

MTSE STRATEGIC PLAN (revised at MTSE retreat on Sep 27, 2019)

MTSE Vision

To become a national and international leader in both materials education and research, the Materials Science and Engineering (MTSE) department will recruit highly qualified undergraduate and graduate students to grow our undergraduate and graduate programs, and will recruit and reward faculty for both teaching, research, and service excellence. Additionally, we will develop long-term strategic research programs that will be well-funded by government agencies and industry, thus capitalizing on current expertise and developing new areas of excellence within the broader materials community. These research activities will comprise an integral component of our undergraduate and graduate programs since only through innovative research can we prepare our students for the ever-changing needs of careers in industry and academia.

Mission

Our mission is to provide our students with the training needed for the 21st century technological landscape that emphasizes a balance between experimental and computational approaches to materials science and engineering. For leading technological sectors, continuous innovation is a key element to sustained excellence and national and international competitiveness. Therefore, students need well rounded training in current practices, and building blocks for innovation-based development of future technologies. Our department will build and maintain academic and research relationships with local and regional industries to continue to provide relevant curricula to enhance the employment opportunities for our students. Our department will maintain its position on the forefront of technological advancement through external research funding from federal, state, industrial and private sources.

Statement of MTSE Principal Goals

Goal 1: Develop the best MTSE undergraduate program in Texas and a top 50 in the US.

1. Grow the undergraduate program to >120 total students in 3-5 years
2. Enhance retention and timely graduation rates
3. Improve quality of incoming students through recruiting
4. Improve the value of the MTSE degree to graduates

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Goal 2: Make the graduate program recognized at national and international levels (in the top 50 of USNWR in 5 years).

1. Increase the number of MTSE and MTSE-UNT collaborations in proposals and publications in structural and functional materials in order to secure larger awards (> \$500K for groups of 2-3 faculty).
2. Establish a UNT-wide focus on developing materials and processes for functional materials with possible concentrations in next generation energy systems, biomaterials, and electronic materials.
3. Continue to strengthen and grow connections with industry. Leverage our presence in structural materials (metals and ceramics) and surface engineering to enhance funding opportunities with/from industry.
4. Grow and support the excellent characterization infrastructure under MRF and within MTSE.
5. Increase the materials synthesis, processing, computational, and testing capabilities in undergraduate and research laboratories to serve both teaching and research missions.
6. Increase the number, qualifications, and diversity of our graduate students
7. Enhance professional development of our graduate students

Goal 3: Departmental Effectiveness

1. Empower Staff to create robust and user-friendly infrastructures within MTSE
2. Enhance MTSE interactions with CENG and UNT to better serve students and faculty
3. Improve MTSE Information/data collection to better monitor assessment and maintain departmental records

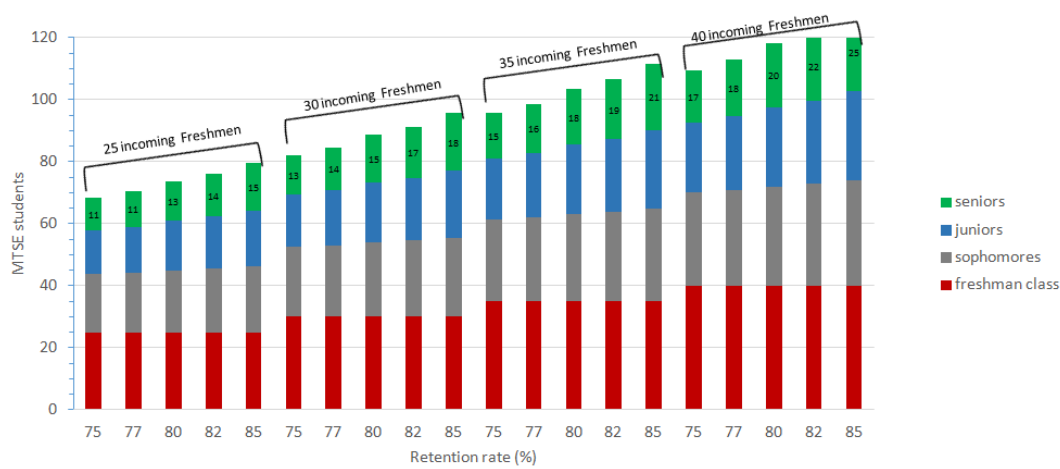
Goal 4: Outreach Activities

1. Enhance recruiting from local high schools and community colleges
2. Create certificate and short course programs key to local industry needs

Action items for the strategic plan

Goal 1 Develop the best MTSE undergraduate program in Texas and a top 50 in the US.

1. Grow the undergraduate program to >120 total students within 3-5 years

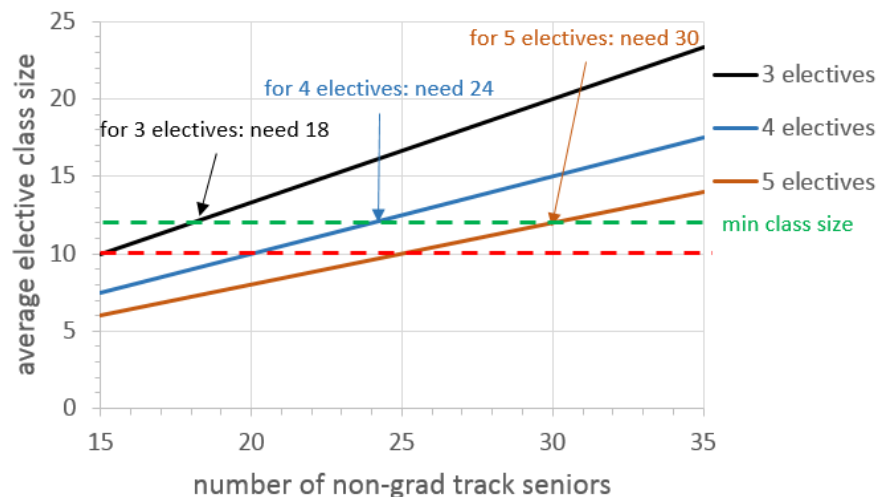


To reach 120 undergraduates we must have 40 incoming freshman and have an 80% retention rate (see figure above).

- a. Outreach to local high school students interested in STEM careers to materials displays/experiments.
 - b. Expand network of industrial sponsors who are engaged with senior design projects. The success of this effort will help recruitment.
 - c. Create a brochure for student recruitment (and Facebook, Twitter, Instagram, Snapchat feed see Goal 4).
 - d. Actively engage high school students from local programs such as TAMS and summer programs.
2. Enhance retention and timely graduation rates (85% in 3-5 years)
 - a. Mentor each cohort throughout their tenure in MTSE. (social activities for each cohort several times a semester: 2 picnics, 2 meet & greet with faculty, --\$4000)
 - b. Provide feedback and guidance to students early in each semester when academic issues arise.

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- c. Create a database to track all MTSE students' progress throughout their tenure at UNT.
 3. Improve quality of incoming students:
 - a. Target students with a; i) Math SAT of 630 or better and a total SAT of 1180 or better; or a Math ACT of 26 or better and a cumulative ACT of 26 or better; ii) in the top 25% of their graduating class and have a Math SAT of 570 or better and a total SAT of 1070 or better; or a Math ACT of 23 or better and a cumulative ACT of 23 or better; iii) they were in the top 50% of their graduating class or have no graduating class ranking (home schooled, GED, international students, etc.) and have a Math SAT of 600 or better and a total SAT of 1100 or better; or a Math ACT of 24 or better and a cumulative ACT of 24 or better.
 - b. Establish scholarships to attract such students.
 4. Improve value of the MTSE degree to graduate
 - a. Maintain continuous quality improvement process through ABET and internal assessment
 - b. Target a 55% graduation rate in four years and a 72% graduation rate in 6 years (~85% retention over all four cohorts). The four and six year windows will be 'effective' years, discounting periods spent on co-op and internship.
 - c. Classroom experience
 - i. Increase the number of senior elective courses offered.



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The number of electives should be commensurate with the number of seniors for a given year.

- ii. Have more UNT undergraduates receiving a MTSE minor degree.
 - iii. Strengthen the coupling between experimental and computational materials science to enhance the value of learning
- b. Non-classroom experience
- i. Target to have 85% of students involved in non-classroom experience to enhance their experimental learning (e.g. research projects and internships).
 - ii. Actively involve undergraduates in the research programs within department and encourage them to pursue internship and co-op opportunities.
 - iii. Encourage all sophomores and juniors to work with the internship/co-op office and faculty to find these opportunities.
 - iv. Increase student attendance and activities in departmental Materials Advantage meetings, local (e.g. ASM and STLE North Texas Chapters, MRS, SPE and SAMPE meetings) and national/international materials science and engineering meetings.
- c. Senior design projects
- i. Have at least 50% of senior design projects in collaborations with industrial partners. (encourage advisory board members to assist)
- d. Employment or higher education placement
- i. Target to have >90% of students to have employment offer or offer to go to graduate programs within six months after graduation
 - ii. Maintain an active database of former undergraduate and graduate students to follow their career paths (use social media).

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Goal 2: Make the graduate program recognized at national and international levels (in the top 50 of US News and World Report in 5 years).

1. Increase the number of MTSE and MTSE-UNT collaborations in proposals and publications in structural and functional materials in order to secure larger awards (> \$500K for groups of 2-3 faculty).
 - a. Transform the current (and positive) “helping” mentality to a “collaborating” one—through planning, take assistance with 1 or 2 experiments and create presentations, publications, and possibly proposals.
 - b. Increase the number of experimental-computational research efforts among the MTSE faculty such that almost all funded projects include each aspect within 5 years.
2. Establish a UNT-wide focus in material design and manufacturing, process modeling, advanced characterization for structural and functional materials with possible concentrations in additive manufacturing, next generation energy systems, biomaterials, and electronic materials.
 - a. Increase collaborations with CENG departments, chemistry and physics (possibly biological sciences) to enhance MTSE capabilities in large \$ proposals.
 - b. Recruit a national prominent researcher in an area of strength/emerging strength who enhances the research opportunities for current faculty
 - c. Develop MSc with additive manufacturing concentration program
3. Continue to strengthen and grow connections with industry. Leverage our presence in structural materials (metals and ceramics), additive manufacturing, surface engineering and functional materials to enhance funding opportunities with/from industry.
 - a. Partnerships with industry and DoD organizations for fundamental and applied research and development under AMMPI, MRF, CAAAM and other large UNT center and facility establishments.
 - b. Partnership with industry, state and federal support for advanced manufacturing centers: research, technology scale up and transition, certifications, training.
 - c. Develop alliances with national network for manufacturing innovation in structural and functional materials and applications.

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4. Grow and support the excellent characterization infrastructure under MRF and within MTSE. Jointly with MRF leadership put in place a plan to upgrade and/or acquire crucial assets to satisfy the material research mission of the university.
5. Increase the materials synthesis, processing, computational, and testing capabilities in undergraduate and research laboratories to serve both teaching and research missions.
6. Increase the number, qualifications, and diversity of our graduate students
 - a. Increase the overall enrollment of PhD+MS students to >100 students within 3 years, with 2/3 of the students enrolled in the PhD program. Recruit from institutions within Texas and surrounding states for domestic students. Names of students met at these schools will be contacted and tracked to determine the value of this program. (budget for student visits \$5000/year—5 US students)
 - b. Increase external funding per faculty to move the department into the top 50 MTSE programs within 5 years.
 - c. Target to have >80% graduate students with GRE verbal + quantitative score of better than 310.
 - d. Graduate 11 PhD students per year on average within 5 years.
 - e. Encourage and mentor BS and MS students to apply for national fellowships from agencies like NSF, DOE, etc.
 - f. Enroll >5 student/year in 4 +1 BS/MS and 4+4 BS/PhD gradtrack program.
 - g. Increase the number of national students who are eligible for additional opportunities (internships at National Labs, Postdoctoral positions) by recruiting local students and retaining undergraduates.
7. Enhance professional development of our graduate students
 - a. Increase the number of graduate students participating in internships in national laboratories.
 - b. Encourage faculty to support their PhD students to present at least one paper per year at materials conferences starting from their second year. Maximize use of CENG and departmental travel resources.

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- c. Compete for a nationally supported graduate student programs like SMART, NRT, GAANN, GRFP, etc. that put emphasis on mentoring of future faculty.

Goal 3: Departmental Effectiveness

1. Empower Staff to create robust and user-friendly infrastructures within MTSE:
 - a. Support staff continuous learning (new skills) and professional development
 - b. Maintain an updated course calendar that permits students to plan their degree plans years in advance
 - c. Encourage support of staff award nominations
2. Enhance MTSE interactions with CENG and UNT to better serve students and faculty
 - a. Organize lab tours and discussion meetings with pre and post award staff members in UNT and CENG to improve communications and discuss issues related to grant processing.
 - b. Invite all joint faculty to participate more fully in collaborations and department social events (including faculty lunch out).
 - c. Conduct annual retreats to evaluate departmental progress on the strategic plan and ABET and institute any corrective measures. (\$1000/year)
3. Improve MTSE Information/data collection to better monitor assessment and maintain departmental records
 - a. Effectively collect information on the whereabouts of alumni and their employment status. Have records of 80% of all graduates after 5 years of graduation.
 - b. Create a searchable and up to date collection of departmental policies and actions

Goal 4: Outreach Activities

1. Enhance recruiting from local high schools
 - a. Coordinate campus visits for high school students
 - i. Train our own undergraduate and/or graduate ambassadors to give tours
 - ii. Coordinate with CENG Undergraduate recruiter to tie these efforts to

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- undergraduate student recruiting efforts
 - iii. Use the 4+1 BS-MS as a recruiting tool
 - iv. Select at least **12** high schools and community colleges to conduct campus visits per year
 - v. Systematically track applicants from schools that were selected for our campus visits
 - vi. The estimated budget for these campus visits will be about **\$3,400** (\$200 per visit for volunteers, **\$1000** for the purchase of demonstration equipment)
2. Create certificate and short course programs key to local industry needs
- a. Tribology and tribo-corrosion
 - b. Failure analysis/materials characterization
 - c. Additive manufacturing

Metrics for Strategic Plan Action Items

Goal 1 Develop the best MTSE undergraduate program in Texas.

1. Fall enrollment numbers
2. Overall retention rate and 4 year graduation rate, 6 year graduation rate (85%, 50%, 72%, respectively)
3. Incoming Freshman SAT, national merit scholars, top 10% in HS class
4. Student employment or graduate admission within 6 months.

Goal 2 Make the graduate program recognized at national and international levels (in the top 50 of USNWR in 5 years).

1. Dollars/faculty in top 50
2. Funded collaborative proposals in the research focus area
3. Funded proposals from collaborations with industry.

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4. Success of equipment proposals and support from UNT
5. Expenditures and equipment updates for undergraduate laboratories
6. UNT Factbook
7. Employment of graduate students within 6 months of graduation

Goal 3: Departmental Effectiveness

1. Training (courses) taken by staff beyond their job description
2. New initiatives undertaken as a result of retreats, ORS interactions
3. % of alumni in MTSE database

Goal 4: Outreach Activities

1. Enrollment data from ensuing year's freshman class
2. Enrollment in short courses, summer programs.