborating with another person to commit any academically dishonest act. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. All suspected violations of academic integrity at The University of Texas at El Paso must be reported to the Office of Student Conduct and Conflict Resolution (OSCCR) for possible disciplinary action. To learn more, please visit HOOP: Student Conduct and Discipline.

Class Recording: The use of recordings will enable you to have access to class discussions or reviewing course materials, and so on in the event you miss a synchronous or in-person class meeting due to illness or other extenuating circumstance. Our use of such technology is governed by the Federal Educational Rights and Privacy Act (FERPA) and UTEP’s acceptable-use policy. A recording of class sessions will be kept and stored by UTEP, in accordance with FERPA and UTEP policies. Your instructor will not share the recordings of your class activities outside of course participants, which include your fellow students, teaching assistants, or graduate assistants, and any guest faculty or community-based learning partners with whom we may engage during a class session. You may not share recordings outside of this course. Doing so may result in disciplinary action.

Copyright Statement for Course Materials: All materials used in this course are protected by copyright law. The course materials are only for the use of students currently enrolled in this course and only for the purpose of this course. They may not be further disseminated.