Quarterly Board Meeting

September 25, 2025
Roaden University Center, Room 282
1:30 p.m.

AGENDA

I. Call to Order

II. Recognition of Students

III. Approval of Minutes of June 26, 2025

IV. Student Trustee Report

V. President's Report

VI. Consent Agenda

- A. Expedited New Academic Program Proposal (ENAPP) for the Master of Science (MS) in Industrial and Systems Engineering
- B. Tenure Upon Appointment Recommendations

VII. Audit & Business Committee Recommendations

- A. Master Plan Amendment
- B. Organizational Chart Change

VIII. Board Secretary Report

IX. Board of Trustees' meeting dates:

Next Meeting: December 4, 2025

Calendar Year 2026:

March 12

June 25

September 24

December 3

X. Other Business

XI. Adjournment

Agenda Item Summary

Date: September 25, 2025

Agenda Item: Recognition of Students

☐ **Review** ☐ **Action** ☒ **No action required**

PRESENTER(S): Board Chair

PURPOSE & KEY POINTS:

Jackon Ragland, a chemical engineer and Spanish double major, is a sophomore by time in college, but a senior by credit hours with 94. He will discuss his study abroad in Valencia, Spain this summer, about his preparation before going, his experience there, and how it affected him.

We are celebrating 5 years of Trailblazers, the elite, competitively selected group of students who put the personal in "It's Personal." They lead campus VIP tours, are trained in Tech traditions and leadership, assist with large campus recruiting events, and impact prospective students' decisions to choose Tech.

BOARD OF TRUSTEES

June 26, 2025

Roaden University Center, Room 282

MINUTES

Meeting streamed live via link found on this web page:

https://www.tntech.edu/board/board-and-board-committee-meetings.php

AGENDA ITEM I – CALL TO ORDER

The Tennessee Tech Board of Trustees met on Thursday, June 26, 2025, in Roaden University Center Room 282. Chair Trudy Harper called the meeting to order at 1:36 p.m.

Chair Harper asked Mr. Lee Wray, Secretary, to call the roll. The following members were present:

- Tom Jones
- Fred Lowery
- Jeannette Luna
- Thomas Lynn
- Claire Myers
- Rhedona Rose
- Camron Rudd
- Johnny Stites
- Barry Wilmore
- Trudy Harper

A quorum was physically present. Tennessee Tech faculty, staff and members of the public were also in attendance.

AGENDA ITEM II – RECOGNITION OF STUDENTS

Chair Harper introduced Tennessee Tech Rugby Club student members, Lane Travis, Todd Harris and Caleb Dunlap. The Rugby Club earned a bid for the collegial Rugby National Championship Tournament held in April, Tennessee Tech's first entry to a national tournament since the Club's founding in 1977.

AGENDA ITEM III – APPROVAL OF MINUTES OF MARCH 6, 2025, AND APRIL 30, 2025, MEETINGS

Chair Harper asked for approval of the minutes for the March 6, 2025, in-person meeting and the virtual April 30, 2025, Tennessee Tech Board of Trustees meeting. Chair Harper asked if there were questions or comments regarding the minutes. There being none, Mr. Jones moved to recommend approval for the March 6 and April 30, 2025, Board of Trustees meeting minutes. Mr. Stites seconded the motion. Mr. Wray called a roll call vote. The motion carried unanimously.

AGENDA ITEM IV – STUDENT TRUSTEE REPORT

Student Trustee, Claire Myers, reported that it had been an exciting and eventful semester. During Spring Break, the 48th annual Appalachian Studies Association Annual Conference was hosted on Tennessee Tech campus with campus members and visiting attendees from across the nation sharing interest in the current struggles of Appalachia.

March was Women's History Month, and the Women's Center and Intercultural Affairs hosted a campus conversations panel show casting the positive impacts of female faculty, staff and students on campus. A petition opposing program cuts within the foreign languages department was signed by current students, alumni and others concerned.

The Tennessee Tech chapter of the National Society of Black Engineers is an award-winning student organization focused on improving the recruitment and retention of black and other minority engineers in both academia and industry. A joint diversity panel with alumni members, the Society of Hispanic Professional Engineers and the Society of Women Engineers was held.

The Student Government Association (SGA) University Infrastructure Committee hosted a safety walk to address student safety concerns and accessibility concerns across campus. This event was a collaborative and multi-level effort.

The third annual Student Leadership Awards were hosted by SGA and the Leadership Honor Society. This semester ended with several highly anticipated events including the annual Solo Concert featuring country artists, Gretchen Wilson and Vincent Mason. Campus and community groups celebrated Earth Day at the Office of Sustainability Annual Earth Day Celebration.

With summer in full swing, current students and recent graduates are starting new full-time positions in internships across the country with companies from Farm Bureau Insurance to Microsoft to Top Golf. Although most students are away for the summer, campus has been anything but quiet with cheer and dance camps, Boys State, Explorations and Engineering Camps, band camps and the Governor's School for Technological Innovation and Business Leadership. Campus tours and SOAR (Student Orientation Advisement and Registration) sessions are in full swing to prepare for the next class of Golden Eagles.

AGENDA ITEM V – PRESIDENT'S REPORT

President Oldham stated that his report was going to be a little different from past meetings for reasons that will become obvious. However, he began with a few important highlights. Enrollment at Tennessee Tech is strong and continues to climb. We anticipate another entering freshman class this fall of over 2,000 freshmen – for the fourth consecutive year. The incoming class is also a strong academic class. This freshman class will propel us to near 11,000 students – likely, the largest overall headcount enrollment at Tennessee Tech in approximately ten or eleven years.

He stated that he is also anticipating a potential record in terms of student retention rate for this fall. Currently, we are tracking at just over 80% first-time freshman retention rate. If this holds, that will also be a record.

Research numbers are still increasing. We have already surpassed last year's record with a few days remaining in this fiscal year. We are at over $47,000,000 in research funding activations for the current fiscal year.

The west stadium project can now be seen coming out of the ground and we are very excited about that. Hopefully, the project will be completed for the fall 2026 season.

We anticipate groundbreakings this fall for both the JJ Oakley Innovations Center and Residence Hall, as well as the new ACME Engineering building. They will both be signature buildings for this campus.

President Oldham stated that leadership matters and he was talking about the general leadership on campus. Leadership throughout the institution has made these and many other successes possible because of good leadership at all levels. We have excellent Vice-Presidents and Directors here on campus. He stated that he wanted to thank and recognize all individuals on campus that made this possible because of the hard work, effort and leadership they contributed.

A couple of key leadership positions are now in transition. He thanked and congratulated Dr. John Liu for taking on the responsibilities of interim Provost over the next several months as we search for a new Provost. His efforts and everything he is doing on campus are appreciated. He has done a phenomenal job with the Research Office, and he will take on the additional role as Provost for this year.

We are also in transition with the Athletic Director position. We have a new Athletic Director, Casey Fox, that will arrive later in July. We have a lot of exciting things to look forward to in Athletics.

Dianne Murphy has been called out of retirement to help us as acting Athletic Director during the interim period. She has served as former Athletic Director of the University of Denver and Columbia University.

So, the rest of my report – again – it gets back to leadership and all of you are a big part of that at the Board level. Your leadership is important and the reason you are in the seats that you are in is because you have demonstrated leadership in various capacities of your life. Trustees bring all that talent and experience to Tennessee Tech, and we greatly appreciate it.

We will now recognize one individual for his talent and leadership, and I'm thankful we can do that for Captain Barry Wilmore. His dad, Eugene, his daughter, Logan, and a family friend, Maggie, are all with us today.

It is an honor to be associated with Board members, especially Board members like Barry. We have a special little video and a couple of presentations to follow the video.

About ten years ago, we initiated a special recognition called the Order of the Eagle. The Order of the Eagle honors individuals whose contributions to Tennessee Tech, whether literal or by association, exemplify the university's tradition of excellence. Awarded at the discretion of the President, inclusion in the Order of the Eagle is reserved for eagles whose impact on the university and its reputation is unparalleled. Inaugural members were Everett and Joan Derryberry, President and First Lady of Tennessee Tech from 1940-1974. Until today, we had presented this award only one other time and it was awarded posthumously to the Derryberrys during our Centennial celebration. It is my pleasure to present this Order of the Eagle to Captain Barry Wilmore.

Tennessee Tech's most iconic symbol is the golden eagle as mascot and as manifested by the eagle gracing the clock tower on Derryberry Hall. The base is personalized and is a work of art created by our Tech alum and local artist, Brad Sells.

Mr. Sells explained that the base is made from a giant holly tree that was located near the men's dorms. The base includes a picture of a football helmet, a space helmet, stars and planets, and a space shuttle. Dr. Oldham stated that Brad has worked at The Smithsonian and is an extremely accomplished artist.

Chair Harper read a resolution to recognize Captain Barry "Butch" Wilmore, alumnus of Tennessee Tech University, member of the Tennessee Tech Board of Trustees, and NASA astronaut for his historic contributions to human space flight and scientific discovery with the naming of Wilmore Way, pedestrian walkway, on Tennessee Tech campus.

Multiple motions and seconds to approve the resolution were received. A voice vote was called and the motion passed unanimously.

Jonathan Frank, with the Office of Communication and Marketing, came up to the podium and stated that when Trustee Wilmore embarked on his latest space flight, he didn't just inspire students, faculty and staff on Tennessee Tech's campus. He also earned the admiration and respect of millions of onlookers the world over. One such person is Pam Inman. Pam is a Special Olympian and cancer survivor from Nashville who is among Trustee Wilmore's biggest fans. Despite the challenges that Pam has faced since early in life, she competed and won gold, silver and bronze medals in the Special Olympics in various competitions. Pam embodies Tennessee

Tech values being bold, fearless, confident and kind.

During Trustee Wilmore's extended stay at the International Space Station, Pam sent a moving handwritten letter to the university expressing her admiration for Trustee Wilmore's bravery and sharing a selfless desire to give him one of her most prized possessions. Mr. Frank introduced Pam, along with her mother, Mary, her father, Tom, and her brother, Jeffrey, who is the proud parent of a current Tech student. A portion of the letter reads as follows:

I'm in the Special Olympics and I have won lots of medals. Some of our motto says, "Let me be brave." I was brave when I got breast cancer four years ago. I think the astronaut, Mr. Wilmore, was brave. I am sending you my gold medal to give to him. He earned it.

Captain Wilmore stated that he has rarely been without words, but he wanted to take the opportunity to say thank you, and that he was touched and grateful. He stated that he took several items with him to space because he wanted to bring them back and give them to individuals with the university that have made an impact on this campus. He presented football jerseys or caps to Johnny Stites, Tom Jones, Chair Harper, President Oldham, and Pam Inman.

President Oldham stated that he had one more presentation for Pam, and he asked Kari, Tennessee Tech First Lady, to join him. Several years ago, Kari initiated "Wings of Kindness," an award given on campus to recognize students, faculty, staff and others across campus for choosing kindness in today's busy, often hectic, world. Described in her own words, "Kindness is often displayed as simple acts such as opening a door for someone, taking time to say please and thank you, making eye contact and smiling, paying an unsolicited compliment, helping campus visitors feel welcome or cleaning up someone else's mess." Maya Angelo put it this way: "Learn that people will forget what you said. People forget what you did, but people never forget how you made them feel."

Tennessee Tech presented to Pam Inman the Wings of Kindness Award. President Oldham and Kari thanked Pam for all the kindness she gives to this world. You are a winner in every way. As we say at Tennessee Tech, "Wings up."

AGENDA ITEM VI – CERTIFICATION OF PRESIDENT'S RESPONSIBILITIES RELATED TO ATHLETICS

Chair Harper stated that the Ohio Valley Conference (OVC) requires the Board of Trustees Chair to attest that the President is responsible for administration of the athletics program, that he has the support of the Board in operating a program of integrity, and may vote on behalf of the institution on NCAA and OVC matters, and that attestation must be presented to the Board. Chair Harper read the attestation and stated that she will sign it as required by the OVC.

- **CONTINUATION OF TRUSTEE APPOINTMENTS**

At the Chair's prerogative, this agenda item was added at the time of the meeting. Chair Harper asked President Oldham to explain the upcoming changes to the Board structure.

President Oldham stated that there has been a revision in state statute coming out of the last General Assembly in Nashville that changes the Board structure for all LGIs (locally governed institutions.) The change will expand the board to twelve members so there will be two additional appointments made to the Board. It also changes who makes those appointments. In addition to gubernatorial selections, there will also be selections based on a formula from the Speaker of the House of Representatives and the Lieutenant Governor in the Senate. We are still awaiting those appointment announcements, so with that in mind --because some terms are ending, others are up for reappointment if chosen to be reappointed, and there will be additional open seats -- there is too much confusion around that right now to proceed with appointments or elections around committee assignments and leadership of the Board. The plan is to call a special meeting as soon as we get clarity out of Nashville.

Chair Harper explained that the faculty and student Trustees would be replaced later in this meeting, as originally planned, because they are confirmed via a different kind of a process than the appointments made by the Governor and the Legislature.

Mr. Jones moved that until appointments to the Board are made by the Governor and/or Legislature and a meeting for new elections and appointments are held, the current slate of officers remains in place. These positions are as follows. Chairman Trudy Harper; Vice Chairman Rhedona Rose; third Executive Committee member, Fred Lowery; Audit and Business Committee Chair, Johnny Stites; Audit and Business Committee members Tom Jones and Thomas Lynn; Academic and Student Affairs Committee Chair, Rhedona Rose; Academic and Student Affairs Committee members, Camron Rudd and Barry Wilmore; and committee members, Claire Myers and Jeannette Luna - as their replacements have been named - will be replaced by Braxton Westbrook (following ratification by the Board) and Michael Allen, respectively. Camron Rudd seconded the motion. Chair Harper requested that Secretary Wray call a roll call vote. The motion passed unanimously.

AGENDA ITEM VII – CONSENT AGENDA – A. EMERITUS PRESIDENT CONTRACT B. TENURE RECOMMENDATIONS C. TTU POLICY 205 (FACULTY TENURE) D. TTU POLICY 511.1 (FEE CHARGES, REFUNDS AND FEE ADJUSTMENTS)

Following discussion at the morning committee meeting and upon the committee's recommendation, Mr. Lowery moved to approve the consent agenda. Mr. Stites seconded the motion. Mr. Wray called a roll call vote. The motion passed unanimously.

AGENDA ITEM VIII – ACADEMIC & STUDENT AFFAIRS COMMITTEE RECOMMENDATION – GENERAL EDUCATION HISTORY REQUIREMENT

Following lengthy discussion at the morning committee meeting and upon the committee's recommendation not to revise the General Education History requirement, there was no need to act on this agenda item.

AGENDA ITEM IX – AUDIT & BUSINESS COMMITTEE RECOMMENDATIONS – A. FY2024-25 ESTIMATED & FY2025-26 PROPOSED BUDGET B. DISCLOSED PROJECTS C. CAPITAL BUDGET

FY2026-27

Following discussion at the morning committee meeting and upon the committee's recommendation, Mr. Stites moved to approve Tennessee Tech's FY2024-25 estimated and FY2025-26 proposed budget and organizational chart. Mr. Jones seconded the motion. Mr. Wray called a roll call vote. The motion passed unanimously.

AGENDA ITEM IX – AUDIT & BUSINESS COMMITTEE RECOMMENDATIONS – B. DISCLOSED PROJECTS

Following discussion at the morning committee meeting and upon the committee's recommendation, Mr. Stites moved to approve the disclosed projects for the Biology Greenhouse and the Bike Shelter. Mr. Lynn seconded the motion. Mr. Wray called a roll call vote. The motion passed unanimously.

AGENDA ITEM IX – AUDIT & BUSINESS COMMITTEE RECOMMENDATIONS – C. CAPITAL BUDGET FY2026-27

Following discussion at the morning committee meeting and upon the committee's recommendation, Mr. Stites moved to approve the FY2026-27 Capital Budget requests. Mr. Jones seconded the motion. Mr. Wray called a roll call vote. The motion passed unanimously.

AGENDA ITEM X – EXECUTIVE COMMITTEE REPORT – A. ANNOUNCEMENT OF ATHLETIC DIRECTOR B. ANNOUNCEMENT OF INTERIM PROVOST AND VP FOR ACADEMIC AFFAIRS

Chair Harper provided a report from the most recent Executive Committee meeting, held on June 19, 2025. A new athletic director, Casey Fox, and the interim Provost and Vice-President for Academic Affairs, Dr. John Liu, were both approved. Mr. Fox will begin on July 23rd. Dr. Oldham reported earlier that Diane Murphy will be helping in athletics until Mr. Fox arrives on campus.

AGENDA ITEM XI – ELECTION OF STUDENT TRUSTEE

Upon a recommendation from the Student Government Association, Mr. Stites nominated Braxton Westbrook to serve as the student Trustee for fiscal year 2025-26. Mr. Jones seconded the motion. Mr. Wray called a roll call vote. The motion passed unanimously.

AGENDA ITEM XII - BOARD SECRETARY REPORT

Secretary Wray reported that THEC (Tennessee Higher Education Commission) will convene all Trustees for state universities in Tennessee on October12 and 13 in Murfreesboro.

The second reminder is the President's evaluation. Trustees and President's Cabinet members will be receiving information about the evaluation the week of July 7th. Rhedona will be coordinating the evaluation. It will be like past years and will consist of a similar questionnaire for completion. It will be anonymous; no one – not even Rhedona -- will know

who the responses are received from.

Secretary Wray stated that the last thing he wanted to mention is we have our newly elected faculty Trustee with us today. Michael Allen has served as a past Faculty Senate President and will begin his term as faculty Trustee on July 1.

AGENDA ITEM XIII – OTHER BUSINESS

Plaques were presented to outgoing Trustees, Claire Myers, Jeannette Luna and Johnny Stites, and appreciation was expressed for their service to the Board of Trustees and to Tennessee Tech.

AGENDA ITEM XIV – ADJOURNMENT

There being no further business, the Tennessee Tech Board of Trustees meeting adjourned at 2:56 p.m.

Approved,

_____

Lee Wray, Secretary

Agenda Item Summary

Date: September 25, 2025

Agenda Item: Student Trustee Report

☐ **Review** ☐ **Action** ☒ **No action required**

PRESENTER(S): Trustee Braxton Westbrook

PURPOSE & KEY POINTS: Student Trustee Braxton Westbrook will provide a report from the student body and reflect on the beginning of the 2025-2026 academic year as a member of the Tennessee Tech Board of Trustees.

6.1

Agenda Item Summary

Date: September 25, 2025

Agenda Item: Expedited New Academic Program Proposal (ENAPP) for the Master of Science (MS) in Industrial and Systems Engineering

☐ **Review** ☒ **Action** ☐ **No action required**

PRESENTERS: Interim Provost John Liu

PURPOSE & KEY POINTS:
The new degree program for which approval is sought is a Master of Science in Industrial and Systems Engineering (MSISE). Faculty in the Department of General and Industrial Engineering in the College of Engineering are leading this proposal.

The Tennessee Higher Education Commission's (THEC) Academic Supply and Demand Report identifies industrial engineering as an "in-demand occupation." In recent years, industrial engineering has accounted for the largest share of engineering jobs in Tennessee. Nationwide, the Bureau of Labor Statistics projects strong growth in industrial engineering employment between 2023 and 2033. However, there are fewer academic programs and graduates available to support these demands. The proposed MSISE will enable a faster response to address this need by preparing graduates with industrial and systems engineering knowledge and skills in approximately eighteen months to two years. This graduate program will be centered on industrial engineering, but will also include a foundation of systems engineering, which is supported by coursework in data analysis and modeling, engineering economics, human factors, and engineering or project management.

The proposed program will require 31 credit hours and support both practitioner and research-focused students with a project option and a thesis option, respectively, and will be offered on campus and online. The program will accommodate students who have earned a Bachelor of Science in any accredited engineering degree program or a similar course of study. The degree will provide knowledge and experience to enable engineering graduates, including those from different disciplines, to work more effectively in industrial engineering jobs.

The proposed implementation date is Fall 2026. The enrollment in the program is projected to begin with about 10 students in year one, growing to approximately 30 by year five.

The estimated costs of delivering the proposed program include both one-time and recurring expenses. One-time costs are projected at $60,000 during the initial year to equip laboratories for human factors simulation courses and research, as well as additional software purchases. Recurring expenses begin at $441,051 in the first year and increase to $502,728 by year five. The recurring expenditures include hiring two new faculty members: one full or associate professor to serve as Program Coordinator and one assistant professor. Projected revenue, driven by enrollment growth, is expected to increase from $268,795 in Year One to $575,693 in Year Five, more than offsetting program expenses.

EXPEDITED NEW ACADEMIC PROGRAM PROPOSAL

for the

Master of Science in Industrial and Systems Engineering

Submitted by

Tennessee Technological University

June 2025
Updated September 2025

CONTENTS

EXPEDITED NEW ACADEMIC PROGRAM PROPOSAL (ENAPP)
Master of Science in Industrial and Systems Engineering

SECTION 1. EXPEDITED LETTER OF NOTIFICATION (ELON)

OVERVIEW

Institution, Program, Degree, CIP Code, and SOC Codes

Institution Name:	Tennessee Technological University
Proposed Academic Program:	Master of Science in Industrial and Systems Engineering
Degree Designation:	MS in ISE
CIP Code and Title:	14.3501 Industrial Engineering
SOC Codes and Titles:	11-3051 Industrial Production Managers 11-9041 Architectural and Engineering Managers 17-2112 Industrial Engineers 25-1032 Engineering Teachers, Postsecondary

Academic Program Liaison Name and Contact Information

Dr. Chris Wilson, Chair
Dept. of General and Industrial Engineering
College of Engineering
931-372-3216
chriswilson@tntech.edu

Implementation Timeline

Proposed date for the external site visit:	July 28, 2025
Estimated date of submission of the external review report to THEC:	August 2025
Estimated date of institution's response to external review:	August 2025
Estimated timeline for proposed programs that will seek programmatic accreditation:	Not Applicable
Proposed date of the institutional governing board's meeting to consider the proposed academic program for approval:	September 25, 2025
Proposed date of the THEC meeting to consider the proposed academic program for approval:	November 13, 2025
Proposed implementation date when students will enroll in the proposed academic program:	August 1, 2026

BACKGROUND AND OVERVIEW

Background Narrative

Tennessee Technological University is proposing the development of a new degree program, the Master of Science in Industrial and Systems Engineering (MS in ISE). Although Tennessee Tech has previously had both Master of Science and Bachelor of Science programs in Industrial Engineering (IE), those programs were terminated with phase-outs in 2010 and 2012, respectively. Since that time, industrial engineering has become one of the fastest growing engineering disciplines nationally, serving manufacturing, logistics, healthcare, and government.

Explanation of Prior Program Terminations.[1] The MS in Industrial Engineering was terminated in 2010. Prior to termination, the faculty offering the program recommended in Spring 2003 that the degree program be placed on inactive status and enrollment suspended for a year to allow study and planning to attract a larger number of students. During the year of study, a plan was developed with input from industry and alumni. However, two vacant Industrial Engineering faculty positions were also moved to other programs with higher priorities at the time, so the University administration decided that the MS should remain on inactive status rather than reopen as planned in Fall 2005. The program remained on inactive status until a decision was made to terminate both the BSIE and MSIE programs in 2010 to satisfy a budget reduction in the College of Engineering. The rationale in the College of Engineering was to cut a single engineering discipline rather than harm all engineering disciplines with significant cuts. The sixty-plus students enrolled in the BSIE in 2010 either transferred to other universities or continued to graduation, with the last class graduating in Fall 2012.

Changes on Campus Since the Prior Program Terminations. The current administration has encouraged program growth to enhance the technological mission of the University, as well as economic development. The proposed MS in ISE supports both aspects of the University's mission. In addition, the new Ashraf Islam Engineering Building had its grand opening in October 2024, and a second new engineering building, the Advanced Construction and Manufacturing Engineering building, is in the planning stages with a groundbreaking scheduled for October 2025. The MS in ISE is being designed as a degree with coursework that can support other graduate programs in the College of Engineering, with a focus that includes systems engineering and the data analysis and modeling methods needed by Tennessee industry, and with minimum prerequisites for a target enrollment of BS graduates in engineering or related disciplines. The features of the proposed program differ substantially from the previous MS in Industrial Engineering, as explained in this proposal.

[1] The THEC ELON evaluation requested information about "why these programs were terminated" and "what has changed on the campus since the termination."

Need and Rationale for Program. Industrial engineering has been identified as an "in-demand occupation" in Tennessee [1]. Employers have told Tennessee Tech administrators that they need industrial engineers and are forced to hire other majors because Tennessee Tech no longer offers this academic program.

To address the growing demand for industrial and systems engineers and the needs of Tennessee employers, a Master of Science (MS) program is proposed. An MS program enables a faster response to produce initial graduates with industrial and systems engineering knowledge and skills, approximately eighteen months or two years after implementation versus three to four years for a Bachelor of Science (BS) degree program. Other advantages for beginning with an MS program versus a BS program include the following:

- Students in the MS program will facilitate the research activities of tenure-track faculty.
- The coursework planned in the proposed program will support other MS programs in the College of Engineering.
- An opportunity for research collaboration and shared faculty support of instruction can help to strengthen the new MS in Engineering Management program, which began in 2020.
- A smaller faculty and fewer laboratories are needed for an MS program than for a BS program, reducing start-up costs.

The MS degree in ISE can be targeted to BS graduates in other engineering disciplines or related technical fields who may be working as industrial engineers without the knowledge they would get from a BS in ISE degree. BS engineering students in other disciplines sometimes develop an interest in ISE through co-operative education experience; however, having earned extensive credits in another major prior to the co-op experience, it is not attractive to change majors as an undergraduate. The MS in ISE will enable BS engineering and technical graduates to earn an advanced degree with less time than for a second BS degree. Students in the program will gain a broad knowledge of ISE as well as depth in data analysis and modeling. The depth in analytical methods addresses industry needs in Tennessee and will be at a level beyond that typically attained in a BS program because the MS in ISE program can build on undergraduate coursework.[2]

A successful MS implementation will be followed by a proposal for a BS degree program if resources and demand prove sufficient.

MS in ISE Program Overview. This section summarizes the goals for development of the program, the focus on industrial and systems engineering, and details of the proposed program.

[2] The THEC evaluation of the ENAPP requested an explanation of "why a master's degree is the preferred approach to address workforce needs rather than reestablishing a bachelor's program." This paragraph provides reasons in addition to those previously provided above.

Program Development Goals

Development of the proposed MS in ISE program has been guided by several goals, as follows:

- Develop an efficient program without extensive prerequisite coursework to attract students from other engineering disciplines who want to build on their BS engineering knowledge to gain technical competence in industrial and systems engineering.
- Design a program based on program objectives and student learning outcomes that include breadth in graduate-level industrial and systems engineering topics and depth in analytical methods.
- Develop a program with coursework that will support other graduate programs in the College of Engineering at Tennessee Tech.
- Develop a flexible program that will attract and effectively serve diverse students, both on-campus and online, full-time and part-time.

Related to the first goal, the MS in ISE program will be focused on attracting graduates from other engineering disciplines who would be interested in an advanced degree in industrial and systems engineering but would not be interested in seeking a graduate degree in their undergraduate discipline. This approach supports the spirit of stackable credentials, a goal identified in the THEC Master Plan Update of 2020 [2], as explained later in this document.

Because of the initial target student population, the second goal specifies that the program emphasis will be to provide breadth across the discipline of industrial and systems engineering and depth in data analysis and modeling. This focus serves the needs of Tennessee employers for both industrial engineers and operations research analysts, occupations identified as "in-demand" in Tennessee [1]. In addition, the degree emphasis on analytical methods and systems engineering is related to the third goal to provide courses that will support other graduate programs in the College of Engineering.

The fourth goal is aimed at flexibility to meet the needs of traditional students interested in on-campus coursework along with working engineers who need the ability to take courses online. It also acknowledges a commitment to seek and serve diverse students.

These goals have been applied in the design of the proposed program described later in this section.

Industrial and Systems Engineering

The proposed program is a Master of Science in Industrial and Systems Engineering. Industrial engineering (IE) and systems engineering (SE) are represented by two different CIP codes. Table 1 shows the instructional content specified in *The Classification of Instructional Programs* [3] for industrial engineering and systems engineering programs.

Table 1. Instructional Content - Industrial Engineering and Systems Engineering Programs [4]

Industrial Engineering (CIP 14.3501)	Systems Engineering (CIP 14.2701)
A program that prepares individuals to apply scientific and mathematical principles to the design, improvement, and installation of integrated **systems** of people, material, information, and energy. Includes instruction in applied mathematics, physical sciences, the social sciences, **engineering** analysis, **systems** design, computer applications, and forecasting and evaluation methodology.	A program that prepares individuals to apply mathematical and scientific principles to the design, development, and operational evaluation of total **systems** solutions to a wide variety of **engineering** problems, including the integration of human, physical, energy, communications, management, and information requirements as needed, and the application of requisite analytical methods to specific situations.

Although the CIP codes differ, Table 1 shows that the instructional content has a substantial overlap. In practice, job titles tend to vary by industry and focus. Systems engineers tend to work in the military and in defense and aerospace industries where the systems of concern are large-scale hardware or software systems. Industrial engineers are employed by a more diverse set of employers operating in systems that involve hardware, software, and people but are focused on processes such as transportation and logistics, healthcare, government, and manufacturing. Job titles for industrial engineers in these industries are also diverse, including titles such as quality engineer, data analyst, management engineer, and operations engineer, among others. Because industrial engineering generally is defined as including a more comprehensive domain than systems engineering, the CIP code for the proposed MS in ISE program is that for industrial engineering.

In recognition of the significant overlap in content, industrial and systems engineering is defined as one discipline by the Institute of Industrial and Systems Engineers, which states [5]:

> *"Industrial and systems engineering is concerned with the design, improvement, and installation of integrated systems of people, materials, information, equipment, and energy. It draws upon specialized knowledge and skill in the mathematical, physical, and social sciences together with the principles and methods of engineering analysis and design, to specify, predict, and evaluate the results to be obtained from such systems."*

Approximately a quarter of accredited undergraduate industrial engineering programs in the U.S. are accredited as "industrial and systems engineering" programs, meeting the program requirements for both disciplines as specified by the Engineering Accreditation Commission (EAC) of ABET. ISE baccalaureate programs accredited by the EAC of ABET include programs at Auburn University, Lehigh University, The University of Alabama at Huntsville, The Ohio State University, University of Florida, University of Oklahoma, University of Southern California, and Virginia Tech, among others. Except for programs at the military academies, engineering

master's programs in the United States rarely seek accreditation by the EAC of ABET. In addition, master's programs related to ISE are typically focused on either industrial engineering or systems engineering, not both. However, Auburn University offers an MS in ISE degree, and the program proposed for Tennessee Tech is an MS in ISE degree.

Program Design Details

The development of the proposed program has been guided by the program learning outcomes listed in Table 2 and the student learning outcomes in Table 3.

Table 2. Program Learning Outcomes

Graduates of the MS in ISE program will . . .

- Apply advanced expertise, leadership, and scholarship in industrial and systems engineering to create value for their employers in Tennessee and beyond;
- Demonstrate a commitment to professional development and continued learning through participation in further graduate studies, continuing education, training programs, or self-study; and
- Use industrial and systems engineering methods to serve the profession, community, or society.

Table 3. Student Learning Outcomes

At the time of graduation, students will be able to . . .

- Demonstrate subject knowledge, technical competence, and professional skills associated with the human factors, economic, analytical modeling, and systems aspects of industrial and systems engineering;
- Conduct research or apply advanced analytical methods in the development of solutions to industrial and systems engineering problems; and
- Give professional presentations or write scholarly documents worthy of publication in conference proceedings and/or peer reviewed journals.

The MS in ISE degree will be centered on industrial engineering but will also include a foundation in systems engineering, which is supported by the emphasis on data analysis and modeling, along with courses on engineering economics, human factors, and engineering management or project management.

The program will require 31 credit hours and support both practitioner and research-focused students with a project option and a thesis option, respectively. Courses will be offered on

campus to encourage enrollment by full-time students and online to attract enrollment, often part-time, by working professionals.

Table 4 provides a summary of the requirements planned for the project and thesis options in the program. All students will have three core topics courses (9 credits) and one core professionalism course (1 credit). Other requirements will include a selection of courses from four focused elective areas for the project option and three or four areas for the thesis option. The focused elective areas guarantee breadth of knowledge in industrial and systems engineering for students who may not have an undergraduate background in ISE. The technical electives will be mathematics courses selected to build strength in data analysis and modeling.

Table 4. Planned Courses for the MS in ISE Program

Course Type	Project Credit Requirements	Thesis Credit Requirements
ISE Core	9	9
Professionalism Course	1	1
Project or Thesis	3	6-9*
Focused Elective Areas	12	9-12*
Technical Electives	6	3
Total	31	31

*For 6 credits of thesis, 12 focused elective credits will be required.
For 9 credits of thesis, 9 focused elective credits will be required.

Justification for Consideration of Expedited Policy

Demand for Industrial Engineers Nationally and in Tennessee. Although the proposed MS program is in industrial and systems engineering, the data reported here to address demand and need represent only industrial engineering (IE) jobs because pure systems engineering employment data are not reported separately for Tennessee in all the cited sources.

In the *In-Demand_Data_3-12-2025* spreadsheet [1] downloaded from THEC's Academic Supply and Demand Report webpage[3], industrial engineering is cited as an "in-demand occupation" that is key to all nine industry clusters in Tennessee, including the following:

- Food and agriculture
- Healthcare and life sciences
- Rubber, ceramics, and glass

[3] The THEC evaluation of the ENAPP stated: "Please provide more recent data to supplement the 2019-2022 figures. Given the time that has elapsed since the initial data collection, updated projections would help ensure the market analysis reflects current industry conditions and employment trends." This section has been updated with the most recent published data. References have been updated to reflect 2025 data sources.

- Automotive
- Electrical equipment and appliances
- Headquarters, finance, and tech
- Distribution and logistics
- Aerospace and defense
- Chemicals

Although the "Distribution and Logistics" cluster was omitted as a key industry sector for industrial engineering in a previous version of the database, industrial engineering is now included as an in-demand occupation for distribution and logistics organizations such as UPS, FedEx, Amazon, and other companies operating the numerous distribution centers in Tennessee. In addition, industrial engineering is cited as in-demand in five of the nine Tennessee regions.

As noted previously, the MS in ISE program will provide depth in data analysis and modeling, and MS in ISE (and MS in IE) graduates with these skills are often hired as operations research analysts. The operations research analyst occupation is cited in [1] as key to four industry clusters in Tennessee.

Nationally, the Bureau of Labor Statistics predicts a strong growth rate in industrial engineering employment between 2023 and 2033, as shown in Table 5.[4] Among engineering disciplines, the metrics of projected total employment in 2033 and employment percentage change from 2023 to 2033 are greatest for industrial engineering as an engineering employment subgroup.

Table 5. Engineering Disciplines with Greatest U.S. Employment (Employment Subgroups) [6]

Occupation Title	Occupation Code	Employment 2023*	Employment 2033*	Employment Change, 2023-2033*	Employment % Change, 2023-2033	Occupational Openings, 2023-2033 Annual Avg*
Industrial engineers, including health and safety	17-2110	359.7	401.8	42.1	11.7%	26.8
Electrical and electronics engineers, not computer	17-2070	287.8	313.9	26.2	9.1%	19.0
Civil engineers	17-2051	341.8	363.9	22.1	6.5%	22.9
Mechanical engineers	17-2141	291.9	323.9	32.1	11.0%	19.8
Computer hardware engineers	17-2061	84.1	90.2	6.1	7.2%	5.0
Aerospace engineers	17-2011	68.9	73.0	4.1	6.0%	4.2

*Employment numbers in thousands

[4] Table 5 has been updated with the most recent employment projections, i.e., 2023-2033 rather than 2020-2030.

Data from the U.S. Bureau of Labor Statistics shown in Table 6 indicates that industrial engineering employment is greater than other engineering employment in Tennessee. In addition, IE jobs have a higher location quotient than most other engineering disciplines. The higher location quotient indicates that IE jobs have a greater representation in Tennessee than nationally, perhaps due to the demand for IEs in manufacturing, logistics, and healthcare, three major employment sectors in Tennessee.[5]

Table 6. Engineering Disciplines with Greatest Tennessee Employment in 2024 [7]

Occupation Title	Occupation Code	Total Employment	Employment% Standard Error	Jobs per 1000	Location Quotient
Industrial engineers	17-2112	7,200	4.1	2.200	0.97
Mechanical engineers	17-2141	3,680	7.4	1.124	0.60
Civil engineers	17-2051	4,660	7.9	1.424	0.62
Electrical and electronics engineers, not computer	17-2071 & 17-2072	2,570 720	9.2 12.9	0.785 0.221	0.64 0.36
Environmental engineers	17-2081	840	15.0	0.258	1.05

Demand Versus Academic Supply. Even though industrial engineering employment represents the greatest number of engineering jobs in Tennessee, fewer academic programs and graduates are available to support this employment, as shown in Table 7.[6] Anecdotal evidence from employers and alumni indicates that engineering graduates of other disciplines are employed in industrial engineering jobs without having had the specialized education offered by an industrial engineering degree.

These data provide support for the addition of another program in Tennessee focused on industrial engineering, and the MS in ISE program at Tennessee Tech is being proposed to address this need.

[5] Table 6 has been updated with the most recent employment data for Tennessee.
[6] Table 7 has been updated with the most current employment and academic supply data.

Table 7. 2022-23 Engineering Degree Production Versus 2024 Total Employment in Tennessee

Occupation Title	Occupation Code	May 2024 Total TN Employment*	2022-23 BS Degrees*	2022-23 MS Degrees**	Total 2022-23 BS & MS Degrees	Degrees as % of 2024 TN Employment
Mechanical engineers	17-2141	3,680	388	29	417	11.33%
Civil engineers	17-2051	4,660	202	44	246	5.28%
Electrical and electronics engineers, not computer	17-2071 & 17-2072	3,290	143	29	172	5.23%
Industrial engineers	17-2112	7,200	63	32	95	1.32%

* Source: [7]

** Source: [8]

Existing Programs of Study at the Institution

The proposed MS in ISE program does not emerge from an existing minor or certificate program at the graduate level. However, some ISE-associated courses are currently offered in support of other BS and MS programs in the College of Engineering at both the undergraduate and graduate levels. Since Fall 2022, an undergraduate minor in Industrial and Systems Engineering has been available. Because of financial aid restrictions on funding for a student to take minor courses not in the student's major program of study, the expected enrollment has not occurred for this minor or most others. Although no students are currently reported in a database search for students enrolled in the ISE minor, one student has indicated an intention to enroll in the ISE minor during the Fall 2025 semester.[7] It is expected that the number of students enrolled should increase as scholarships are now available, effective Fall 2025, for students in the ISE minor. Students may enroll in a minor at any time.

Additionally, students do take the courses specified for the ISE minor when the courses can be used as part of their degree programs. These students would be a natural market for the MS in ISE. Further, graduate students in other engineering disciplines and computer science often take existing courses that are proposed for the MS in ISE degree. Table 8 provides enrollments for the past four academic years in both the undergraduate courses that are part of the ISE minor and the existing graduate courses that are part of the proposed MS in ISE program.[8]

[7] The THEC evaluation of the ENAPP stated: "If possible, please provide Fall 2025 enrollment figures in the ISE minor to demonstrate increased student interest."

[8] The THEC ELON evaluation requested "current enrollment figures for the undergraduate minor." Table 8 has been updated to include enrollments in ISE minor courses for 2024-25.

Table 8. Enrollment in ISE Undergraduate Minor Courses and Existing MS in ISE Courses

Course Type	Course	Enrollment			
		2021-22	2022-23	2023-24	2024-25
ISE Under-graduate Minor	ENGR 3300 Human Factors Engineering	NA*	NA	NA	NA
	ENGR 3400 Operations Research	NA	NA	NA	NA
	ENGR 3710 Principles of Engr. Economy	109	90	90	86
	ENGR 3720 Principles of Engr. Statistics	35	23	17	43
	ENGR or VE 4500 Reliability & Quality Engr.	13	NA	16	16
	ENGR 4510 Engineering Management	14	14	12	18
	ME 4450 Design for Manufacturability	NA	NA	NA	16
Existing Courses in Proposed MS in ISE	ENGR or CEE 6200 Statistical Inference for Engineers	10	8	10	13
	EMGT 6100 Intro to Engineering Mgmt.	5	14	10	11
	EMGT 6210 Project Management I	14	15	14	9
	EMGT 6300 Decision Analysis		3	4	5

*Entries of NA indicate that the course was not offered during the time period shown.

At other institutions, graduate programs in industrial and systems engineering have grown in recent years. For example, the graduate ISE programs at the University of Alabama in Huntsville grew 82.4% from Fall 2021 to Fall 2024 [9], and the graduate ISE programs at Virginia Tech grew 38.1% from Fall 2020 to Fall 2024 [10]. These examples are evidence of growing student demand for the program.[9]

Community and Industry Partnerships

Letters of Support from Industry. Six letters of support from industry are submitted in Appendix A.[10] These letters show support for the degree program from a wide variety of employers, including the following:

- ATC
- Atmus Filtration
- FedEx
- JR Automation
- Nissan
- Tenneco

[9] The THEC ELON evaluation suggested including enrollment trends in comparable programs in other states to substantiate demand.

[10] The THEC ELON evaluation requested updated letters, all properly dated and showing support for an MS in ISE program rather than a BSISE program as some of the letters had specified. The letters of support have been updated or replaced. The letter of support from Cummins Filtration is now from Atmus Filtration, the company's new name. An additional letter of support from Nissan is also included.

Employer Surveys. In addition, a survey was sent in November 2022[11] to 171 employer representatives who had recruited engineering students at a Tennessee Tech career fair during the period from Fall 2021 through Fall 2022. The survey resulted in 35 survey responses for a response rate of 20.5%. To update the employer results, a slightly revised survey was sent in August 2025 to 169 employer representatives who had recruited engineering students at a career fair in 2024 or 2025.[12] The survey resulted in 20 responses, some incomplete, for a response rate of 11.8%. Table 9 provides a summary of the positive survey responses from both surveys and demonstrates employer support.

In the 2022 survey, the percentage of respondents who indicated that their organization hires industrial engineers was 42.4%, and the same percentage indicated that they were definitely or probably interested in interviewing industrial engineering students from Tennessee Tech if a program is developed and approved. Another 24.2% of the employers responded that they might be interested in interviewing students from the program. The survey results indicate excellent potential for additional partnerships with industry beyond those found in the letters of support.

The percentage of respondents in 2025 who indicated that their organization hires industrial engineers was slightly lower than in 2022 (37.5% in 2025 versus 42.4% in 2022), so it is not surprising that the percentage interested in interviewing industrial engineers was also somewhat lower (46.7%) than in 2022 (66.7%). Still, almost half of the respondents showed interest in interviewing IEs from Tennessee Tech.

Table 9 shows a new question asked in 2025. After explaining the MS in ISE program proposal and target market, as well as the requirement for THEC approval, employers were asked if any of their employees would benefit from the new degree program. Over half responded “Yes” or “Maybe.” The survey results provide additional evidence of potential engineering employer support of the MS in ISE program.

[11] The THEC ELON evaluation requested information on when the surveys were conducted.

[12] The THEC evaluation of the ENAPP stated: “Given the time gap since the last survey, could you provide additional recent demand data to support this program?” Another employer survey was conducted as reported here.

Table 9. Employer Survey Results (2022 and 2025 Surveys)

Question	Positive Response	Percentage 2022 Survey	Percentage 2025 Survey
Does your organization currently employ industrial engineers?	Yes	42.4%	37.5%
Would your organization be interested in interviewing Tennessee Tech University industrial engineering students for potential employment, either for internships or permanent positions?	Definitely yes	18.2%	6.7%
	Probably yes	24.2%	20.0%
	Maybe	24.2%	20.0%
	Total	66.7%	46.7%
Does your company have employees who could benefit from this new program? (A statement describing the proposed MS in ISE program and the THEC approval process preceded this question.)	Yes	NA*	14.3%
	Maybe	NA*	42.9%
	Total	NA*	57.1%
(Optional) We welcome your comments regarding the potential for an industrial engineering program at Tennessee Tech University.	Selected comments related to industrial engineering are listed below.		
▪ We have hired several industrial engineers from Tech (back in the day). Currently a number of MEs and METs work here as well. An Industrial Engineering program would be very helpful and useful for us in automotive manufacturing. ▪ We use MEs and EEs as IEs from time to time. Process improvements, time studies, understanding of routings for product builds, etc. are all helpful concerning operational efficiencies. An IE program at TTU would definitely interest our company from a Co-op and full-time employment experience. Likely, IEs would go into other areas of operations like continuous improvements and six sigma. ▪ We have hired many engineers from TN Tech and look forward to hiring many more.			

* Not asked in 2022 survey

ACCREDITATION

Although the Engineering Accreditation Commission (EAC) of ABET supports the evaluation of engineering master's programs for accreditation, few engineering MS programs in the U.S. opt to seek this accreditation. Institutions in the U.S. generally focus their engineering accreditation efforts on their BS programs. Likewise, the MS in ISE program at Tennessee Tech will not initially seek accreditation by the EAC of ABET for two reasons.

- Accreditation by the EAC of ABET at the master's level is best supported by restricting enrollment to graduates of EAC of ABET-accredited BS engineering programs in the major discipline to be accredited. This approach would require restricting admission and enrollment to graduates of EAC of ABET-accredited BS in ISE programs, which would limit enrollment and require a change in the direction of the proposed program. To meet accreditation requirements at the master's level and support admission of BS graduates of other (non-ISE) engineering disciplines, applicants without an ISE background would need to take several undergraduate ISE courses as prerequisites to the graduate program. Such a change in direction would be counter to the basic premise of providing a graduate ISE experience for non-ISE degreed engineers.
- After the MS in ISE is established, the program faculty will seek to develop an ISE concentration within a BS Engineering program, which will be an accredited degree path. Enrollment growth in this concentration will provide support for a BS in ISE program, which would seek EAC of ABET accreditation.

The external reviewer of the proposed program suggested that ABET accreditation would uniquely distinguish the MS in ISE program and help in marketing the program. If the decision is made not to pursue a BS path in ISE, the suggestion to seek accreditation for the MS in ISE degree program will be explored.

ADMINISTRATIVE STRUCTURE

Figure 1 provides the organization chart proposed for the MS in ISE program. A new academic department is not required. The program will be offered by faculty in the General and Industrial Engineering (GIE) Department, one of seven departments in the College of Engineering. The department name was changed in Fall 2024 to reflect the new undergraduate ISE minor and the MS in Engineering Management (MSEM, often associated with ISE programs), as well as to prepare for the proposed new MS in ISE program, if approved. Other programs offered through faculty in the GIE Department are included in Figure 1.

The MS in ISE program will be led by a program coordinator, who will be a new hire. The search for this coordinator will begin after THEC approval of the new MS in ISE program. Following the proposed timeline in the Overview, the projected search is expected to begin in December 2025.[13]

[13] The THEC ELON evaluation requested information on when the search will begin.

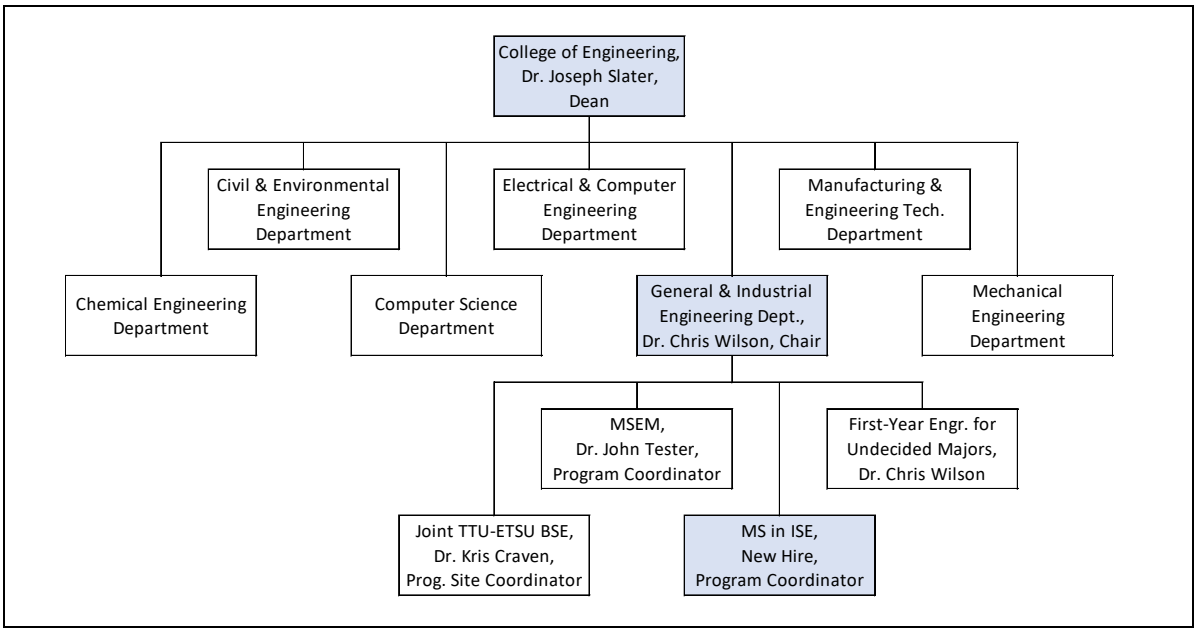


Figure 1. Organization Chart for the Proposed MS in ISE Program

ENROLLMENT AND GRADUATION PROJECTIONS

Table 10 shows projected enrollments and graduates for the first five full academic years of the MS in ISE program. To assist in completing Table 10, the Office of Institutional Assessment, Research, and Effectiveness (IARE) at Tennessee Tech provided persistence and graduation data, along with time-to-degree, for the past five years for all MS programs in the College of Engineering. Because the MS in ISE program is planned for both on-campus and online students, the IARE data were analyzed for the five on-campus MS programs separately from the data for the MS in Engineering Management (MSEM) program, which was the only fully online MS program offered by the College of Engineering.

Table 10. Projected Enrollments and Graduates

Year	Academic Year	Projected Fall Enrollment			Projected Total Attrition	Projected Total Graduates
		On-Campus	Online	Total		
1	2026-27	6	3	9	2	0
2	2027-28	12	5	17	2	2
3	2028-29	17	8	25	3	6
4	2029-30	18	10	28	3	8
5	2030-31	20	11	31	3	10

Data for attrition and number of graduates for on-campus students in the MS in ISE program were based on the historical persistence and graduation rates, along with time-to-degree, for the five existing on-campus MS programs. Data for attrition and number of graduates for online students in the MS in ISE programs were based on the persistence and graduation rates for the MSEM. Projections for the on-campus and online students were then combined, resulting in the estimates for attrition and graduates shown in Table 10. Appendix B includes the underlying data and analysis that resulted in the Table 10 projections. The projection for number of graduates has been revised in this proposal based on an adjustment to the unusually high attrition rate for online students during the pandemic used in the original ELON.

Table 10 includes both full-time and part-time students[14] with enrollment and graduation rates typical for MS programs in the College of Engineering. Enrollment plans were projected for all entering students to yield the historical average time to degree for each student category, i.e., two years for on-campus and more than three years for online students.

- Most students will be on-campus students. The two-year on-campus average time to degree reported by IARE included College of Engineering students in other MS programs who graduate in a year because they are in fast-track options that allow them to earn graduate credit as undergraduates. The MS in ISE will not initially have a fast-track option, so the average time-to-degree will likely exceed two years. Most students were assumed to be full-time until the last semester when they would not typically need a full schedule of courses to complete graduation requirements. In addition, some on-campus students in the thesis option often take extra part-time or full-time semesters for thesis research and more than the minimum thesis credits. Thus, Table 10 enrollments and graduates reflect some additional part-time semesters for a few students to yield the appropriate time-to-degree average.
- Graduate research assistants (GRAs) are on-campus students usually enrolled in less than nine credits per fall or spring semester but are considered full-time if enrolled for six credits each term during the academic year. Table 10 includes one GRA enrolled in the first year and two enrolled in each year following the first year. All GRAs were assumed to be full-time except for the final semester when full-time enrollment was not needed to complete graduation requirements.
- Based on historical experience with the MSEM, all online students are assumed to be part-time, most taking only one course per term, and these students are included in the enrollment and graduation data in Table 10.

It is noted that the enrollment projections over the five-year period yield more than the number of graduates to satisfy THEC's minimum productivity threshold for master's degrees.[15]

[14] The THEC evaluation of the ENAPP states: "The ELON mentions part-time enrollment, please provide these figures in the enrollment and graduation table." Part-time students were already included in Table 10, but an explanation of part-time enrollment has been added.

[15] The THEC ELON evaluation noted that the enrollment projections are at THEC's minimum productivity threshold and requested information in the ENAPP "to address concerns in relation to the THEC definition of low-producing program."

In addition, the faculty members plan to develop certificate programs using selected MS in ISE courses, which should encourage additional enrollment.

INSTITUTIONAL ALIGNMENT AND DEMAND

Alignment with State Master Plan and Institutional Mission Profile

Alignment with the THEC Master Plan. *Enabling the Competitive Edge: THEC Master Plan Update 2020* [2] identifies the following two goals and metrics related to building the future workforce:

- **Increase enrollment in majors leading to high-demand jobs**: The proportion of students enrolling in degree programs that lead to employment in high-need fields, as determined by THEC's annual Academic Supply and Occupational Demand report, will increase by at least 5% annually (N = 500) over the next five years.
- **Increase Computer Science and Data Analytics offerings**: THEC will encourage higher education institutions, via funding opportunities and pilot initiatives, to increase offerings in Computer Science and Data Analytics to all students, not only those who are pursuing either field as a major.

The proposed MS in ISE degree program addresses both goals. As previously noted, the MS in ISE is designed to prepare students for employment as industrial and systems engineers and operations research analysts. The occupations of industrial engineer and operations research analyst are included in the Tennessee *In-Demand Occupations* data file [1] as "in-demand occupations." In addition, the proposed MS in ISE program's emphasis on data analysis and modeling addresses the second goal to increase offerings in data analytics. The coursework in data analytics and modeling will support other graduate programs in the College of Engineering, extending the benefits of this program to other students as suggested in the second goal.

The *THEC Master Plan Update 2020* [2] also notes that stackable credentials are important for building the future workforce, stating that "A student's ability to accumulate credentials in a given field over his or her working life is critical to the success of Tennessee's economy." The MS in ISE program is designed to permit students with BS degrees in engineering or technical disciplines to earn an advanced degree without the requirement for significant prerequisite work. The degree will provide instruction and experiences to enable engineering graduates, perhaps with a degree in a different discipline, to work more effectively in industrial engineering jobs.

These program aspects demonstrate that the proposed MS in ISE degree is aligned with the *THEC Master Plan*.

Alignment with Tennessee Tech's Institutional Mission. The proposed MS in ISE program is strongly supportive of the mission of Tennessee Tech University [11], which is stated below.

Tennessee's technological university creates, advances, and applies knowledge to expand opportunity and economic competitiveness. As a STEM-infused, comprehensive institution, Tennessee Tech delivers enduring education, impactful research, and collaborative service.

Alignment with the mission is evident from the following points.

- The MS in ISE is a STEM degree with strength in data analysis and modeling, which supports Tennessee Tech's mission "as a STEM-infused" institution and a technological university.
- The MS in ISE is focused on system design and operation for efficiency and effectiveness. The program will require a course in engineering economics, i.e., economic decision-making with a system perspective. These features of the program support the mission of applying "knowledge to expand economic competitiveness."
- MS in ISE student thesis research and other faculty research projects will create and advance "knowledge to expand opportunities and economic competitiveness" and will deliver "impactful research."
- The MS in ISE project option will require application of program knowledge to a real-world problem to improve efficiency and effectiveness, and thus economic competitiveness. Projects involving collaborative service will be encouraged.
- The program will be offered in two modalities: on campus to support full-time students and online to support working professionals. These modalities support the delivery of an "enduring education."

Student Interest

Three Qualtrics surveys were conducted to assess student interest in a graduate ISE degree. One survey focused on students who had participated in the Cooperative Education Program, the second survey focused on recent engineering alumni, and the last survey focused on current students.

Cooperative Education Students Survey. Incoming first-year engineering undergraduate students often have a very limited understanding and knowledge of industrial and systems engineering. BSISE programs often attract greater numbers of sophomore or junior engineering majors who change their major from another engineering discipline rather than transferring out of engineering. These transfers occur when the students have gained a greater understanding of industrial and systems engineering as well as their previous majors. With no BS in IE or ISE program in place at Tennessee Tech to provide context, surveying undergraduate engineering students' interest in a potential MS in ISE program is problematic. However, students who have participated in employment through Tennessee Tech's Cooperative Education Program have potentially gained some knowledge of ISE through their employment experience. Hence, in October 2022[16], a Qualtrics survey was sent to 72 current BS and MS students who had participated in at least one semester of co-op employment.

[16] The THEC ELON evaluation requested information on when the surveys were distributed.

When the survey was closed at the end of October 2022, responses had been received from 21 students (with 3 incomplete responses) for a 29.2% response rate. Students were asked about their experience with topics in the ISE Body of Knowledge and could select as many responses as applicable from the following choices:

- I learned about this topic during my co-op term
- I already knew about this topic from previous coursework or experience
- I participated in co-op work related to this topic
- I am interested in working in this area

Table 11 summarizes some of the results from the 2022 survey, as well as results from a new survey in 2025.

The results showed that 71.4% of the students in the 2022 survey learned about some ISE topics during their co-op assignment, 57.1% gained experience in some of those topics, and 52.4 % of the students checked that they had an interest in working in an area related to one or more of the ISE topics. The interest indicates potential student demand for ISE topics.

It was not surprising that the 2022 survey question to undergraduate co-op students on whether the students planned to enroll in a master's degree after graduation resulted in only four positive responses, none for the MS in ISE. Since the survey was administered anonymously, the characteristics of the sample respondents are unknown. The respondents could have been several semesters from graduation, or they could have been graduating seniors who already had offers for employment.

In August 2025, another survey was sent to 72 students who had participated in at least one semester of co-op. A total of 20 students responded (with 2 responses incomplete), which represents a 27.8% response rate. Of the 17 students who responded to a question about their current degree program, 2 were MS students and 15 were BS students. Including all 20 respondents, 70% indicated that they had learned about one or more ISE topics during their co-op experience, 60% gained experience in one or more ISE topics, and 45% indicated an interest in working in the area related to one or more topics in the ISE body of knowledge.

In 2025, students were more definite about plans for enrolling in a master's degree within five years after graduation with 57.1% of the BS student respondents indicating plans to enroll. Of the BS student respondents with plans to enroll, 62.5% indicated potential interest in enrolling in an MS program with topics related to ISE. In addition, one of the MS student respondents indicated potential interest in such a degree program. The updated survey provides additional evidence of demand for ISE topics and the potential to attract students to the MS in ISE degree program.

Table 11. Co-op Student Experience Survey from 2022 (2025 results in parentheses) *

Industrial & Systems Engineering Body of Knowledge Topic	Learned about topic on co-op	Learned about topic in prior courses	Participated in co-op work related to topic	Interested in work related to topic
Data analysis, modeling, and/or simulation	9 (8)	11 (7)	4 (9)	8 (7)
Economic analysis (time value of money, present worth of alternatives, make/buy analysis, replacement analysis, etc.)	6 (5)	5 (3)	6 (6)	5 (4)
Ergonomics and human factors (safety, physical & cognitive ergonomics, displays and/or controls design)	9 (7)	3 (1)	2 (7)	2 (3)
Facilities engineering (location analysis, layout, material handling, warehousing)	6 (8)	3 (0)	3 (7)	5 (2)
Inventory planning and control or lean systems	9 (6)	2 (1)	3 (1)	3 (1)
Manufacturing engineering (design for manufacturing, manufacturing processes selection and management)	12 (5)	9 (2)	7 (6)	5 (2)
Operations engineering (material or personnel flow planning, scheduling, balancing, perf. metrics)	7 (8)	3 (1)	3 (6)	2 (4)
Quality and reliability engineering (control charts, acceptance sampling, quality mgmt. or planning)	9 (5)	2 (2)	5 (6)	3 (5)
Supply chain management and/or logistics (supply chains from suppliers through customers)	8 (4)	3 (1)	1 (1)	3 (1)
Industrial and systems engineering (process or procedures design, life-cycle analysis, integrated system requirements analysis incl. equipment, information, energy, materials, and/or people)	11 (3)	6 (0)	4 (3)	3 (5)
Work design and/or work measurement (methods engineering, standards, productivity analysis, etc.)	7 (9)	5 (1)	4 (6)	5 (4)
Percentage of respondents who checked one or more topics	71.4% (70.0%)	57.1% (55.0%)	57.1% (60.0%)	52.4% (45.0%)

*Number of respondents: 21 in 2022 survey (3 incomplete), 20 in 2025 survey (2 incomplete)

College of Engineering Recent Alumni Survey. A different survey was sent in October 2022 through an e-mailed link to 2,236 alumni of the Tennessee Tech College of Engineering who had graduated within the past five years.[17] The number of alumni who opened the e-mail was 750 for a 33.5% open rate, which is above average for an e-mail message of this type. The click rate was 5% with 112 clicks, which is about average, and 105 alumni completed the survey within four weeks. Table 12 provides a summary of the survey results.

Table 12. Survey of Recent Tennessee Tech College of Engineering Alumni

Question	Response	Number of Responses	Percent of Responses
Please select the major in which you earned your BS degree.	Chemical Engineering	10	9.5%
	Civil Engineering	18	17.1%
	Computer Engineering	5	4.8%
	Computer Science	14	13.3%
	Electrical Engineering	14	13.3%
	Engineering Technology	11	10.5%
	Mechanical Engineering	33	31.4%
	Engineering (joint program with ETSU)	0	0.0%
Do your plans during the next five years include enrolling for a graduate degree?	Yes	37	35.2%
	No	68	64.8%
If yes, what is your planned graduate degree, assuming all of the following degrees are available? (Note: Multiple answers could be selected, and 54 selections were made by the 37 alumni who responded "Yes" to plans for a graduate degree.)	Master's degree in Chemical Engineering	1	1.8%
	Master's degree in Civil Engineering	2	3.7%
	Master's degree in Computer Science	4	7.4%
	Master's degree in Electrical and Computer Engineering	5	9.3%
	Master's degree in Engineering Management	8	14.8%
	Master's degree in Industrial and Systems Engineering	2	3.7%
	Master's degree in Mechanical Engineering	3	5.6%
	Master's degree in an engineering field not listed above	6	11.1%
	Master's degree in a different field, not engineering or computer science	1	1.8%
	MBA – Master of Business Administration	11	20.4%
	Another type of graduate degree (e.g., MD, DO, DDS, JD, PhD)	9	16.7%
	Uncertain	2	3.7%

[17] The THEC ELON evaluation requested information on when the surveys were distributed.

Table 12 shows that the number of alumni who indicated their planned graduate degree is a master's in ISE is the same as the number indicating a master's in civil engineering and only one less than the number indicating a master's in mechanical engineering even though none of the respondents had an undergraduate degree in ISE. These results indicate that the MS in ISE, with appropriate marketing, could be successful in enrolling a sustainable number of students for a quality degree program.

Current Students Survey. More than 2300 undergraduate students in the College of Engineering were surveyed immediately after the Spring 2023 Semester.[18] There were only 37 responses (36 complete responses) as the survey was sent during the intersession break. To update the results, the survey was sent again to 671 students who were enrolled in July 2025 with 29 responses (28 complete responses) within one week. Two questions were asked, as shown below along with the results from both surveys.

1. If the M.S. in Industrial Systems Engineering is available at TTU, how likely is it that you will consider pursuing it in the future?

Responses	May 2023	July 2025
Extremely Likely:	2 (06%)	4 (14%)
Very Likely:	10 (28%)	7 (25%)
Somewhat Unlikely:	14 (39%)	14 (50%)
Extremely Unlikely:	10 (28%)	3 (11%)

2. Obtaining an M.S. in Industrial Systems Engineering will enhance my employment prospects and professional growth opportunities.

Responses	May 2023	July 2025
Extremely Likely:	5 (14%)	6 (21%)
Very Likely:	22 (61%)	15 (54%)
Somewhat Unlikely:	5 (14%)	5 (18%)
Extremely Unlikely:	4 (11%)	2 (07%)

This survey indicates that over one-third of the student respondents (34% in May 2023 and 39% in July 2025) thought it likely that they would pursue a master's in ISE. Additionally, three-fourths of the student respondents in both surveys acknowledged that obtaining a master's in ISE would be beneficial to their career and professional growth. While the overall response rates were only 1.6% in May 2023 and 4.3% in July 2025, the responses are very favorable. As with the other surveys, these results indicate that the MS in ISE, with appropriate marketing, could be successful in enrolling a sustainable number of students for a quality degree program.

[18] The THEC ELON evaluation requested information on when the surveys were distributed.

Enrollment Strategies and Student Recruitment Initiatives.[19] It has been noted that the previously terminated MS in IE program, which ceased admitting students in 2003, had some enrollment challenges, but the proposed MS in ISE differs substantially from the previous program in five important ways:

- **Campus Environment:** As noted earlier in this document, the environment on campus is very supportive of new degree programs that address Tennessee needs. In addition, the College of Engineering recognizes the value of and supports the return of a program in industrial and systems engineering.
- **Target Market:** The target market for the proposed MS in ISE is students who have BS degrees in engineering or related fields, who are working in Tennessee, and who are in jobs (or want to move to jobs) requiring industrial engineering knowledge and skills. The target market in the prior degree was BSIE graduates, and the student body was primarily international students.
- **Required Prerequisites:** The required prerequisite coursework is minimal for students with BS in engineering or related degree programs. The previous degree program required at least three undergraduate courses as prerequisites for students who did not have BSIE degrees.
- **Program Courses:** The required courses in the proposed MS in ISE program provide breadth in ISE and depth in analytical modeling and are aligned with the current needs of Tennessee employers of ISE graduates. The curriculum in the previous MS in IE program lacked opportunities to focus on the area of data analysis and modeling. Some courses existed but were not taught on a regular basis. The knowledge and skills that will be acquired in the program courses are needed in manufacturing, logistics, and healthcare. In addition, the courses that have been proposed are supportive of other graduate programs in the College of Engineering.
- **Faculty:** The faculty who were teaching in the previous MS in IE program have either retired or moved to another university. For the MS in ISE degree, two new faculty will be hired with expertise to support the new emphasis on analytical modeling, and current faculty in other programs but with ISE backgrounds will share teaching responsibilities.

In summary, in contrast to the previously terminated program, the proposed MS in ISE program has been designed to be more aligned with student interests and industry needs and to accommodate a different target market with reasonable prerequisite requirements within a supportive campus environment. These differences will provide opportunities for a new marketing approach.

As part of the approach, Tennessee Tech and College of Engineering marketing personnel will assist with a plan for reaching the target market. Marketing will address current students on

[19] The THEC evaluation of the ENAPP stated: "Given the previous enrollment challenges in this field, what enrollment strategies and student recruitment initiatives does TTU plan to implement to ensure the success of this new program?" This section has been added to provide details on these topics.

campus, Tennessee Tech alumni, and engineering employers. Some current plans include the following:

- To promote awareness of ISE on campus, the GIE Department will celebrate the first annual ISE Day on-campus on September 15, 2025. ISE Day is a new national initiative, sponsored by the Institute for Industrial and Systems Engineers, aimed at improving the public's understanding of ISE contributions to society. An alumni panel will be invited to help with this celebration event.
- Monthly events such as information sessions or guest speakers are planned to increase awareness on campus of Industrial and Systems Engineering.
- The Office of Alumni Affairs will be asked to assist in promoting awareness of the new degree program to Tennessee Tech alumni.
- The College of Engineering industrial liaison will be asked to help the GIE department chair and the ISE program coordinator in establishing relationships with Tennessee employers interested in MS in ISE graduates.

Existing Programs Offered at Public and Private Tennessee Universities

Existing Tennessee Academic Programs with the Same or Similar CIP Code. This section provides information on existing Tennessee programs in Industrial Engineering, Systems Engineering, and Engineering Management.

Industrial Engineering Programs (CIP 14.3501)

Currently, only the University of Tennessee at Knoxville (UTK) offers degrees with the same CIP code, i.e., BS, MS, and PhD degrees in Industrial Engineering. No institution offers a degree in Systems Engineering alone or in Industrial and Systems Engineering. Both THEC's searchable Academic Program Inventory [12] and the UTK *2025-26 Graduate Catalog* [13] list Systems Engineering and Automotive Manufacturing concentrations for the MS in IE at UTK. The UTK *2025-26 Graduate Catalog* [13] refers students to the Industrial and Systems Engineering Department's *Graduate Handbook* [14] for details on these concentrations. The Department's *Graduate Handbook* online lists the following "three areas of study for the Master of Science program in the Department of Industrial and Systems Engineering" [14]:

- Industrial Engineering
- Engineering Management Concentration
- Reliability and Maintainability Engineering

The *Graduate Handbook* [14] provides no information on concentrations in either Systems Engineering or Automotive Manufacturing, and neither does the Industrial and Systems Engineering Department's website for the Master's program [15]. These concentrations appear as "Active" in a search of the THEC Academic Program Inventory database, but UTK does not seem to provide details on these concentrations.

THEC's searchable Academic Program Inventory [12] lists "Active" concentrations in Industrial Engineering and Manufacturing Engineering for the Bachelor of Science in Engineering (BSE) program at the University of Tennessee at Martin (UTM). However, neither the UTM website [16] nor the UTM *2025-26 Undergraduate Catalog* [17] lists the Industrial Engineering concentration for the BSE degree. It appears that the Industrial Engineering concentration is not currently offered.

Systems Engineering Programs (CIP 14.2701)

According to THEC's searchable Academic Program Inventory [12], no institution offers a degree in Systems Engineering alone or in the combined Industrial and Systems Engineering. As noted previously, Systems Engineering is listed as a concentration for the MSIE at UTK.

Engineering Management (CIP 15.1501) and Other Programs

Faculty with ISE backgrounds often offer degree programs or certificates related to Engineering Management or to Risk and Reliability, so these programs are also reported here.

In addition to Tennessee Tech University [18], Master of Science in Engineering Management (MSEM) degrees are offered at multiple public institutions in Tennessee, as follows.

- The University of Memphis offers a Master of Science in Engineering Management (MSEM or MS) degrees with a choice of no concentration [19] or one of three concentrations: Biomedical Engineering [20], Manufacturing [21], Transportation [22].
- The University of Tennessee Chattanooga offers a Master of Science degree in Engineering Management [23], which also offers concentrations in Construction Management, Engineering Analytics, and Power.
- As of Fall semester 2022, the University of Tennessee at Knoxville has offered a Master of Science in Engineering Management. UTK's Industrial and Systems Engineering Department also offered the MSIE degree with a concentration in Engineering Management [14] prior to Spring 2024. The THEC Academic Program Inventory *Comprehensive Report* for UTK [24] shows that this concentration was phased out that semester.
- The UTK ISE Department participates in offering a related interdisciplinary degree, the Master of Science in Reliability and Maintainability Engineering [25].
- Middle Tennessee State University offers a Master of Science in Professional Science with an Engineering Management concentration [26].

Private universities offering ISE-related programs include Vanderbilt University and Christian Brothers University.

- Vanderbilt offers a Master of Engineering degree in two related areas: Engineering Management [27] and Risk, Reliability, and Resilience Engineering [28]. An engineering

management minor [29] is available to undergraduate engineering students at Vanderbilt.

- Christian Brothers University offers both BS [30] and MS [31] degrees in engineering management. The BS degree [30] has four concentrations for selection: data analytics, engineering studies, packaging, or game design.

Number of Degrees Awarded by Existing Programs. Table 14 provides a summary of the number of graduates from industrial engineering and similar programs at other institutions for which the data could be obtained.[20] It should be noted that there is a discrepancy between the number of MSIE graduates shown for 2021-22 in the table, i.e., 32, versus the Academic Supply for Occupational Demand 2024 report [32], which lists 29. The data in Table 14 came from data reporting dashboards found on the websites of the institutions. The Academic Supply for Occupational Demand Report for 2024 noted that 66% of the MSIE graduates remained in Tennessee for employment, another indication of potential demand and benefit to Tennessee for the proposed program.

Table 14. Number of Graduates in Programs at Other Institutions

University	Degree	Total or Concentration, If Any	2021-2022	2022-2023	2023-2024	Notes
UTK [33]	MS, Industrial Engineering	Total	32	36	34	
		Systems Engineering	15	16	18	
		Engineering Management	10	9	1	Phased out 01/2024
	MS, Engineering Management		Degree not available	6	6	Began Fall 2022
	MS, Reliability & Maintainability Engineering	All Departments Total	6	3	3	
TTU [34], [35]	MS, Engineering Management		New	6	6	
University of Memphis [36]	MS, Engineering Management	Total	1	2	3	Began Fall 2020
		Manufacturing	0	2	1	
		Transportation	1	0	1	
UTC [37]	Engineering Management		9	13	18	
MTSU [38], [39]	Professional Science	Engineering Management	10	9	Data not available	

[20] The THEC ELON evaluation requested that the updated ELON provide the number of degrees awarded in each MS program listed for each of the last three years.

Differences in the Proposed Program as Compared to Existing Programs. This section explains how the proposed MS in ISE is unique in comparison to other Tennessee programs with the same or similar CIP codes. Because bachelor's programs are significantly different in focus and credit hours than master's degree programs, only programs at the master's level are compared.

MS in ISE Programs versus MS Programs in Engineering Management

Although MSEM degrees include a selection of engineering topics, instruction in these degrees also covers business and management topics. An MS in ISE degree that is not an engineering management concentration has far greater emphasis on quantitative topics and data analytics. The content of the MSEM degree differs substantially from the content of an MS in ISE or MSIE degree program. Thus, the proposed MS in ISE is different from existing MSEM programs in Tennessee.

Proposed Tennessee Tech MS in ISE versus MS Programs in Risk and Reliability Engineering

Although some overlap exists in statistics and data analysis courses with the proposed MS in ISE program, the MS programs in risk and reliability engineering at UTK and Vanderbilt are much more narrowly focused on the reliability of equipment or on risk and reliability applications in other disciplines such as civil, electrical, or mechanical engineering. The breadth of the proposed MS in ISE at Tennessee Tech is critical to ensure that students with undergraduate degrees in other disciplines gain a clear understanding of industrial and systems engineering rather than a portion of the discipline.

Proposed Tennessee Tech MS in ISE versus UTK's MS in IE

As noted previously, Tennessee Tech's proposed MS in ISE program will provide breadth in industrial and systems engineering and depth in data analysis and modeling. The primary differences in the proposed MS in ISE program and the MS in IE program at UTK are as follows:

- The UTK degree is the MS in Industrial Engineering, not the MS in ISE. The Tennessee Tech MS in ISE program will have required content in systems engineering. UTK's program permits inclusion of this content but does not require it.
- The Tennessee Tech program will be designed to facilitate engineering graduates in other disciplines to achieve a breadth of knowledge related to ISE while also gaining depth in data modeling and analysis. The UTK program permits this approach but allows other emphases as well. To guarantee breadth in ISE, the Tennessee Tech program will require focused electives in three or four areas for the thesis option and in four areas for the project option. The electives listed for the UTK MSIE program in the *Graduate Handbook* [14] do not guarantee this breadth.
- Based on the UTK core courses and listed electives, both programs have strength in data modeling and analysis. Students in the proposed MS in ISE at Tennessee Tech will earn a minimum of 15 or 18 credits in courses focused on these topics. Students in UTK's

program may earn a similar or greater number of credits, depending on the electives selected in their programs of study.

Table 15 provides a comparison of the proposed MS in ISE program with the UTK MSIE program.

Articulation and Transfer

The proposed program is an MS degree, not a BS degree, so this section is not applicable. However, transfer credit for the MS in ISE degree will be evaluated in compliance with existing policies for graduate transfer credit at Tennessee Tech.

Table 15. Comparison of Proposed MS in ISE with UTK's MS (Industrial Engineering Track)

Program Features	Tennessee Tech's Proposed MS in ISE	UTK's MS in IE
Degree Name	MS in Industrial and Systems Engineering	MS in Industrial Engineering
Concentrations	None	Automotive Engineering Systems Engineering Engineering Management (terminated Spring 2024)
Credit Hours	31	32
Options	Thesis or Project	Thesis or Project
Prerequisites	Calculus-based Probability and Statistics Linear Algebra Engineering Economy (or graduate course will be required)	IE 200 Engineering Statistics IE 301 Operations Research in IE I IE 405 Engineering Economic Analysis
Core Courses	9 ISE credits	9 IE credits
Electives	9 credits in 3 focused areas or 12 credits in 4 focused areas for thesis option; 12 credits in 4 focused areas for project option	9 credits for thesis option; 12 credits for project option
Technical Electives	3 credits for thesis option; 6 credits for project option; all credits in selected mathematics courses	6 elective credits, usually Computer Science, Math, or Statistics, selected with major professor
Seminar	1 credit for professionalism course	2 credits
Thesis or Projects	6-9 credits for thesis option; 3 credits for project option	6 credits for thesis option; 3 credits for project option

INSTITUTION'S RESPONSE TO THE ELON AND ENAPP EVALUATIONS

Responses to the items cited by THEC in the ELON evaluation have been embedded in the revised ELON of Section I and other sections as required. Responses to items cited by THEC in the ENAPP evaluation have also been embedded in the appropriate sections of this document. For ease of reference, all THEC comments requesting further explanation are shown as footnotes. In addition, Appendix C provides a copy of the ELON evaluation with corresponding responses, and Appendix D provides a copy of the ENAPP evaluation with corresponding responses.

SECTION II. CURRICULUM

Section I, the revised ELON, briefly summarized the planned curriculum, and this section of the ENAPP provides further detailed information about the curriculum options for the MS in ISE degree program.

CATALOG DESCRIPTION

The proposed catalog description is provided below.

> *The Department of General and Industrial Engineering offers advanced studies leading to the degree of Master of Science in Industrial and Systems Engineering (MS in ISE). The goals of the MS in ISE program are to prepare graduates with breadth across the discipline of industrial and systems engineering (ISE) and depth in data analysis and modeling. This focus serves the needs of Tennessee employers for both industrial and systems engineers and operations research analysts, occupations that have been identified as "in-demand" in Tennessee.*
>
> *The program accommodates students who have earned a Bachelor of Science in any accredited engineering degree program or a similar course of study. The MS in ISE degree prepares graduates to apply advanced engineering data analysis and modeling skills and knowledge in industry or in advanced studies towards the Ph.D. The MS in ISE degree program can be pursued with either a thesis option or a non-thesis option and is offered online. Faculty advisors assist graduate students in developing individual programs of study depending on their career goals and research interests. The student's advisory committee assists the student in the development and execution of the program of study and monitors and evaluates the student's work towards the degree.*
>
> *Degree Options*
> *Students may choose either a thesis or non-thesis (project) option.*
> - *Thesis Option:*
>   *This option requires 31 credit hours, which includes 22 to 25 credit hours of coursework and 6-9 credit hours of thesis research.*
> - *Non-thesis (Project) Option:*
>   *This option requires 31 credit hours, which includes 28 credit hours of coursework and a 3-credit professional project.*

As stated above, both options require a minimum of 31 credit hours for degree completion.[21] In the thesis option, a student who completes 6 credit hours of thesis research will register for 25 credit hours of other coursework whereas a student who completes 9 credit hours of thesis

[21] The THEC evaluation of the ENAPP stated: "Please confirm that all students in this program will complete 31 credit hours, even with variable credits within categories."

research will register for 22 credit hours of other coursework. Either path requires a minimum of 31 credit hours. Some students in the thesis option may register for more than the minimum credit hours for thesis research.

PROGRAM LEARNING OUTCOMES

As noted in Table 2 of the ELON, graduates of the MS in ISE program will achieve three program learning outcomes:

Graduates of the MS in ISE program will

1. Apply advanced expertise, leadership, and scholarship in industrial and systems engineering to create value for their employers in Tennessee and beyond;
2. Demonstrate a commitment to professional development and continued learning through participation in further graduate studies, continuing education, training programs, or self-study; and
3. Use industrial and systems engineering methods to serve the profession, community, or society.

STUDENT LEARNING OUTCOMES

As noted in Table 3 of the ELON, three specific and measurable student outcomes will verify that learning has occurred.

Students in the MS in ISE program will

1. Demonstrate subject knowledge, technical competence, and professional skills associated with the human factors, economic, analytical modeling, and systems aspects of industrial and systems engineering;
2. Conduct research or apply advanced analytical methods in the development of solutions to industrial and systems engineering problems; and
3. Give professional presentations or write scholarly documents worthy of publication in conference proceedings and/or peer reviewed journals.

These student learning outcomes 1 through 3 directly align with the program learning outcomes 1 through 3, respectively, as listed above.

ACADEMIC PROGRAM REQUIREMENTS

The MS in ISE degree program offers both a thesis option and a non-thesis project option. The core courses are the same for both options. The primary differences are explained in the following sections.

Thesis Option

Table 16 shows the courses in the MS in ISE degree program for the thesis option. The thesis option is designed for those students who want a research experience and for those who might want to pursue a doctoral degree after graduation. The program offers flexibility in the number of credit hours devoted to the thesis, with a requirement of either six or nine credits of thesis research. For the six-credit thesis option, the student will choose four Elective courses, one from each Elective area for a total of twelve credits. For the nine-credit option, the student will choose one course from each of three Elective areas for a total of nine credits. Thesis-option students take only three credits of a technical elective. The required number of credits for the thesis option is 31[22], but some thesis students may take more than the minimum number of thesis research credits.

Table 16. Planned Courses for the MS in ISE Program – Thesis Option

Course Type	Course Number and Title	Thesis Credit Hours
Core	EMGT 6300 Decision Analysis	3
Core	ENGR 6200 Statistical Inference for Engineers	3
Core	ISE 6500 Human Factors in Systems Design	3
Core	ISE 6920 ISE Professionalism	1
Thesis	ISE 6990 Research and Thesis	6-9
Management Elective Area	EMGT 6100 Engineering Management or EMGT 6210 Project Management I	9-12**
Economics Elective Area	ISE 5710 Economic Evaluation of Engr. Projects* or ISE 6800 Systems Engr. and Life-Cycle Economics	
Modeling Elective Area	ISE 5410 Systems Simulation or ISE 6460 Optimization Methods	
Application Elective Area	ISE/ENGR 5500 Reliability & Quality Engineering. or ME 5450 Design for Manufacturability or ISE 6970 Special Topics in ISE	
Technical Elective – Thesis Option	MATH 6070 Applied Linear Statistical Methods I or MATH 6170 Experimental Design I	3
Total	Minimum Requirements***	31

*ISE 5710 is required for both project and thesis options if the student's undergraduate curriculum did not include a course in Engineering Economics.

**For the thesis option, one 3-credit course from each of three areas (a total of 9 credits) is required if the student's program specifies 9 credits of thesis coursework. One 3-credit course from each of the four areas (a total of 12 credits) is required if the student's program specifies 6 credits of thesis coursework.

***A maximum of nine credits of 5000-level coursework is permitted.

[22] The THEC evaluation of the ENAPP stated: "Please confirm that all students in this program will complete 31 credit hours, even with variable credits within categories."

Project Option

Table 17 shows the courses in the MS in ISE degree program for the project option. The project option is designed for students who are interested in applying industrial and systems engineering methods as a practitioner in industry or other organizations after graduation or in their current job. A three-credit professional project course is required, along with one course from each of four Elective areas, a total of twelve credits, and six credits of technical electives. The required number of credits for the project option is 31[23].

Table 17. Planned Courses for the MS in ISE Program – Project Option

Course Type	Course Number and Title	Project Credit Hours
Core	EMGT 6300 Decision Analysis	3
Core	ENGR 6200 Statistical Inference for Engineers	3
Core	ISE 6500 Human Factors in Systems Design	3
Core	ISE 6920 ISE Professionalism	1
Project	ISE 6950 Professional Project	3
Management Elective Area	EMGT 6100 Engineering Management or EMGT 6210 Project Management I	12**
Economics Elective Area	ISE 5710 Economic Evaluation of Engr. Projects* or ISE 6800 Systems Engr. and Life-Cycle Economics	
Modeling Elective Area	ISE 5410 Systems Simulation or ISE 6460 Optimization Methods	
Application Elective Area	ISE/ENGR 5500 Reliability & Quality Engineering. or ME 5450 Design for Manufacturability or ISE 6970 Special Topics in ISE	
Technical Electives – Project Option	MATH 6070 & 6080 Applied Linear Statistical Methods I & II or MATH 6170 & 6180 Experimental Design I & II or MATH 6070 Applied Linear Statistical Methods I & MATH 6170 Experimental Design I	6
Total	Minimum Requirements****	31

*ISE 5710 is required for both project and thesis options if the student's undergraduate curriculum did not include a course in Engineering Economics.

**For the project option, one 3-credit course from each of the four areas is required for a total of 12 credits.

***A maximum of nine credits of 5000-level coursework is permitted.

[23] The THEC evaluation of the ENAPP stated: "Please confirm that all students in this program will complete 31 credit hours, even with variable credits within categories."

EXISTING AND NEW COURSES

Table 18 shows requirements for both the project and thesis options in one table. New courses are highlighted in green. The program requires the development of five unique 3-credit courses, which have already been proposed and approved on campus through appropriate channels.

Table 18. Planned Courses for Project and Thesis Options in the MS in ISE Program

Course Type	Course Number and Title	Project Credit Hours	Thesis Credit Hours
Core	EMGT 6300 Decision Analysis	3	3
Core	ENGR 6200 Statistical Inference for Engineers	3	3
Core	ISE 6500 Human Factors in Systems Design	3	3
Core	ISE 6920 ISE Professionalism	1	1
Project	ISE 6950 Professional Project	3	--
Thesis	ISE 6990 Research and Thesis	--	6-9
Management Elective Area	EMGT 6100 Engineering Management or EMGT 6210 Project Management I	12**	9-12***
Economics Elective Area	ISE 5710 Economic Evaluation of Engr. Projects* or ISE 6800 Systems Engr. and Life-Cycle Economics		
Modeling Elective Area	ISE 5410 Systems Simulation or ISE 6460 Optimization Methods		
Application Elective Area	ISE/ENGR 5500 Reliability & Quality Engineering or ME 5450 Design for Manufacturability or ISE 6970 Special Topics in ISE		
Technical Electives – Project Option	MATH 6070 & 6080 Applied Linear Statistical Methods I & II or MATH 6170 & 6180 Experimental Design I & II or MATH 6070 Applied Linear Statistical Methods I & MATH 6170 Experimental Design I	6	--
Technical Elective – Thesis Option	MATH 6070 Applied Linear Statistical Methods I or MATH 6170 Experimental Design I	--	3
Total	Minimum Requirements****	31	31

*ISE 5710 is required for both project and thesis options if the student's undergraduate curriculum did not include a course in Engineering Economics.

**For the project option, one 3-credit course from each of the four areas is required for a total of 12 credits.

***For the thesis option, one 3-credit course from each of three areas (a total of 9 credits) is required if the student's program specifies 9 credits of thesis research. One 3-credit course from each of the four areas (a total of 12 credits) is required if the student's program specifies 6 credits of thesis research.

****A maximum of nine credits of 5000-level coursework is permitted.

Four courses are highlighted in gold. These courses have also already been approved through the appropriate channels as new courses, but they represent additional implementations of already existing courses in other disciplines in the College of Engineering.

All non-highlighted courses are existing courses and are currently taught for other programs, except for ISE 6990, an existing course not currently active. Explanations and course catalog descriptions are included in the following sections, and course syllabi are in Appendix E.

New Courses

Five unique new 3-credit courses are required for the MS in ISE degree program. These include one required core course (ISE 6500 Human Factors in Systems Design), two economics area elective courses to provide breadth in that area (ISE 5710 Economic Evaluation of Engineering Projects and ISE 6800 Systems Engineering and Life-Cycle Economics), and two modeling area electives that provide depth in analytical methods (ISE 5410 Systems Simulation and ISE 6460 Optimization Methods).

As noted previously, four "new" courses are very similar to existing courses in other programs. One new MS in ISE course, ISE 5500 Reliability and Quality Engineering, currently exists at the undergraduate level as ENGR 4500 and VE 4500 and is taught by GIE Department faculty for the Vehicle Engineering concentration in the BS in Mechanical Engineering program. The new MS in ISE course will be dually listed and offered as ISE 5500 and ENGR 5500. The graduate implementation focuses on the same content as the undergraduate course but includes additional requirements for graduate credit. The remaining new courses are similar to existing courses in other programs and are standard for engineering master's programs. These courses include ISE 6920 ISE Professionalism, ISE 6950 Professional Project, and ISE 6970 Special Topics in ISE.

Catalog descriptions for all new courses are below, and course syllabi are in Appendix E.

<u>ISE 5410 Systems Simulation</u>
Prerequisite: Graduate standing. Completion of undergraduate, calculus-based statistics and probability course and undergraduate course in computer programming or consent of instructor.
Computer modeling of systems subject to uncertainty, using discrete-event simulation. Topics include the development of system models, selection of statistical distributions, routing decision rules, and the design and analysis of simulation experiments. (3 credits)

<u>ISE/ENGR 5500 Reliability and Quality Engineering</u>
Prerequisite: MATH 3470 or ENGR (CEE) 3720 or equivalent. Graduate standing.
Basic engineering and statistics principles as well as advanced tools focusing on design of experiments, statistical process control, and reliability engineering are presented. Theoretical and practical methods to improve the capability of systems to perform their designated functionalities, to predict the probability of their functioning without failures in certain

environments for desired periods, to assess their maintainability, availability and safety based on sampled data, and to make decisions on corrective action and mitigation. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus. (3 credits)

ISE 5710 Economic Evaluation of Engineering Projects
Prerequisite: Graduate standing. Completion of undergraduate, calculus-based probability and statistics course or consent of instructor.
Engineering economic techniques for analyzing investment opportunities under conditions of risk and uncertainty. The time value of investments and depreciation of capital are also explored. (3 credits)

ISE 6460 Optimization Methods
Prerequisite: Graduate standing. Completion of undergraduate, calculus-based probability and statistics course or consent of instructor.
Optimization methods used in modeling of engineering systems. Classical optimization techniques are addressed, including mathematical single-variable and multi-variable approaches, constrained problems, and search techniques. Linear and integer programming problems are addressed. Modern methods involving highly computational methods are also examined. (3 credits)

ISE 6500 Human Factors in Systems Design
Prerequisite: Graduate standing. Completion of undergraduate, calculus-based probability and statistics course or consent of instructor.
Consideration of human capabilities and limitations in design of technology that supports systems and users. Established engineering practices are covered in Human Factors Engineering design and evaluation methods. The human processing of data is addressed with cognition study and human-machine interfaces. (3 credits)

ISE 6800 Systems Engineering and Life-Cycle Economics
Prerequisite: Graduate standing. Completion of undergraduate, calculus-based probability and statistics course or consent of instructor.
Analysis of engineering systems for statistical and economic performance. Statistical analysis of system performance is introduced. The risks of system design, project outcomes, and forecasting are presented, mostly in terms of economic performance. (3 credits)

ISE 6920 ISE Professionalism
Prerequisite: Graduate standing in ISE.
Various aspects of professionalism from the perspective of industrial and systems engineering. Topics include degree requirements, resources available, research methods, engineering communications, engineering ethics, and professional growth and development. (1 credit)

ISE 6950 Professional Project
Prerequisite: Consent of instructor based on the completion of at least 24 credit hours in the MS in ISE program.
Individualized professional project that requires the student to demonstrate breadth of knowledge in the ISE discipline, depth in specific areas, and the ability to integrate what has been learned. Written project report and oral presentation are required. (3 credits)

ISE 6970 Special Topics in ISE
Prerequisite: Graduate standing. Approval by department chairperson. Selected topics of current interest in graduate-level industrial and systems engineering that are not covered in existing graduate courses. Course may be repeated for credit if course topics are different. (3 credits)

Existing Courses

Nine of the eighteen courses specified as core or electives for the MS in ISE project option (and seven of the seventeen courses specified for the MS in ISE thesis option) are currently being offered and taken by students in existing degree programs. In addition, ISE 6990 Research and Thesis was used in the terminated MS program in Industrial Engineering and remains in the course catalog. Catalog descriptions for these courses are shown below, and course syllabi are provided in Appendix E.

EMGT 6100 Engineering Management
Prerequisite: Graduate standing.
Broad introduction to engineering management fundamentals as applied to scientific or technological organizations, including discipline definitions, management and leadership principles, basic organization structures, project management practices, and ethical decisions. (3 credits)

EMGT 6210 Project Management I
Prerequisites: EMGT 6100 Introduction to Engineering Management and undergraduate calculus-based probability and statistics.
Comprehensive understanding of the fundamentals of project management as applied to scientific or technological organizations, including project planning, organizing, staffing, scheduling, budgeting and controlling. (3 credits)

EMGT 6300 Decision Analysis
Prerequisites: CEE 6200 Statistical Inference for Engineers.
The course will focus on complex decisions that involve tradeoffs among objectives or are made in the face of uncertainty. Topics include the nature of decision-making; tools for framing and analyzing hard decisions; risk and uncertainty in decision-making; the value of information; and ethical decision-making. (3 credits)

ENGR 6200 Statistical Inference for Engineers
Prerequisite: Introductory calculus-based statistics course or consent of instructor.
Decision making with hypothesis testing and confidence intervals. Multiple regression and stepwise regression. Design of one and multifactor experiments. 2k experiments with blocking and fractional factorials. Control charting of time series data. (3 credits)

ISE 6990 Research and Thesis
Prerequisite: Graduate standing in ISE and consent of instructor.
Independent research that requires the student to demonstrate breadth of knowledge in the discipline, depth in specific areas, and the ability to integrate what has been learned. Written thesis report and oral defense are required. (1 to 9 credits)

MATH 6070 Applied Linear Statistical Methods I
Prerequisite: Consent of instructor.
Regression analysis in the context of classical linear, nonlinear, generalized linear, and time series models. (3 credits)

MATH 6080 Applied Linear Statistical Methods II
Prerequisite: B or better in MATH 6070 or consent of instructor.
Regression analysis in the context of classical linear, nonlinear, generalized linear, and time series models. (3 credits)

MATH 6170 Experimental Design I
Prerequisite: Consent of instructor.
Introduction to basic concepts of experimental design, fundamental assumptions in analysis of variance, multiple comparison tests, complete randomized design, general linear model approach to ANOVA, various experimental designs, incomplete block designs, factorial experiments, fractional factorial experiments, response surface methods, repeated measure designs. (3 credits)

MATH 6180 Experimental Design II
Prerequisite: Consent of instructor.
Introduction to basic concepts of experimental design, fundamental assumptions in analysis of variance, multiple comparison tests, complete randomized design, general linear model approach to ANOVA, various experimental designs, incomplete block designs, factorial experiments, fractional factorial experiments, response surface methods, repeated measure designs. (3 credits)

ME 5450 Design for Manufacturability
Prerequisites: ME 3010, CEE 3110.
Material and manufacturing process constraints on design shape, size, and quantity; plastic and fibrous composite parts manufacturing; rapid prototyping; design for X; dimensions and tolerances. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus. (3 credits)

PROGRAM OF STUDY

Tables 19 and 20 show examples of programs of study for the thesis and project options, respectively. In Table 19, the program of study is for a student in the thesis option and represents full-time enrollment for a student not employed as a graduate assistant. The schedule assumes that the student takes nine credits during both the fall and spring terms of the first year and no credits during the first summer term. The final credits in the degree program will be completed during the spring term of the second year. If the student opts to enroll during the first summer term, all coursework could potentially be completed during the second fall term, i.e., in less than 18 months. As noted, this program of study is for a student not employed as a graduate assistant. Full-time enrollment for a student who has an appointment as a graduate assistant is six credits each fall and spring term. A student who is a graduate assistant taking six or seven credits each fall and spring term would typically need a third fall term to complete the degree program.

Table 19. Example Program of Study - Thesis Option, Full-Time On-Campus or Online Student

Semester and Year	Course	Credits	Course Type
Fall 1	ENGR 6200 Statistical Inference for Engineers	3	Core
	ISE 5710 Economic Evaluation of Engineering Projects	3	Econ. Elective
	MATH 6170 Experimental Design I	3	Tech. Elective
Spring 1	EMGT 6210 Project Management I	3	Mgmt. Elective
	ISE 6500 Human Factors in Systems Design	3	Core
	EMGT 6300 Decision Analysis	3	Core
	ISE 6920 ISE Professionalism	1	Core
Summer 1			
Fall 2	ISE 6970 Special Topics in ISE	3	Applic. Elective
	ISE 5410 Systems Simulation	3	Model. Elective
	ISE 6990 Research and Thesis	3	Thesis
Spring 2	ISE 6900 Research and Thesis	3	Thesis
	Total Credit Hours	31	

Table 20 shows an example of a program of study for a full-time student in the project option. This program of study assumes that the student takes three courses per fall and spring term and no courses during the summer term. At this level of enrollment, the student will graduate in two academic years, completing all requirements during the spring term of the second year.

As discussed previously, most online students enroll for only one or two courses per term because of the demands of their employment and will take longer than two years to complete their degree.

Table 20. Example Program of Study - Project Option, Full-Time On-Campus or Online Student

Semester and Year	Course	Credits	Course Type
Fall 1	ENGR 6200 Statistical Inference for Engineers	3	Core
	ISE 5710 Economic Evaluation of Engineering Projects	3	Econ. Elective
	MATH 6170 Experimental Design II	3	Tech. Elective
Spring 1	EMGT 6210 Project Management I	3	Mgmt. Elective
	ISE 6500 Human Factors in Systems Design	3	Core
	EMGT 6300 Decision Analysis	3	Core
	ISE 6920 ISE Professionalism	1	Core
Summer 1			
Fall 2	MATH 6070 Applied Linear Statistical Methods I	3	Tech. Elective
	ISE 5410 Systems Simulation	3	Model. Elective
	ISE 6970 Special Topics in ISE	3	Applic. Elective
Spring 2	ISE 6950 Professional Project	3	Project
	Total Credit Hours	31	

Both on-campus and online courses will have the same content. On-campus class sessions will be recorded for online students. Online students will be able to participate synchronously if their schedules permit or asynchronously if their schedules do not. Each class time slot will be organized with two sections, one for on-campus students and one for online students, so that the needs of both categories of students can be addressed and so that tuition and enrollment fees can be calculated accurately.[24]

ASSESSMENT AND EVALUATION

At Tennessee Tech, Institutional Effectiveness, which is part of the Institutional Assessment, Research, and Effectiveness Office, supports planning and assessment by departments and programs. Campus Labs software "is used as a repository for student learning and program outcomes, assessment results, and modifications aimed at continuous improvement" [40]. A staff member from Institutional Effectiveness works with programs on identifying the best assessment tools and processes for continuous improvement.

The GIE Department chairperson, with assistance from the MS in ISE Coordinator, will annually submit Institutional Effectiveness reports, which are reported as part of the SACSCOC accreditation process. These reports examine the degree of achievement of program and student learning outcomes with respect to identified thresholds.

[24] The THEC evaluation of the ENAPP asked: "Do you plan to offer separate on-ground and online courses for each course to accommodate these two different student populations?"

The GIE Department will use the following assessment tools to evaluate the effectiveness of the MS in ISE program in achieving specific thresholds for program goals and learning outcomes:

- Assignment outcomes from several courses, targeted to specific Student Learning Outcomes,
- Thesis and non-thesis project evaluations,
- GPA of students at graduation,
- Graduate student exit interviews,
- Time to degree completion,
- Surveys from alumni and employers, one year after graduation, and
- Feedback from advisory board to be created.

The assessment data will be collected by the faculty, the MS in ISE Coordinator, and the GIE Department chairperson, as appropriate. The data will be evaluated annually by the faculty and the advisory board. Improvements will be identified and implemented as needed.

In addition, the Tennessee Higher Education Commission requires a program review every five years for programs not otherwise accredited. The first academic program review would occur during the fifth year of the program. The GIE Department chair, the MS in ISE Coordinator, and other program faculty members are responsible for data collection and evaluation to support the goal of continuous improvement of the MS in ISE.

SECTION III. STUDENTS

ACADEMIC STANDARDS

Admission Requirements

To be admitted to the MS in ISE program, students must meet the requirements of the College of Graduate Studies, the College of Engineering, and the General and Industrial Engineering Department.

College of Graduate Studies General Requirements. Tennessee Tech's *2024-25 Graduate Catalog* [41] states the following general requirements.

> *Admission to the College of Graduate Studies is open to anyone holding a bachelor's or master's degree from an accredited college or university. A foreign degree must be equivalent to a U.S. Bachelor's degree and must be accredited by its regional or national accreditation agency or Ministry of Higher Education. Applicants should have completed undergraduate or graduate work of sufficient quality and scope to enable them to successfully pursue graduate study.*

Each prospective student must apply for admission and submit official transcripts of undergraduate and graduate credit from all institutions attended. The admission process is fully online. Details regarding application process, admission requirements, program of study, a graduate student handbook, and other pertinent information are given on the College of Graduate Studies website at https://www.tntech.edu/graduatestudies/index.php.

College of Engineering General Requirements. The 2024-25 Graduate Catalog provides a summary of multiple criteria considered for admission to the Master of Science programs in the College of Engineering, but each department and program has specific requirements that fit within those criteria. The criteria are considered holistically by the various graduate programs in the College of Engineering. A specific requirement for international students is achievement of "a score of at least 79 on the TOEFL or a minimum base score of 6.5 on the IELTS" [42].

GIE Department Requirements for the MS in ISE. The admission requirements for the MS in ISE are closely aligned with the admission requirements for the MSEM, since both degree programs are administered by faculty in the General and Industrial Engineering Department. The GIE Department admission requirements for the MS in ISE are as follows:

> *Admission to the MS in ISE program is open to anyone holding an accredited bachelor's or master's degree in engineering, computer science, or a closely related discipline. The admission decision is based on the criteria below.*

- *Undergraduate GPA: at least 3.0 on a 4.0 scale.*
- *Bachelor's degree: a bachelor's degree from an accredited program in engineering, computer science, or related area, all requiring mathematics at least through differential and integral calculus and including an upper division (junior or senior level) course in probability and statistics.*
- *Letters of Recommendation: two letters of recommendation that demonstrate strong evidence for success in the graduate program.*
- *Resume and Statement of Purpose: Current resume and a one-page (350-500 words) statement of purpose. The resume and statement of purpose may include professional considerations not specifically mentioned in the three previous criteria, such as relevant work experience, certifications, or test scores. In particular, the following information should be included in the resume or statement of purpose if applicable:*
    - *Work experience in engineering or a technological field. Such experience may include cooperative education or internship experiences.*
    - *Successful completion of the Fundamentals of Engineering examination.*
    - *Work training or experience in the use of probability and/or statistics, such as Six Sigma, Statistical Process Control, or other similar topics.*
    - *Post-graduate course completion at a university.*

The resume and statement of purpose provide an opportunity for holistic consideration of the admission criteria.

Since the GIE Department already offers the MSEM degree, the processes for admitting students to the MS in ISE program will be aligned with the processes for admitting students to the MSEM program. As with other graduate programs, MS in ISE students will be admitted through a cooperative effort of the College of Graduate Studies and the department.

When the College of Graduate Studies receives the student's application material, an official (electronic) application is created within secure, online, workflow software called Slate. After the applicant has submitted all supporting information, the GIE Department is notified it has access for review of the applicant's materials. The electronic file will be reviewed by the department's MS in ISE Coordinator, and an admission recommendation will be made to the College of Graduate Studies.

Based on the level of satisfaction of the above criteria, the MS in ISE Coordinator will either recommend admission to Full Standing, Provisional Standing, or Special Standing, or deny admission. Status may be changed to Full Standing after the student satisfies the requirements specified by the department at the time of admission.

The proposed MS in ISE admission requirements have been approved through all appropriate steps at Tennessee Tech and will be used at the time of program implementation.

Advising and Retention Requirements

Retention of students is accomplished through initial and ongoing advisement as well as through requirements by the College of Graduate Studies for appropriate progress in the program of study and toward meeting graduation standards.

Initial and Ongoing Advisement. Advisement of students will begin with their entrance into the MS in ISE program. The MS in ISE Coordinator will contact the student via email or telephone or both, for an introductory advising session. During this meeting, the MS in ISE Coordinator provides the initial information needed to help the student quickly get started in the graduate program.

The College of Graduate Studies generally requires students in master's programs to form an advisory committee having a minimum of three faculty members by the time 15 semester hours are earned [43]. The MS in ISE Coordinator serves as the academic advisor for each student until the student's advisory committee is formed. During the initial call, the MS in ISE Coordinator will determine whether the student has a particular area of interest or has already reached out to a faculty member to serve as chair of the student's advisory committee. If so, the student will be assigned for future advising to the appropriate faculty member, after consultation with that faculty member. The faculty advisor will chair the student's advisory committee and help the student select the additional committee members.

The advisory committee helps to guide the student's studies and progress toward completion of the degree requirements. The advisory committee has the following duties:

- Input to, review of, and approval of the student's program of study,
- Monitoring of academic progress, and
- Coordination of the thesis or non-thesis project.

Required Progress in Program of Study. A graduate student's program of study is documented in Degree Works, a web-based tool that helps the student and advisory committee chair to track the student's academic progress toward degree completion.

The College of Graduate Studies requires students to apply for admission to candidacy immediately following the completion of nine semester hours of graduate credit [44]. Requirements that must be met before approval of admission to candidacy for the MS in ISE include the following [44]:

- Achievement of Full Standing
- Completion of at least nine semester-hours of graduate credit with a minimum quality point average of 3.0
- Written approval by the student's advisory committee
- Written approval of the chairperson of the department

In accordance with current academic requirements, if the student's application for admission to candidacy is not approved due to academic deficiencies, the student cannot continue graduate study [44].

Continuous Enrollment in Program. The MS in ISE program includes the option for on-campus or online enrollment. An on-campus or online student is considered full-time if the student is enrolled with a minimum of nine credits each fall and spring semester, or six credits if the student is a graduate assistant [45]. A student who completes nine or ten credits each fall and spring term, and three credits in one summer term can graduate in 18 months. If summer credits are not taken, the student taking nine or ten credits each fall and spring term can graduate in two academic years.

A graduate student who is not a graduate assistant is considered part-time if the student is enrolled with three or six credits per semester during the fall and spring terms. At six credits per term (with seven credits for one term and no summer enrollment), the time-to-completion for a student in the MS in ISE program will be five semesters or 2.5 years. For a student who also enrolls part-time during the summer, the degree could potentially require only two calendar years.

Often, online students enroll in only one class per semester due to their employment requirements. They are still considered continuously enrolled by the university in such cases if they are enrolled in consecutive fall and spring semesters. Of course, their timeline for completion will then be longer. Experience with the MSEM program indicates that some students who are fully employed and located elsewhere will have difficulty maintaining continuous enrollment due to their work requirements. If the student does not enroll for at least one graduate course during a fall or spring semester, the student is placed in a non-attending status. The student must then apply for readmission to the College of Graduate Studies before re-engaging in MS in ISE class enrollment. Such readmission for a student in good standing is automatic.

Time Limit for Degree Completion. Students in a master's program must complete all requirements for the degree within six consecutive years. The time limit begins with the first semester the student is admitted and enrolled in a degree program. [46]

Graduation Requirements

Course Credits and Level. The College of Graduate Studies and College of Engineering require any candidate for the master's degree to complete at least 33 semester hours of credit in a non-thesis program, but a number of exceptions exist [47]. Like several other MS programs in the College of Engineering, the MS in ISE is proposed to require 31 semester credit-hours for either the thesis option or the non-thesis option.

The College of Graduate Studies requires at least 70% of the graduate course credits to be at the 6000 level or above for a master's degree. For the 31-credit master's program, this requirement implies that at most nine hours of the MS in ISE degree can be at the 5000 level.

Grades. As stated in the TTU *2024-25 Graduate Catalog* [48], "all graduate coursework is part of the graduate transcript and all grades earned are part of the cumulative grade point average (GPA)" including graduate courses that "are not part of the degree requirements. A graduate student must achieve a grade of at least 'C' on all graduate courses taken, including those taken for non-degree purposes, background courses, mandatory or pre-requisite courses, . . . , and on all undergraduate courses listed on the Program of Study." A minimum GPA of 3.0 is required both to graduate and to remain in good standing in the program.

Tennessee Tech will not accept more than six credit hours of "C" earned toward any graduate program. A graduate student may appeal an assigned grade through Tennessee Tech Policy 218 (Grade Appeals Policy). [48]

Completion Requirement. The MS in ISE program will require either a thesis or a professional project in which the candidate is expected to demonstrate a breadth of knowledge in the discipline, depth in specific areas, and the ability to integrate what has been learned. The student's thesis defense or project presentation is attended by advisory committee members, student peers, faculty, and other guests as appropriate, and the advisory committee evaluates the student's performance with respect to breadth, depth, and knowledge integration. Successful completion of the thesis or professional project is required for graduation.

MARKETING AND RECRUITMENT

The plan for marketing and recruiting students to the MS in ISE program will follow the well-established current practice for recruiting on-campus students including minority students in the College of Engineering (CoE) at Tennessee Tech. In addition, the program will participate in the recruiting activities conducted throughout the year by the College of Graduate Studies.

Recruiting will follow a multipronged approach, including the following activities:

- Develop brochures and a website for advertising the new program.
- Send emails and materials to students within the College of Engineering. Provide information that will help students in their decision-making process.
- Attend and recruit at student-based professional society meetings on campus and at conferences such as the Institute of Industrial and Systems Engineers Mid-Atlantic Regional Student Conference.
- Attend career development events at commercial and government organizations.
- Attend job recruitment fairs at regional colleges and universities with particular emphasis on underrepresented populations.

- Develop a "network" of connections with regional universities that have undergraduate engineering programs, but not graduate programs.
- Identify undergraduate students that are the best "fit" to this program and develop "pipelines" with colleagues at these institutions for new student referrals.
- Use Facebook, LinkedIn, and other social media to advertise the program.

The brochures, website, and recruiting events listed above will address the lack of knowledge about industrial engineering as an in-demand career field.[25] For example, co-op students who have industrial engineering experience, regardless of their undergraduate major, can be recruited.

The Office of Communications and Marketing provides design assistance for print and digital media including brochures, video and audio productions, photographs, and social media. This office helps to ensure that marketing resources are utilized effectively and will be used as a consultant for marketing plans and materials. Other specific recruiting initiatives aimed at current students, alumni, and employers were discussed previously on pages 23-24.

STUDENT SUPPORT SERVICES

Various academic and professional development support services are available to all graduate students to help them with their academic studies, technical writing, and professional development. Other support services are available to help students with personal issues such as mental health wellness and financial assistance. Many of these resources are available both to on-campus students and to online students through the respective services' online access and telephone systems. The following university offices and services provide services to graduate students:

- The Volpe Library at TTU offers many academic support services. The library provides resources through online access to books, journals, and articles as well as print materials, interlibrary loan, *Get It Now*, archives, and special collections. The College of Engineering is assigned a library liaison, who provides specific support to engineering faculty and students including sessions on how to use library services/resources, how to obtain interlibrary loans, and how to request resources to be purchased. Because the Volpe Library subscribes to many online databases containing engineering, business and general technical publications, resources are as easily accessible to online students as to on-campus students.
- Information Technology Services (ITS) provides support for all computing needs including video conferencing, software, and a high-performance computing (HPC) cluster. Computer labs are available in various locations on campus.

[25] The THEC evaluation of the ELON asked that the marketing section of the ENAPP address student lack of knowledge about industrial engineering as an in-demand career field.

- The Center for Innovation in Teaching and Learning (CITL) is available to help students navigate the iLearn system. The CITL also assists faculty with recommendations on methods to adopt for course needs.
- The College of Graduate Studies provides information and guidelines for graduate students through its website, handouts, and presentation sessions, and offers individual assistance in the office and by telephone.
- The Center for Career Development offers a range of services for students, faculty, and employers. Students can attend a series of professional development workshops and earn career readiness certificates. The Center staff members assist with resume development and practice interviews. Career fairs are held on campus, with at least two fairs for engineering majors, and the Center facilitates employer interviews for student co-operative education experiences and internships, as well as for jobs after graduation. Other services can be found at https://www.tntech.edu/career/index.php.
- The Office of Financial Aid (https://www.tntech.edu/financialaid), the Office of Scholarships (https://www.tntech.edu/scholarships/index.php), the Office of Military and Veterans Affairs (https://www.tntech.edu/veterans/index.php), and the Bursar's Office (https://www.tntech.edu/bursar/index.php) together provide information and financial resources, where assistance is justified and resources are available, to students seeking assistance to complete their degree programs.
- The Accessible Education Center (https://www.tntech.edu/disability/index.php) assists individuals with disabilities in gaining equal access to academic and physical environments through academic adjustments, assistive technology, software, and other support services.
- The Campus Health Services staff (https://www.tntech.edu/) offer acute and urgent care, preventive care, immunizations, physical exams, allergy injections, laboratory testing, and other services for enrolled students. Laboratory tests and medicines incur a small fee. Two health and accident insurance plans are available for reasonable rates for hospital and surgical coverage. [49]
- The mission of the Center for Counseling and Mental Health Wellness (https://www.tntech.edu/counsel/about.php) is "to promote healthy student development during the college experience" by offering "a wide range of mental health, educational, and consultative services to students and other members of the campus community." The Center also "offers brief, short term, solution focused therapeutic interventions" for Tennessee Tech students. [50]
- For students who wish to live on campus, the Office of Housing and Residential Life (https://www.tntech.edu/reslife/housing/index.php) provides options for campus housing and learning communities. Students who live on campus have free access to the Cookeville Area Transit System bus and Tennessee Tech's campus shuttles.
- Two offices assist students from underrepresented or underserved populations. The Office of Intercultural Affairs (https://www.tntech.edu/intercultural/about.php) promotes the "personal, cultural, social, and academic growth and development of students from underrepresented populations and encourages opportunities for all students to engage with others across differences" [51]. The Women's Center

(https://www.tntech.edu/women/about.php) “leads and supports efforts for women's equity across campus and the community” [52].

The MS in ISE Coordinator, each student’s advisory committee chair and members, and other graduate faculty members in the GIE Department are available to help with graduate student academic questions and needs. After the advisory committee is formed, the chair serves as the primary academic advisor, with input from the committee as previously explained in the section on Academic Standards: Advising and Retention Requirements. The advisory committee chair and other members help with issues related to coursework and the thesis or project, as applicable for the student’s degree program.

These support services help to ensure success for all students, including underserved and historically underrepresented students.

SECTION IV. INSTRUCTIONAL AND ADMINISTRATIVE RESOURCES

FACULTY RESOURCES

The program will be staffed by existing faculty along with new hires as described in the following sections.

CURRENT FACULTY

The GIE Department at TTU currently has four full-time tenure-track and tenured faculty positions and one lecturer. The Department Chair is included in the tenured faculty population. In addition, the department regularly supplements online teaching with at least one adjunct faculty hire. Of the tenure and tenure-track ranks, all four faculty members hold the rank of associate professor. Given the breadth of the general and industrial engineering fields, the GIE faculty body is diverse in academic background, having expertise in several areas related to general engineering, industrial engineering, and engineering management. The GIE faculty members are listed in Table 21 and online at https://www.tntech.edu/engineering/programs/gie/faculty-staff.php. Also listed in Table 21 are Mathematics Department faculty members who teach the technical electives specified in the MS in ISE program. As shown, some GIE faculty members who primarily support other degree programs or are not graduate faculty will not be teaching in the MS in ISE program. Brief faculty vitas for the graduate faculty participating in the MS in ISE program are included in Appendix F.

The GIE faculty are active in educational endeavors beyond their teaching requirements. Two of the faculty members are active directors or participants of student-oriented learning experiences, such as the Tennessee State Governor's School and the regional Lego League. Several faculty members are advisors to campus engineering professional organizations such as the SAE Baja, SAE AeroDesign, AIAA, and the Order of the Engineer. Two of the faculty members have ongoing research efforts funded by the university or government agencies. The College of Engineering provides funding for student-centered teaching strategies through the Engineering Enhancements for Student-Centered Learning @ Tech (ESCL@Te) program; and at least three faculty members have engaged in that program, one having been funded to begin new student-centered activities. Faculty members regularly write publications for presentations at peer-reviewed conferences focused on engineering education or their specific technical expertise.

The MS in ISE Coordinator will have overall curricular leadership of the program, and a new hire is planned for this role. However, the budgeting and similar administrative responsibilities will be overseen by the department chairperson, Dr. Chris Wilson. This division of responsibilities is the approach used for other programs in the GIE Department.

Table 21. Current Faculty Roster

Current Faculty Roster					
Faculty Name	**Highest Degree**	**Rank**	**Primary Department**	**Full-time or Part-time**	**% of Time Devoted to Program**
Chris Wilson*	Ph.D., Univ. of Tennessee	Associate Professor	GIE	Full-time	10%
Kristine Craven	Ph.D., Univ. of West Virginia	Associate Professor	GIE	Full-time	0%
Mazen Hussein*	Ph.D., Univ. of Wisconsin	Associate Professor	GIE	Full-time	50%
John T. Tester*	Ph.D., Virginia Tech Univ.	Associate Professor	GIE	Full-time	20%
Sabrina Wells	MSIE, TN Tech Univ.	Lecturer	GIE	Full-time	0%
David Smith*	Ph.D., Univ. of Georgia	Professor	Mathematics	Full-time	10%
Michael Allen*	Ph.D., Univ. of Georgia	Professor	Mathematics	Full-time	5%

*Graduate faculty

ANTICIPATED FACULTY

Table 22 shows that two new faculty positions are planned with both positions to be filled for the 2026-27 academic year. A full or associate professor will be recruited to serve as MS in ISE Coordinator. One additional faculty member will be hired at the assistant professor level.

Table 22. Anticipated Faculty and Instructional Staff

Anticipated Faculty and Instructional Staff				
Faculty Rank or Job Title	**Full-time or Part-time**	**Anticipated Salary**	**Anticipated Start Date**	**Comments**
Full or Associate Professor	Full-time	$150,000	Summer 2026	Program Coordinator
Assistant Professor	Full-time	$105,000	Fall 2026	

The new faculty members will be hired to bring expertise in human factors engineering, an area that is not the focus of any current faculty member, and in data analytics, an area of depth for the degree program. These additional capabilities will help to expand capacity for interdisciplinary research.

Details on the costs for faculty and instructional staff are provided in a separate section at the end of this narrative, along with the Financial Projection Form. Information on benefits and cost of living increases is provided in the new section, along with an explanation of planning year costs for faculty and instructional staff.[26]

NON-INSTRUCTIONAL STAFF

No new position is anticipated for non-instructional staff. The GIE Department has a full-time administrative associate who will assist the MS in ISE Coordinator and students as needed. This staff member provides similar support for all programs housed in the General and Industrial Engineering Department. Likewise, for laboratory and classroom support, the College of Engineering has a centralized technical staff pool to assist with equipment setup and maintenance in laboratories, along with three information technology support staff to provide support for computer hardware and software issues. The current staffing should be sufficient for assisting faculty and students in the new MS in ISE program.

[26] The THEC evaluation of the ENAPP requested inclusion of "a narrative regarding what is included in the planning year for the faculty and instructional staff costs" and information on "benefits and cost of living increases per year . . . to align with the financial projection form."

SECTION V. INSTITUTIONAL CAPACITY TO DELIVER PROPOSED PROGRAM

This section contains an explanation of existing and needed resources, along with cost projections for one-time and recurring expenditures as summarized in Table 23 at the end of this section.

ACCREDITATION

As noted in Section I, accreditation by the Engineering Accreditation Commission of ABET is typically sought only for undergraduate engineering programs. The MS in ISE program will not seek accreditation by the EAC of ABET. Thus, expenses are not required for either initial or ongoing accreditation.

CONSULTANTS

An external consultant will be needed for the one-time initial external review. A stipend of $3,000 is budgeted for this review. External consultants will be needed at a similar stipend every five years for program reviews, beginning in the fifth year of the program.

An Advisory Board will be formed with employers and alumni who can provide input on the MS in ISE program. The Board will meet twice a year with one of the meetings in person on campus. Expenses will be incurred for these on-campus meetings, and $500 is included annually in the budget.

EQUIPMENT

Existing Equipment

The primary equipment required to support the MS in ISE program is computing equipment for data modeling and analysis courses and equipment for a Human Factors Engineering laboratory for instruction and research.

Existing specialized classrooms will be available to the MS in ISE program. The GIE Department shares Clement Hall with engineering advisors, Information Technology Services, and College of Engineering research labs. The GIE chair has authority over several physical classrooms and a large lecture hall. If streamed services are required (such as for an exam or activity, e.g., presentations), three classrooms are specifically equipped with CAD-oriented desks. In addition, one room is equipped with a computer near each desk where students engage in groups around tables, and the presentation podium has more advanced display options with a large format LCD television for viewing remote presentations as well. A computer laboratory with

advanced capabilities in the new Ashraf Islam Engineering Building can be utilized by the program as well.

Existing computing resources and software are summarized in the Information Technology section.

Additional Equipment Needed

Laboratories will be needed for the Human Factors and Simulation courses and research. Both equipment and software will be needed. Equipment expenditures of $20,000 during the planning year and $10,000 for each of the following two years are budgeted to enable the new faculty hires to develop the laboratories with the human factors and other equipment they need for teaching and research. In addition, recurring expenses of $2,000 per year are budgeted for repairs and replacements. Computing and software needs are listed in the next section.

INFORMATION TECHNOLOGY

Existing Information Technology Resources

Computer resources for students and faculty are provided centrally through the university's Information Technology Services (ITS) Department. ITS provides assistance with computing issues through the myTech Helpdesk, which can be accessed by telephone, e-mail, or walk-up, with Helpdesk personnel physically located on the second floor of the Angelo and Jennette Volpe Library building. The HelpDesk is staffed from 7:00AM to 6:00PM Monday through Friday. In addition, the College of Engineering has three technical personnel with IT-related backgrounds who work with ITS and are designated to provide computer hardware and software support for College of Engineering faculty and courses.

ITS provides and supports traditional desktop laboratories on campus but also supports a range of other opportunities for accessing software and storage space, along with technology assistance, as follows:

- TechAnywhere virtual desktops provide on- and off-campus access to a computer environment similar to those found in campus computer labs. This environment is divided into desktop pools. In addition to the Anywhere Computer Lab pool, a student's course enrollment may grant access to additional pools with specialized software.
- LabDrive is a file storage space available for faculty, staff, and students using any computer lab on campus. This storage provides up to 5GB of space, and is available from any desktop, laptop, or virtual (VDI) lab computer. It provides temporary storage only.
- The myTech HelpDesk offers first-level (Tier1) IT services to the Tennessee Tech community. These services include password resets for student password resets in

network and e-mail accounts; network connectivity troubleshooting; general technology knowledge base; student PC Service, i.e., general assistance with computer-related issues for students currently enrolled at Tech; and Tier1 support for Tech-owned equipment and devices. Access is available by e-mail, telephone, and walk-up. A chat service is available during normal business hours.

- Tech provides a High-Performance Computing cluster and a staff member to support it. The staff member assists faculty and students with the use of the cluster, especially with ensuring that the cluster is used both efficiently and equitably across units that wish to use this resource. The staff member also provides short courses and other informal learning opportunities that support the optimal use of the cluster.
- LinkedIn Learning is an online learning portal offering video courses in multiple fields. It is available free to all Tennessee Tech faculty, staff, and students.
- Students can download a free copy of Microsoft Office as well as the current version of Windows used on campus. Faculty, staff, and students can also install Office 365 to work from home. Other software and hardware can be purchased at a discount.

The software available in the computing facilities varies depending on the discipline; but for computer facilities used by multiple disciplines, the standard GIE deployment includes Zoom, SolidWorks, LabVIEW, Maple, MATLAB, MS Teams, MS Office, MS Project, MS Visio, MS Visual Studio, Minitab, PuTTY, Python, Ruby, SAS, and others.

Information Technology Acquisitions Needed

Computing equipment for faculty and labs, simulation software, and software for human factors will be needed. In addition, some existing equipment will need to be replaced as it reaches the end of its useful life.

During the first year, the human factors lab will need computers and software at an expense of $10,000. The simulation lab will also need software at a cost of $10,000. During the first year, computers and software will be needed for two faculty hires at an expense of $3,500 per faculty member. These computers will be replaced after five years.

A recurring information technology expense of $5,000 is budgeted annually for software licenses and equipment replacements.

LIBRARY RESOURCES

Existing Resources

Volpe Library Organization. The Angelo and Jennette Volpe Library has several services to support academic programs through online e-mail, chat, and telephone. The Volpe Library is

regularly open 98 hours per week and keeps extended hours during projects week and final examinations week.

A comprehensive online learning and information resource environment is available to support teaching and learning, including the Center for Innovation in Teaching and Learning (CITL), online scientific research papers through the *Get It Now* feature, and online databases. The databases are available to any graduate student connected on-campus or remotely and logged in to the TechExpress secure connection.

The Volpe Library offers access to over 200,000 physical books and over one million electronic book titles. The library also has over 80,000 electronic journals. As a selective depository for U.S. government publications, the library receives materials from various government agencies. There are approximately 17,000 bound volumes of government publications and approximately 4,000 maps. The variety of online databases offers on-campus and off-campus access to magazines, journals, and e-books, many with full text. Students needing help finding resources, print or electronic, can make appointments online to connect with a librarian.

Like most university libraries, the Volpe Library has transitioned from a focus on providing on-site resources to an approach of enabling access to online resources. Numerous online databases, along with e-journals and government publications, are available from the library's website; please see https://www.tntech.edu/library/databases.php.

EagleSearch is the Volpe Library's comprehensive search service for resources. Available from the library's homepage, it searches most of the Volpe Library databases for journal articles, books, and conference proceedings. Every Tech student has an account that allows searches and results to be saved, and the search capability is integrated with inter-library loans and RefWorks. Interlibrary loan is a free service for the Tech community to find and access full-text resources. Resources requested are delivered within two to three days, if digital, to the requestor's account and provide PDF file access. Through the inter-library loan program, students and faculty have easy access to the holdings of most of the libraries in the United States and Canada, as well as a few libraries in other countries.

RefWorks is an online citation management software system provided to Tennessee Tech students and faculty. These systems allow access to the library's holdings and electronic resources from on- and off-campus locations.

Tennessee Tech has partnered with several libraries that augment the library resources on campus. Students and faculty have access to the libraries of the University of Tennessee at Knoxville and a reciprocal borrowing program with Vanderbilt University, located in Nashville. Tech's faculty build most of the library's collection by making purchase requests to the library tailored to fit their instruction and research needs. Faculty may submit requests either directly to the library online, or through their departmental liaison. Final decisions on purchases are made by the Volpe Library staff. The funds available for this purpose are sufficient to cover all faculty requests of this type.

Center for Innovation in Teaching and Learning (CITL). The Volpe Library is also the home of the Center for Innovation in Teaching and Learning, which offers comprehensive support for the design and evaluation of courses. The CITL helps in several specific ways, as described below.

- Teaching and Learning
  Faculty can work with a trained teaching and learning expert to communicate learning outcomes, create instructional activities, and construct assessments in significant and transformative ways.
- Instructional design
  The CITL also offers instructional design services specializing in online course and program development, design, and engagement. Services offered include coordination of new online course and/or program development and design; updating existing online offerings to increase engagement; recommendation or examination of Open Educational Resources (OERs) for use in online offerings; incorporating/increasing the use of iLearn into existing blended, hybrid, or in-person courses; and assistance with integration of supported technologies in collaboration with technology specialists.
- Instructional Technology
  Instructional Technology services support and train faculty in using software and equipment in the classroom from development to teaching and managing a class. They also offer individual consultation and assistance for supported software.

Other Resources in the Volpe Library. In addition to the resources previously discussed, other resources located in the Volpe Library are available for students and faculty**.** This access includes any enrolled on-campus or online student who may wish to come to campus to take advantage of these resources**.** The student's Tennessee Tech identification will enable that access.

- iCUBE
  Tennessee Tech's iCube is a place where students and faculty "imagine, inspire, and innovate" (i^3). The goal is to provide creative solutions to traditional problems through marketing, training, website and application development, public policy campaigns, and the application of emerging technologies, such as virtual reality.
- iMakerSpace
  The iMakerSpace is a university-wide available, student-centered space under the leadership of the Colleges of Engineering and Business. It is a maker-space with additive manufacturing machines and a variety of other modern fabrication tools. The iMakerSpace serves as a focal point on campus to provide training, service, partnership, research, and evaluation in innovation and entrepreneurship to all disciplines and course activities.

Acquisitions Needed During Planning and First Five Years

The major journals needed for research in industrial and systems engineering are included in the databases available through the Volpe Library.

MARKETING

Brochures, travel, and vendor registration fees for recruiting events are the expected costs associated with marketing the program. Travel costs for recruiting events are included in the travel budget, but vendor registration fees for participating in recruiting sessions are included here.

Initial costs will be for brochures and business cards, and an expense of $2,000 is budgeted. Vendor registration fees will be incurred annually for recruiting events, and $1,000 is budgeted.

FACILITIES

Existing Space and Facilities

The GIE Department has several nearby classrooms and computer labs in Clement Hall that are available to the MS in ISE program. In addition, the University manages classroom selection across campus to ensure that all campus programs have the classrooms needed.

The GIE Department has two labs in Clement Hall that are available for use by the MS in ISE program. Clement 122D (1000 ft^2) will be used for the Human Factors Laboratory. The lab has a seating capacity of 16 students, and there is space for research setups as well. The lab will have a dual undergraduate-graduate use. Clement 407 (1100 ft^2) is a classroom that can be repurposed for a graduate simulation lab with space for several collaboration areas and a small conference area.

Offices are available for new faculty and graduate students on Clement 3rd Floor—the current home of the General and Industrial Engineering Department. These offices are being vacated by the College of Engineering Student Success Center.

New and Renovated Facility Needs

While the two lab spaces mentioned above are available, some renovation and re-equipping is needed. Lab furniture (benchtops, etc.) and lab equipment for conducting human factors research are needed. Computers and software for simulation work are needed as well, but these equipment and information technology expenses are included in other categories. A one-time expenditure of $10,000 is included in this category for renovation of lab spaces during the planning year.

Office spaces will need some updating for two new faculty members. An expense of $4,000 is budgeted during the planning year for office renovations for the two faculty hires. The total one-time expenditure for facilities is $14,000.

TRAVEL

Recruitment and conferences are the main sources of recurring travel expenses for the program. A total of $1,000 annually is designated for recruitment travel, $5,000 annually is allocated for faculty travel to research conferences, and $2,500 annually is budgeted for student travel. Recruitment travel during the planning phase is also budgeted at $1,000.

OTHER RESOURCES

An amount of $5,000 per year is estimated for operational expenditures such as paper, copies, postage, telephones, and similar support.

SUMMARY OF RESOURCES NEEDED

As required in the ENAPP checklist, Table 23 provides a summary of the estimated one-time and recurring non-personnel costs to deliver the proposed program.

FINANCIAL PROJECTION FORM

Table 24 is the THEC Financial Projection Form, which includes non-personnel costs from Table 23, as well as personnel costs and projected revenues. Explanations of the amounts in the Financial Projection Form are included for each category of costs and revenues. Table 24 indicates that the program is financially feasible, with projected revenues exceeding projected costs in years 3 through 5.

Table 23. Estimated Costs to Deliver the Proposed Program

Estimated Costs to Deliver the Proposed Program						
One-Time Expenditures						
Category	**Planning**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Accreditation						
Consultants	$3,000					
Equipment	$20,000	$10,000	$10,000			
Information Technology	$20,000					
Library						
Marketing	$2,000					
Facilities	$14,000					
Travel	$1,000					
Other						
Total One-Time Expenditures	**$60,000**	**$10,000**	**$10,000**			
Recurring Expenditures						
Category	**Planning**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Accreditation						
Consultants		$500	$500	$500	$500	$3,500
Equipment		$2,000	$2,000	$2,000	$2,000	$2,000
Information Technology		$12,000	$5,000	$5,000	$5,000	$5,000
Library						
Marketing		$1,000	$1,000	$1,000	$1,000	$1,000
Facilities						
Travel		$8,500	$8,500	$8,500	$8,500	$8,500
Other		$5,000	$5,000	$5,000	$5,000	$5,000
Total Recurring Expenditures		**$29,000**	**$22,000**	**$22,000**	**$22,000**	**$25,000**
Grand Total (One-Time and Recurring)	**$60,000**	**$39,000**	**$32,000**	**$22,000**	**$22,000**	**$25,000**

Table 24. THEC Financial Projection Form

THEC

Financial Projections Form

Institution	Tennessee Technological University
Program Name	Master of Science in Industrial and Systems Engineering

Projected One-Time Expenditures

Category	**Planning**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6***	**Year 7***
Faculty & Instructional Staff								
Non-Instructional Staff								
Graduate Assistants								
Accreditation								
Consultants	$3,000							
Equipment	$20,000	$10,000	$10,000					
Information Technology	$20,000							
Library resources								
Marketing	$2,000							
Facilities	$14,000							
Travel	$1,000							
Other								
Total One-Time Expenditures	*$60,000*	*$10,000*	*$10,000*	*$0*	*$0*	*$0*	*$0*	*$0*

Projected Recurring Expenditures

Category	**Planning**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6***	**Year 7***
Faculty & Instructional Staff (Salaries+Benefits)	$8,281	$379,076	$390,448	$402,161	$414,226	$426,653		
Non-Instructional Staff								
Graduate Assistants		$22,939	$47,121	$48,400	$49,718	$51,075		
Accreditation								
Consultants		$500	$500	$500	$500	$3,500		
Equipment		$2,000	$2,000	$2,000	$2,000	$2,000		
Information Technology		$12,000	$5,000	$5,000	$5,000	$5,000		
Library								
Marketing		$1,000	$1,000	$1,000	$1,000	$1,000		
Facilities								
Travel		$8,500	$8,500	$8,500	$8,500	$8,500		
Other		$5,000	$5,000	$5,000	$5,000	$5,000		
Total Recurring Expenditures	*$8,281*	*$431,015*	*$459,568*	*$472,561*	*$485,944*	*$502,728*	*$0*	*$0*
Grand Total (One-Time and Recurring)	**$68,281**	**$441,015**	**$469,568**	**$472,561**	**$485,944**	**$502,728**	**$0**	**$0**

Projected Revenue

Category	**Planning**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6***	**Year 7***
Tuition		$162,841	$216,085	$259,137	$286,394	$310,370		
Grants (and Gifts)		$75,000	$175,000	$200,000	$200,000	$200,000		
Other (Fees)		$30,954	$44,929	$55,445	$61,533	$65,323		
Total Revenues	**$0**	**$268,795**	**$436,014**	**$514,582**	**$547,927**	**$575,693**	**$0**	**$0**

**Years 6 and 7 should only be included for doctoral programs*

One-Time Expenditures

The financial projection form section for one-time expenditures is shown below, along with an explanation for each category.

Projected One-Time Expenditures			
Category	**Planning**	**Year 1**	**Year 2**
Faculty & Instructional Staff			
Non-Instructional Staff			
Graduate Assistants			
Accreditation			
Consultants	$3,000		
Equipment	$20,000	$10,000	$10,000
Information Technology	$20,000		
Library resources			
Marketing	$2,000		
Facilities	$14,000		
Projected One-Time Expenditures (continued)			
Category	**Planning**	**Year 1**	**Year 2**
Travel	$1,000		
Other			
Total One-Time Expenditures	*$60,000*	*$10,000*	*$10,000*

Consultants. During the planning year, an external reviewer is required as part of the review process for evaluation of the proposal for the new degree program. An estimated budget of $3,000 is projected.

*Equipment***.** Equipment is needed for the startup of the program laboratories, but primarily for the Human Factors Laboratory. During the planning year, an amount of $20,000 is allocated, and funding amounts of $10,000 are allocated in each of the next two years. The faculty hires will specify the equipment to be purchased, but initial estimates have been made using current costs for typical equipment. Additional funds may be available from other sources for startup packages for new faculty. Computing hardware and software are not included here but are addressed in the next category.

*Information Technology***.** During the planning year, computers and software for the Human Factors Laboratory are estimated to be $10,000. Software for the Simulation Laboratory is also estimated to be $10,000 during the planning year for a total of $20,000.

*Marketing***.** An amount of $2,000 is allocated for marketing during the planning year.

Facilities. The space available for the Human Factors Laboratory will need to be renovated. Only minor renovation will be needed for the Simulation Laboratory. An amount of $10,000 is allocated during the planning year for work needed in these lab spaces. Faculty offices will need minor refreshing at a cost of $4,000 during the planning year.

Travel. An amount of $1,000 is allocated for travel during the planning year for recruitment. Travel during this year would primarily be focused on locations in the state of Tennessee that might partner with Tennessee Tech to recruit students for the MSISE program. Examples include other four-year institutions with primarily undergraduate engineering and related programs and employers who want to hire Tennessee Tech industrial engineers.

Recurring Expenditures

The financial projection form section for recurring expenditures is shown below with explanations following for each category.

Projected Recurring Expenditures						
Category	Planning	Year 1	Year 2	Year 3	Year 4	Year 5
Faculty & Instructional Staff (Salaries+Benefits)	$8,281	$379,076	$390,448	$402,161	$414,226	$426,653
Non-Instructional Staff						
Graduate Assistants		$22,939	$47,121	$48,400	$49,718	$51,075
Accreditation						
Consultants		$500	$500	$500	$500	$3,500
Equipment		$2,000	$2,000	$2,000	$2,000	$2,000
Information Technology		$12,000	$5,000	$5,000	$5,000	$5,000
Library						
Marketing		$1,000	$1,000	$1,000	$1,000	$1,000
Facilities						
Travel		$8,500	$8,500	$8,500	$8,500	$8,500
Other		$5,000	$5,000	$5,000	$5,000	$5,000
Total Recurring Expenditures	*$8,281*	*$431,015*	*$459,568*	*$472,561*	*$485,944*	*$502,728*

Faculty and Instructional Staff Salaries and Benefits. The following factors were used to estimate faculty salaries and benefits.

- Two new faculty hires are needed. Initial starting salaries are $150,000 for the faculty member who will serve as program coordinator and $105,000 for a new assistant professor. These salaries are for the academic year, i.e., fall and spring semesters.
- A 3% annual increase in salaries is projected each year after Year 1.
- Benefit costs during the academic year are at a factor of 42% of salaries.

- Because healthcare costs are deducted for summer during the academic year, summer benefit costs are only for FICA (Social Security and Medicare).
- Summer pay is based on a credit-hour allocation with one credit hour defined as 7.5 hours of work per week. Faculty hourly rates are calculated as the nine-month salary divided by 1462.5.
- During the planning year, the program coordinator will be hired to begin in July and budgeted for 2 credit hours (75 work hours) to help with program organization for the first fall semester.
- Each summer thereafter, a 2-credit assignment is factored into the salary and benefits based on the program coordinator's salary. In addition, another 3-credit course assignment is factored into the summer cost based on the other new faculty member's salary.

Graduate Assistants. The following factors were used to determine the cost of graduate research assistants for the program.

- One graduate research assistant (GRA) is included the first year, and two GRAs are included in each of years 2-5.
- GRAs are assumed to be on-campus students with full-time enrollments of six or seven credit-hours per term during the academic year except during the final term.
- No summer employment is projected.
- The initial GRA receives a stipend of $1600 per month for eight months during Year 1. The stipend amount will increase by 3% in Year 2 and each year thereafter.
- Benefit costs include FICA contributions as well as tuition and fees for full-time enrollment of credit hours each semester during the academic year.
- Tuition for Year 1 is calculated using the 2025-26 tuition rates, with a 3% increase, for six or seven credits of graduate courses per semester.
- Tuition is assumed to increase by 3% each year for years 2-5.
- Each semester's fees are calculated using the 2025-26 fees for on-campus graduate students plus academic course fees for engineering courses.
- Graduate tuition and fees for 2025 are posted on the bursar's website at https://www.tntech.edu/bursar/pdf/fees_25-26/gr_basic_ay26.pdf. Course fees are found at https://www.tntech.edu/bursar/pdf/fees_25-26/fees-course-selection-major_ay26.pdf.

Consultants. The program will have an advisory board that will meet virtually for some meetings but will be on campus at least once each year. An amount of $500 per year is allocated for the on-campus meeting. An external consultant is also budgeted at $3,000 for the five-year program review required as part of academic institutional assessment in Tennessee.

Equipment. Repair or replacement of laboratory equipment other than computing hardware and software is budgeted at $2,000 per year.

*Information Technology***.** During the first year, new computers and peripherals will be needed for the new faculty at estimated costs of $3,500 per faculty member. An amount of $5,000 is budgeted every year for software licenses and equipment replacement.

Marketing. An amount of $1,000 is budgeted every year for registration fees to participate in recruiting events.

Travel. Faculty travel to research conferences is budgeted at $5,000 per year, and student travel to conferences or other events is budgeted at $2,500 per year. Travel for recruitment is budgeted at $1,000 per year.

Other. Other operating expenses such as telephone, copier usage, paper, and office supplies are estimated to be $5,000 per year.

Projected Revenue

Below is the projected revenue section from the Financial Projection Form. Explanations follow for each category.

Projected Revenue						
Category	**Planning**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Tuition		$162,841	$216,085	$259,137	$286,394	$310,370
Grants (and Gifts)		$75,000	$175,000	$200,000	$200,000	$200,000
Other (Fees)		$30,954	$44,929	$55,445	$61,533	$65,323
Total Revenues	*$0*	*$268,795*	*$436,014*	*$514,582*	*$547,927*	*$575,693*

Tuition and Other (Fees). Tuition and fees are included in two different categories on the Financial Projection Form. These items are calculated using the projected enrollments and graduations shown in Table 10 of the ENAPP and the following assumptions and factors.

- Based on data for similar programs in the College of Engineering at Tennessee Tech, a time-to-degree average of two years is assumed for on-campus students, and a time-to-degree average of 3.5 years is assumed for online students.
- Paths for each student entering the program based on Table 10 have been developed to yield the expected time-to-degree average and graduation outcomes. Credit hour totals for each semester have been determined, considering attrition and graduation data.
- Tuition (but not fees) is estimated to increase at 3% per year for years 1-5. No increase is projected for fees.
- On-campus students who are not serving as GRAs are primarily considered to be full-time and taking nine or ten credits per semester except for the final semester and summers. Some may take only six credits per semester.
- On-campus students who serve as GRAs take six or seven credits per semester except for the final semester and summers.
- Revenues from on-campus students include tuition, service fees, and academic course fees as given for 2025-26 on the Bursar's websites: (https://www.tntech.edu/bursar/pdf/fees_25-26/gr_basic_ay26.pdf) and

(https://www.tntech.edu/bursar/pdf/fees_25-26/fees-course-selection-major_ay26.pdf).

- Online students are assumed to take three or six credits per semester based on experience with the MSEM program.
- Revenues for online students include tuition, online fees, and academic course fees (but no service fees) as shown on the websites listed previously.
- Course enrollments from students in other degree programs are projected to be 48 students enrolled in 3-credit MSISE courses in each academic year. Revenues from these students include tuition and student course fees. Neither service fees for on-campus students nor online fees for online students are included in the total.
- The total projected revenues include tuition and fees from on-campus and on-line students in the MSISE program as well as tuition and course fees for students in other graduate degree programs taking MSISE courses.

Grants (and Gifts). This category includes both funded research grants and gifts to the program as explained below.

- Faculty members hired with tenure and in tenure-track positions in the College of Engineering at Tennessee Tech are expected to write research proposals and receive funding for conducting the proposed research. Year 1 includes $75,000 in this category from one of the faculty members, and the amount increases to $100,000 in Years 2-5 for this faculty member. The second new faculty member is shown with funding of $75,000 starting in Year 2 and with $100,000 in Years 3-5.
- Research grants at Tennessee Tech are most often for support of graduate assistants, travel, equipment, faculty summer salary, and some faculty release time. Faculty members are given reduced teaching loads as new faculty to develop their research programs. The amounts shown are expected to offset graduate student costs, travel, and a small portion of academic-year faculty salaries listed as costs on the Financial Projection form as well as provide the 42% indirect costs required by the university for research projects. Because the projected research grant funds are expected to be used to offset costs and do not require additional resources beyond the amounts shown in the form, it is appropriate to include them as revenues here.
- Proposal success cannot be guaranteed, but other funds are available for supplementing various expenditures such as graduate students and travel. Two alumni have established an endowment fund for faculty support. Dean Slater also intends to provide support to the program through earnings from two endowments established for support of the previous industrial engineering programs.

REFERENCES

[1] Tennessee Higher Education Commission, Tennessee Department of Economic and Community Development, Tennessee Department of Labor and Workforce Development, and Tennessee Department of Education, "Academic Supply for Occupational Demand - In-Demand_Data_3-12-2025 Download," 12 March 2025. [Online]. Available: https://www.tn.gov/thec/data-research-reports/reports-studies-pub/supply-and-demand-report.html. [Accessed 18 August 2025].

[2] Tennessee Higher Education Commission, "Enabling the Competitive Edge: Tennessee Higher Education in the New Economy," 2020. [Online]. Available: https://www.tn.gov/content/dam/tn/thec/bureau/research/other-research/master-plan/finalmp.pdf. [Accessed 10 June 2022].

[3] National Center for Education Statistics, "The Classification of Instructional Programs," [Online]. Available: https://nces.ed.gov/ipeds/cipcode/searchresults.aspx?y=56&aw=systems%2cengineering&sw=1%2c2%2c3&ct=1%2c2%2c3&ca=1%2c2%2c5%2c3%2c4. [Accessed 30 August 2022].

[4] National Center for Education Statistics, "The Classification of Instructional Programs," [Online]. Available: https://nces.ed.gov/ipeds/cipcode/searchresults.aspx?y=56&aw=systems%2cengineering&sw=1%2c2%2c3&ct=1%2c2%2c3&ca=1%2c2%2c5%2c3%2c4. [Accessed 30 August 2022].

[5] Institute of Industrial and Systems Engineers, "About IISE," [Online]. Available: https://www.iise.org/details.aspx?id=282. [Accessed 30 August 2022].

[6] U.S. Bureau of Labor Statistics, Employment Projections Program, "Employment Projections > Data: Occupational Projections and Worker Characteristics," 18 April 2025. [Online]. Available: https://www.bls.gov/emp/tables/occupational-projections-and-characteristics.htm. [Accessed 22 July 2025].

[7] U.S. Bureau of Labor Statistics, Employment Projection Program, "Occupational Employment and Wage Statistics (OEWS) Survey: State Occupational Employment and Wage Estimates – Tennessee," May 2024. [Online]. Available: https://www.bls.gov/oes/#/area/4700000. [Accessed 22 July 2025].

[8] Tennessee Higher Education Commission, Tennessee Department of Economic and Community Development, Tennessee Department of Labor and Workforce Development, and Tennessee Department of Education, "Academic Supply for Occupational Demand," 2025. [Online]. Available: https://www.tn.gov/thec/data-research-reports/reports-studies-pub/supply-and-demand-report.html. [Accessed 22 July 2025].

[9] University of Alabama at Huntsville, "Academic Affairs\Offices\Office of Institutional Research, Effectiveness, and Assessment\Enrollment," 2025. [Online]. Available: https://www.uah.edu/academic-affairs/offices/oirea/enrollment. [Accessed 18 March 2025].

[10] Virginia Tech University, "University DataCommons Home / Institutional Data Home / Students / Enrollment Majors," 2025. [Online]. Available: https://udc.vt.edu/irdata/data/students/enrollment/index#college. [Accessed 18 March 2025].

[11] Tennessee Technological University, "Our Mission and Vision," [Online]. Available: https://www.tntech.edu/about/mission.php. [Accessed 21 June 2022].

[12] Tennessee Higher Education Commission, "Academic Program Inventory: API Search," 2025. [Online]. Available: https://thec.ppr.tn.gov/APIReports/ReportViewer.aspx?ReportName=API%20Comprehensive%20-%20Non-Terminated%20Programs. [Accessed 3 September 2025].

[13] University of Tennessee Knoxville, "Academic Catalog, 2025-26 Graduate Catalog, Industrial Engineering Major, MS," 2025. [Online]. Available: https://catalog.utk.edu/preview_program.php?catoid=55&poid=35145&returnto=11827. [Accessed 3 September 2025].

[14] University of Tennessee Knoxville, Department of Industrial and Systems Engineering, "Graduate Handbook," 20 December 2020. [Online]. Available: https://studylib.net/doc/27779352/graduate-handbook-ut-ise-revised-12.2020. [Accessed 3 September 2025].

[15] University of Tennessee Knoxville, Department of Industrial and Systems Engineering, "Industrial & Systems Engineering, Master's Program," [Online]. Available: https://tickle.utk.edu/ise/academics/grad/masters-program/. [Accessed 3 September 2025].

[16] University of Tennessee Martin, "Department of Engineering: Undergraduate Programs of Study," 2025. [Online]. Available: https://www.utm.edu/academics/departments/engineering. [Accessed 3 September 2025].

[17] University of Tennessee Martin, "2025-26 Undergraduate Catalog, Engineering, B.S.E. (6510)," 2025. [Online]. Available: https://catalog.utm.edu/preview_program.php?catoid=24&poid=6498&returnto=692. [Accessed 3 September 2025].

[18] Tennessee Technological University, "Graduate Degrees and Programs, Master of Science in Engineering Management," 2022. [Online]. Available: https://www.tntech.edu/engineering/programs/grad/msem/index.php. [Accessed 22 June 2022].

[19] University of Memphis, "2025-26 Graduate Catalog, Engineering Management - No Concentration (MS)," 2025. [Online]. Available: https://catalog.memphis.edu/preview_program.php?catoid=35&poid=14785&returnto=2204. [Accessed 3 September 2025].

[20] University of Memphis, "2025-26 Graduate Catalog, Engineering Management - Biomedical Engineering Concentration (MS)," 2025. [Online]. Available: https://catalog.memphis.edu/preview_program.php?catoid=35&poid=14934&returnto=2204. [Accessed 3 September 2025].

[21] University of Memphis, "2025-26 Graduate Catalog, Engineering Management - Manufacturing Concentration (MS)," 2025. [Online]. Available: https://catalog.memphis.edu/preview_program.php?catoid=35&poid=14735&returnto=2204. [Accessed 3 September 2025].

[22] University of Memphis, "2025-26 Graduate Catalog, Engineering Management - Transportation Concentration, (MS)," 2025. [Online]. Available: https://catalog.memphis.edu/preview_program.php?catoid=35&poid=14734&returnto=2204. [Accessed 3 September 2025].

[23] University of Tennessee Chattanooga, "2025-26 Graduate Catalog, Engineering Management, M.S.," 2025. [Online]. Available: https://catalog.utc.edu/content.php?catoid=51&navoid=2079. [Accessed 3 September 2025].

[24] Tennessee Higher Education Commission, "Academic Programs Inventory Database," 2025. [Online]. Available: https://thec.ppr.tn.gov/APIReports/ReportViewer.aspx?ReportName=API%20Comprehensive%20-%20Non-Terminated%20Programs. [Accessed 3 September 2025].

[25] University of Tennessee Knoxville, "2025-26 Graduate Catalog, Reliability and Maintainability Engineering Major, M.S.," 2025. [Online]. Available: https://catalog.utk.edu/preview_program.php?catoid=55&poid=35206. [Accessed 3 September 2025].

[26] Middle Tennessee State University, "Professional Science, Engineering Management Concentration, M.S.," 2025. [Online]. Available: https://www.mtsu.edu/program/professional-science-engineering-management-concentration-m-s/. [Accessed 3 September 2025].

[27] Vanderbilt University, "Online Learning, Master of Engineering in Engineering Management," 2025. [Online]. Available: https://www.vanderbilt.edu/online-learning/program/master-of-engineering-in-engineering-management/. [Accessed 3 September 2025].

[28] Vanderbilt University, "Risk, Reliability, and Resilience Engineering," 2025. [Online]. Available: https://www.vanderbilt.edu/reliability-studies/. [Accessed 3 September 2025].

[29] Vanderbilt University, "Vanderbilt School of Engineering, Minor in Engineering Management," 2025. [Online]. Available: https://engineering.vanderbilt.edu/departments/engineering-science-management/minor-ge/. [Accessed 3 September 2025].

[30] Christian Brothers University, "Academic Catalog 2025-26, Policies & Undergraduate Programs, School of Engineering, Engineering Management, Bachelor of Science," 2025. [Online]. Available: https://cbu.smartcatalogiq.com/en/2025-2026/catalog/policies-undergraduate-programs/school-of-engineering/engineering-management-bachelor-of-science. [Accessed 3 September 2025].

[31] Christian Brothers University, "Academic Catalog 2025-26, Graduate Programs and Policies, Graduate Programs in Engineering, Engineering Management, Master of Science," 2025. [Online]. Available: https://cbu.smartcatalogiq.com/en/2025-2026/catalog/graduate-programs-policies/graduate-programs-in-engineering/engineering-management-master-of-science. [Accessed 3 September 2025].

[32] Tennesse Higher Education Commission, Tennesseee Department of Labor and Workforce Development, Tennessee Department of Economic and Community Development, and Tennessee Department of Education, "Academic Supply for Occupational Demand Report," 2024. [Online]. Available: https://www.tn.gov/content/dam/tn/thec/bureau/research/other-research/supply-demand/2024/2024%20Supply%20and%20Demand%20Report.pdf. [Accessed 12 February 2025].

[33] University of Tennessee Knoxville, "Self-Service Majors Awarded Report," [Online]. Available: https://sas.utk.edu/SASVisualAnalytics/?reportUri=%2Freports%2Freports%2F7e2dae8d-c06d-471f-8828-01f8c7935972&sectionIndex=0&sso_guest=true&sas-welcome=false. [Accessed 11 February 2025].

[34] Tennessee Technological University, Institutional Assessment, Research, and Effectiveness, "Tech IARE Reports 2022-23," 2025. [Online]. Available: https://tennesseetechuniversity.sharepoint.com/:x:/r/sites/research/techsource/_layouts/15/Doc.aspx?sourcedoc=%7B4E579FB4-7BEF-4700-8C00-31CD288EC649%7D&file=Degrees%20by%20Level%20College%20Program%20Concentration%20and%20Term%202022-23.xlsx&action=defau. [Accessed 11 February 2025].

[35] Tennessee Technological University, Institutional Assessment, Research, and Effectiveness, "Tech IARE Reports 2023-24," 2025. [Online]. Available: https://tennesseetechuniversity.sharepoint.com/:x:/r/sites/research/techsource/_layouts/15/Doc.aspx?sourcedoc=%7B5B2AFBF9-60AF-41F3-AF90-

783A005C93F3%7D&file=Degrees%20by%20Level%20College%20Program%20Concentration%20and%20Term.xlsx&action=default&mobiler. [Accessed 11 February 2025].

[36] University of Memphis, "University of Memphis Degrees Awarded," 2025. [Online]. Available: https://www.memphis.edu/oir/data/public_degree_trends.php. [Accessed 12 February 2025].

[37] University of Tennessee Chattanooga, "Institutional Dashboards: Degrees Awarded," 2025. [Online]. Available: https://www.utc.edu/academic-affairs/planning-evaluation-and-institutional-research/institutional-dashboards/degrees-awarded. [Accessed 11 February 2025].

[38] Middle Tennessee State University, "Degrees By Academic Year Summary," 2025. [Online]. Available: https://app.powerbi.com/view?r=eyJrIjoiN2RlMmJlNTAtNmFlYi00NWRmLWI2MDMtODQ5NjgwYmYzNGRhIiwidCI6Ijc2MmViZjQwLTgwYjItNDBiYS04NmZlLTZkZDQwOWFjYjQ5OSIsImMiOjN9. [Accessed 11 February 2025].

[39] Middle Tennessee State University, "Degrees by Academic Year Summary," 2025. [Online]. Available: https://app.powerbi.com/view?r=eyJrIjoiN2RlMmJlNTAtNmFlYi00NWRmLWI2MDMtODQ5NjgwYmYzNGRhIiwidCI6Ijc2MmViZjQwLTgwYjItNDBiYS04NmZlLTZkZDQwOWFjYjQ5OSIsImMiOjN9. [Accessed 11 February 2025].

[40] Tennessee Technological University, "Institutional Effectiveness," 2025. [Online]. Available: https://www.tntech.edu/iare/effectiveness/index.php. [Accessed 12 March 2025].

[41] Tennessee Technological University, College of Graduate Studies, "Admission to the Graduate College," 2024. [Online]. Available: https://grad.catalog.tntech.edu/admission/admissioncollege. [Accessed 19 February 2025].

[42] Tennessee Technological University, "2024-25 Graduate Catalog, College of Engineering: Master of Science Admission Requirements," 2024. [Online]. Available: https://grad.catalog.tntech.edu/admission/coeadmissionsms. [Accessed 19 February 2025].

[43] Tennessee Technological University, "2024-25 Graduate Catalog, College of Graduate Studies, General Degree Requirements: Advisory Committee," 2024. [Online]. Available: https://grad.catalog.tntech.edu/degreerequire/general. [Accessed 11 February 2025].

[44] Tennessee Technological University, "2024-25 Graduate Catalog, College of Graduate Studies, Master's Degree General Requirements: Admission to Candidacy," 2024. [Online]. Available: https://grad.catalog.tntech.edu/degreerequire/degreerequire. [Accessed 12 February 2025].

[45] Tennessee Technological University, College of Graduate Studies, "2024-25 Tennessee Tech Graduate Catalog, Registration and Enrollment: Permissible Loads," 2024. [Online]. Available: https://grad.catalog.tntech.edu/registration/loads. [Accessed 25 February 2025].

[46] Tennessee Technological University, "2024-25 Graduate Catalog, College of Graduate Studies, Degree Requirements: General Degree Requirements," 2024. [Online]. Available: https://grad.catalog.tntech.edu/degreerequire/general. [Accessed 19 February 2025].

[47] Tennessee Technological University, "2024-25 Graduate Catalog, College of Graduate Studies, Master's Degree General Requirements: Program of Study," 2024. [Online]. Available: https://grad.catalog.tntech.edu/degreerequire/degreerequire. [Accessed 12 February 2025].

[48] Tennessee Technological University, "2024-25 Graduate Catalog, College of Graduate Studies, Registration and Enrollment--Graduate Courses," 2024. [Online]. Available: https://grad.catalog.tntech.edu/registration/courses. [Accessed 21 February 2025].

[49] Tennessee Technological University, College of Graduate Studies, "2024-25 Graduate Catalog, Student Health Services: Campus Health Services," 2024. [Online]. Available: https://grad.catalog.tntech.edu/support/health. [Accessed 12 March 2025].

[50] Tennessee Technological University, "About the Center for Counseling and Mental Health Wellness," 2025. [Online]. Available: https://www.tntech.edu/counsel/about.php. [Accessed 11 March 2025].

[51] Tennessee Technological University, Intercultural Affairs Office, "About the Intercultural Affairs Office," 2025. [Online]. Available: https://www.tntech.edu/intercultural/about.php. [Accessed 12 March 2025].

[52] Tennessee Technological University, Women's Center, "Women's Center," 2025. [Online]. Available: https://www.tntech.edu/women/about.php. [Accessed 12 March 2025].

APPENDIX A – LETTERS OF SUPPORT

This appendix contains letters of support from the following organizations.

ATC Automation
Atmus Filtration Technologies
FedEx
JR Automation
Nissan
Tenneco

atcautomation.com

2/21/2025

To whom it may concern:

ATC Automation in Cookeville, TN would find benefit to the skills acquired in a Master of Science in Industrial and Systems Engineering (MS in ISE) degree program for current and future employees. We would also like to partner and assist Tennessee Tech as needed.

We've always seen Industrial Engineering as being a great blend of math, computer science, and business combined with the engineering mindset. We are excited that Tennessee Tech is renewing its commitment to the field of Industrial Engineering through the General & Industrial Engineering Department. This commitment will lead to graduates who can be plugged into many different areas of our company. We have even used many pieces of software here at ATC Automation written by Industrial Engineers!

We can communicate with current employees who would benefit from the program and encourage them to enroll with more information in our flow down. Even though we already attend job fairs currently, we would also be interested in sponsoring tours, job shadowing and internships.

This program would be a great benefit to the community and current industry needs. We look forward to the creation of the MS in ISE Program at Tennessee Tech.

Regards,

Ethan Bernhardt
President, ATC Automation

Atmus™
FILTRATION TECHNOLOGIES ¶

Dr.·Chris·Wilson¶ **Mar·2025¶**
Tennessee·Tech·University¶
¶
¶
¶
Dear·Dr.·Wilson,¶
¶
As·manufacturing·is·transforming·into·the·next·phase,·"Industrial·4.0"·there·is·a·need·for·additional·skillset·of·new·graduates·that·are·hitting·the·work·field·in·MFG.··With·respect·to·I4.0·this·has·created·a·need·to·have·greater·integration·of·all·these·functions·of·MFG·into·these·skillsets·complimentary·to·Engineering·Degrees.··Decisions·are·now·driven·more·based·on·holistic·approach·of·incoming·data·from· systems· analysis· and· evaluation.· I'd· like· to· stress· that· this· is· built· on· the· premise· on· the·traditional·engineering·disciplines·of·mathematics,·physics·and·MFG·Lead·Design·but·with·the·need·to·have·an·integrated·systems·approach·of·all·the·MFG·Functions.·¶
¶
In·addition,·industry·is·looking·for·stronger·individuals·with·systems·integration·approach·that·will·bridge·the·gaps·that·we·are·seeing·in·the·I4.0·transition.·I·hope·this·feedback·will·help·in·any·new·degree·opportunities·that·TTU·may·consider.··¶
¶
Best·Regards,¶
¶
Jeff·A.·Bowerman¶
Global·MFG·Director¶
Atmus·Filtration·Technologies¶
Jeff.A.Bowerman@Atmus.com¶
¶

January 21, 2025

Dr. Chris Wilson
General and Industrial Engineering Department
Tennessee Tech University
P.O. Box 5002
Cookeville, TN 38505

Dear Dr. Wilson:

It was great talking with you. I am very excited to hear that Tennessee Tech is proposing to develop a new Master of Science degree program in Industrial and Systems Engineering (ISE) under the newly named General and Industrial Engineering Department. As a global transportation and logistics company headquartered in Memphis, TN, FedEx is a major employer of engineering talent in Tennessee and around the globe. We employ Industrial and Systems Engineers (both B.S and M.S.) in traditional ISE roles like Operational & Process Engineering and Project Management, as well as in roles like Data Analytics, Systems Modeling and Operations Research that also fall under the broad ISE umbrella.

Any help I can provide you in developing this program will be especially gratifying for me, considering I have both a B.S. and an M.S. in Industrial Engineering. FedEx hired me 28 years ago out of University of Alabama's M.S.I.E program, which is a testimony to FedEx's long-standing commitment to hiring such talent. I can also proudly say that my ISE coursework was instrumental in my growth within FedEx to where I am now heading a global Pricing organization employing over 200 employees with those very skills that got me into FedEx.

Please consider this letter as a support for your efforts to develop the ISE program, and an offer to serve as a contact for input in its development. Additionally, as an employer of the exact skills that the ISE program would develop in its graduates, both my organization (FedEx Pricing) as well as other FedEx departments in Memphis and the USA would be very interested in hiring both interns and graduates of the ISE program. FedEx also provides benefits for employees for their continued education that may also avail of this ISE program. I would also be delighted to serve as a member of an external advisory board for the program.

Thank you for the information about this potential new program. I look forward to hearing from you about its progress.

Sincerely,

Aashish Gahlaut
Vice President, Marketing - Enterprise Pricing
Mobile: +1 (901) 409-8467
E-mail: agahlaut@fedex.com

JR AUTOMATION
A Hitachi Group Company

4190 Sunnyside Dr.

Holland, MI 49424
833.800.7630
jrautomation.com

6.1

1/22/25

To whom it may concern:

JR Automation in Nashville, TN would find benefit to the skills acquired in a Master of Science in Industrial and Systems Engineering (MSISE) degree program for current and future employees. We would also like to partner and assist.

We can communicate with current employees who would benefit from the program and encourage them to enroll with more information in our flow down.
Currently JR automation offers tuition assistance for full time employees with tuition reimbursement for those who are employed for a year, and commit to two years in the field of study at JR.

Even though we already attend job fairs currently, we would also be interested in sponsoring tours, job shadowing and internships.

This would a great benefit to the community and current industry needs and can help as needed.

Regards,

Tessa Powell
Human Resource Manager South Division

From: Hale, Gerald (NNAS) <Gerald.Hale@Nissan-Usa.com>
Sent: Friday, March 28, 2025 4:38 PM
To: Wilson, Chris <ChrisWilson@tntech.edu>
Subject: Master of Science in Industrial and system Engineering

External Email Warning

This email originated from outside the university. Please use caution when opening attachments, clicking links, or responding to requests.

To Whom it may concern,

I'm excited to learn Tennessee Tech is considering implementing a Master of Science degree in Industrial and Systems Engineering.

As I have been with Nissan Smyrna / Nissan Canton for 34 years I can say that I appreciate the skills and talents that such a MS program would bring to all Automotive plants in Tennessee and South Eastern US region.

I graduated from Tennessee Tech (as well as my Son and Daughter) and personally wish I had the opportunity to work toward MS degree in Industrial and Systems Engineering.

I have seen firsthand the talent, value and positive mindset of multiple Tennessee Tech Engineering graduates within Industrial Engineering, Process Engineering, Quality Engineering and Facilities Engineering groups here at Smyrna.

Super excited to learn about the MS Industrial / Systems Engineering initiative and fully support.

Wings UP!!!!!!

Gerald Hale
Nissan North America
Senior Manager Nissan Smyrna Mfg
Parts Quality Engineering (PQE) P42S Program
983 Nissan Drive, Bin 1U, Smyrna, Tenn 37167
(cell) 615.796.5709
gerald.hale@nissan-usa.com

General Business - Tenneco Confidential

TENNECO

Dr. Chris Wilson
General and Industrial Engineering Department
Tennessee Tech University
P.O. Box 5002
Cookeville, TN 38505

January 29, 2025

Dr. Chris Wilson,

We have received word that the Tennessee Tech College of Engineering is reviewing the opportunity to develop a Master of Science in Industrial and Systems Engineering (MSISE) degree program. As part of this, you are investigating the interest and support for a MSISE program from local industry.

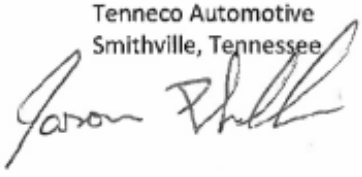
Tenneco has supported TTU Engineering often in the past, through hiring multiple co-ops over the years (some who have hired on full time), and allowing senior projects when the opportunity arises.

The local Tenneco (Smithville) plant believes that we would be able to support a MSISE program through:

- Encouraging employees who would benefit from the program to enroll
- Funding educational benefits for employees who enroll in the program
- Recruiting and hiring program graduates, when the opportunity is there
- Supporting student projects for students when possible
- Providing speakers or coordinating facility tours for ISE courses or student organizations
- Serving as a member of an external Board of Advisors for the program

Thank you for contacting us for our input regarding higher education.

Jason Phillips
Plant Manager
Tenneco Automotive
Smithville, Tennessee



APPENDIX B – ENROLLMENT AND GRADUATION PROJECTIONS

Projected enrollments and numbers of graduates were estimated separately for on-campus and online student populations.

ON-CAMPUS ENROLLMENT

Enrollment estimates were based on interest expressed by alumni for the MS in ISE from the survey of recent alumni. Interest in the MS in ISE was the same as interest in the MS in Civil Engineering (MSCE). The MSCE program has averaged 5.6 new students enrolling each fall during the past five years (2018-2022), along with an average continuing enrollment of 13.0 students for an average total enrollment of 18.6 students. These values were used to guide the projection of on-campus enrollments in the MS in ISE but with an increase to account for the pandemic.

The Tennessee Tech Office of Institutional Assessment, Research, and Effectiveness provided data showing a one-year persistence rate from 2017-2021 of 84.4% for on-campus fall MS graduate student cohorts in the College of Engineering and an average time-to-degree of 2.0 years. These data were used in projecting enrollments for on-campus students, along with the following assumptions.

- No students will earn a degree within one year of enrollment. Although the IARE data show that a number of students in existing, on-campus MS programs do complete their degrees within one year of enrollment, many of these programs have fast-track options allowing students to earn graduate credit as undergraduates to complete their MS degrees more quickly. The MS in ISE will not initially have a fast-track option.
- All students still in the program after two years will graduate during their third year, and 46.1% of students returning for their second year will graduate during that year.
- Enrollments are projected with the expectation that two faculty will have primary responsibility for the MS in ISE program.
- An attrition rate of 15.6% is applied for the on-campus new students from the first to the second fall semester.

Table B.1 shows the enrollment and graduation projections by year for on-campus students based on these data and assumptions. Table B.2 summarizes the results in the format requested by THEC.

Table B.1. Enrollment and Graduation Projections for On-Campus MS in ISE Students By Year

Entry Year	New Students	Attrition	Graduates				
			2026-27	2027-28	2028-29	2029-30	2030-31
2026-27	6	1		2	3		
2027-28	7	1			3	3	
2028-29	8	1				3	4
2029-30	8	1					3
2030-31	9	1					

Table B.2. Enrollment and Graduation Projections for On-Campus MS in ISE Students Summary

Year	Academic Year	New Students	Projected Total Fall Enrollment	Projected Attrition from Incoming Class	Projected Graduates
1	2026-27	6	6	1	0
2	2027-28	7	12	1	2
3	2028-29	8	17	1	6
4	2029-30	8	18	1	6
5	2030-31	9	20	1	7

ONLINE ENROLLMENT

The online enrollment estimates were based on data from enrollments in Tennessee Tech's MS in Engineering Management program, the only online program for which comparable data were available. However, the MSEM program began only in 2020, and the first graduates were in December 2022. Based on data from IARE for the MSEM program, the following assumptions were used to project online enrollments and graduates.

- No students will earn a degree during the first two years of enrollment. Although a few MSEM students complete two courses in a semester, most complete only one course each semester, so the expected time to complete their online degrees is 11 semesters, including summers, or almost four years. Similarly, for MS in ISE students, the expected completion time is ten semesters, which exceeds three years.
- All students still in the program after three years will graduate during their fourth year, and 10.0% of students returning for their third year will graduate during that year.
- Enrollments are projected with the expectation that two faculty will have primary responsibility for the MS in ISE program.
- Using the MSEM historical results, which occurred during the pandemic, an attrition rate of 80.0% was found. However, this rate has been adjusted, and a 40% attrition rate has been applied for online new students from the first to the second fall semester. Based on historical MSEM data, the attrition for returning students beyond the second fall semester is negligible.

Table B.3 shows the enrollment and graduate projections based on these assumptions by year, and Table B.4 provides a summary in the format requested by THEC.

Table B.3. Enrollment and Graduation Projections for Online MS in ISE Students by Year

Entry Year	New Students	Attrition	Graduates				
			2026-27	2027-28	2028-29	2029-30	2030-31
2026-27	3	1				2	
2027-28	3	1					2
2028-29	4	2					1
2029-30	4	2					
2030-31	5	2					

Table B.4. Enrollment and Graduation Projections for Online MS in ISE Students Summary

Year	Academic Year	New Students	Projected Total Fall Enrollment	Projected Attrition from Incoming Class	Projected Graduates
1	2026-27	3	3	1	0
2	2027-28	3	5	1	0
3	2028-29	4	8	2	0
4	2029-30	4	10	2	2
5	2030-31	5	11	2	3

TOTAL ENROLLMENT AND PROJECTED GRADUATES

Combining the enrollment, attrition, and projected graduates data for on-campus and online students in Tables B.2 and B.4 results in Table B.5. Table B.5 provides the data shown in Table 10, Section I, of this document.

Table B.5. Enrollment and Graduation Projections for All MS in ISE Students

Year	Academic Year	New Students	Projected Total Fall Enrollment	Projected Attrition from Incoming Class	Projected Graduates
1	2026-27	9	9	2	0
2	2027-28	10	17	2	2
3	2028-29	12	25	3	6
4	2029-30	12	28	3	8
5	2030-31	14	31	3	10

APPENDIX C – RESPONSE TO THEC COMMENTS IN ELON EVALUATION

The THEC evaluation of the ELON follows. Tennessee Tech responses are in red below the THEC comments in italicized and bold font.

Tennessee Higher Education Commission
Expedited Letter of Notification Evaluation
October 4, 2023

The evaluation of the Expedited Letter of Notification (ELON) is in accordance with the *THEC Policy A1.6 Expedited Academic Programs: Approval Process.* The evaluation is conducted by interested parties and THEC staff. The ELON is posted on the THEC website for a 10-day period of comment by interested parties. Based on the internal and external evaluation, THEC will make a determination to support, not to support, or defer a decision based on a revised ELON.

Institution: Tennessee Technological University	**LON Submission Date:** September 20, 2023
Academic Program, Degree Designation: Industrial and Systems Engineering, MS (MS in ISE)	
Proposed CIP Code: 14.3501 (Industrial Engineering, Systems Engineering)	
Proposed Implementation Date: Spring 2025	
Time Period Posted on Website for Public Comment: September 20-September 30, 2023	

Note: Comments in italics within this document should be addressed in the ENAPP.

Criteria	Comments
Letter of support from President/Chancellor	▪ A letter of support from President Phil Oldham dated September 13, 2023 and addressed to THEC Interim Executive Director Bob Smith is included in the ELON.
Overall Comments	▪ ***The degree designation is listed as MS, MS in ISE and MS-ISE – please clarify the intended degree designation.*** Response: The intended degree designation is MS in ISE.
Implementation timeline	▪ The tentative timeline for the proposed program includes the following key dates: o External Site Visit: Spring 2024 o Submission of external review report: Spring 2024 o Institutional response to external review: Spring 2024 o Proposed timeline for accreditation: Not Applicable o Proposed institutional governing board consideration date: June 2024 o Proposed THEC consideration date: July 2024 o Proposed date when students will enroll: Spring 2025 o ***In the ENAPP, please provide more specific dates for external review and institutional response.*** Response: More specific dates have been provided.

Background narrative	▪ TTU is proposing a Master of Science in Industrial and Systems Engineering to address a demonstrable and growing demand for industrial and systems engineers in the state. This Master of Science program allows a faster, less expensive (in terms of startup costs) response to workforce need, as students can complete the program in 18 months, versus four years for a Bachelor of Science. Approval of the proposed program would confer several other benefits at TTU, including coursework that would support other MS programs in the College of Engineering, assistance with faculty research activities, and opportunity for research collaboration with the new Engineering Management, MS. ▪ TTU plans to follow a successful MS program with a BS program if resources and demand prove sufficient. ▪ TTU previously offered BS and MS degrees in Industrial Engineering, but both programs were terminated in 2012 and 2010, respectively. Since the time of the termination of these programs, Industrial Engineering has become one of the fastest growing engineering disciplines in the US. ***In the ENAPP, please provide information about why these programs were terminated, and about what has changed on the campus since the termination.*** Response: Page 2 of the ENAPP includes two new sections: --Explanation for Prior Program Terminations --Changes on Campus Since the Prior Program Terminations ▪ The proposed program will not require extensive prerequisite coursework, which will attract students from non-industrial engineering disciplines. The curriculum will offer breadth across industrial and systems engineering and depth in data analysis and modeling, along with courses in engineering economics, human factors, and engineering or project management. ▪ The proposed program will require 32 credit hours and support both practitioner and research-focused students with a project option and thesis option. The program will be offered on-campus and online through full-time and part-time enrollment to accommodate working students. o All students will have three core topics courses (9 credits) and two core professionalism courses (1 credit each). o Students will also take courses from three (thesis option) or four (project option) focused elective areas to ensure breadth.

Justification for consideration of expedited policy	▪ Industrial engineers are cited as in-demand across eight of the nine industry clusters identified in THEC's Supply and Demand Report (Food and agriculture; health and life sciences; rubber, ceramics, and glass; automotive; electrical equipment and appliances; headquarters, finance and technology; aerospace and defense; chemicals). Students with data analysis and modeling skills are often hired to work in the last career cluster, distribution and logistics, and the proposed program will offer such training. Additionally, Industrial engineering is cited as an ''in demand occupation'' in the same source. o The Bureau of Labor Statistics projects a 13.1 percent national growth in employment from 2020-2030, which translates to 25,000 average job openings per year, higher than any other engineering field. BLS data also predicts that industrial engineering growth will be higher in Tennessee than in other states, likely due criticality of Industrial Engineering skills to the state's three major employment sectors, manufacturing, logistics, and healthcare. ▪ Despite the need for trained Industrial Engineers, few academic programs and graduates are available to fulfill the need. For example, in 2019-20, only 80 degrees BS and MS Industrial Engineering degrees were awarded in Tennessee, despite there being 6,930 jobs in the field. Anecdotal evidence reported by employers and alumni indicates that many industrial engineering positions are filled by engineers of other disciplines without the specialized training offered by an industrial engineering degree.
Existing programs of study at the institution	▪ The proposed MS in ISE does not come from an existing minor or certificate program. However, some courses are currently offered through other BS and MS programs in the College of Engineering, and an undergraduate minor in Industrial and Systems Engineering was approved in Fall 2022. ***Please provide current enrollment figures for the undergraduate minor.*** Response: Current enrollment figures are given for the undergraduate minor, and demand for industrial and systems engineering coursework is discussed.
Community and industry partnerships	▪ Letters of support for the proposed program were provided by: o Ethan Bernhardt, President, ATC o Jeff A. Bowerman, Global MFG Director Cummins Filtration; ***This letter is not properly dated (no year is indicated)*** o Aashish Galaut, Vice President of Marketing, FedEx o Tessa Powell, Human Resource Manager (South Division), JR Automation

	○ Greg Tompkins, Plant Manager, Tenneco Automotive ○ ***Several of these letters of support directly address the development of a BS program rather than an MS program. Please ensure corporate partners are offering the same support for the proposed MS and attach updated letters.*** Response: All letters have been updated and are now properly dated. All support the development of an MS program. A letter from Nissan has been added. ▪ One hundred seventy-one employer representatives who recruited TTU engineering students from Fall 2021 to Fall 2022 were sent a survey to determine employer need for academic training in Industrial Engineering. The survey had 35 responses, with 42 percent (roughly 15 respondents) indicating that their organization hires industrial engineers and another 42 percent indicating they would definitely or probably be interested in interviewing students of the proposed program.
Accreditation	▪ The Engineering Accreditation Commission of ABET (EAC-ABET) supports accreditation of engineering master's programs, but few programs in the US opt to seek it and instead focus on accrediting baccalaureate programs. TTU does not intend to seek accreditation for the proposed program.
Administrative structure	▪ The proposed program will be housed in the General and Basic Engineering Department, one of six departments in the College of Engineering. ▪ A program director will be hired to lead the proposed MS in Industrial and Systems Engineering. ***When will this search begin?*** Response: The program coordinator search will begin in December 2025, given approval of the proposed program by THEC at the November meeting.

Enrollment and graduation projections

- Projected enrollments for part-time and full-time students are as follows and are based on persistence and graduation data in existing MS programs in engineering:

Academic Year	Projected Fall Enrollment	Projected Attrition	Projected Graduates
Spring 2025	4 (2 FT, 2 PT)	1	0
2025-2026	9 (6 FT, 3 PT)	3	0
2026-2027	13 (9 FT, 4 PT)	3	3
2027-2028	16 (10 FT, 6 PT)	4	3
2028-2029	19 (12 FT, 7 PT)	4	5

- ***These enrollment projections point to a program that is aimed right at THEC's minimum productivity threshold (5 graduates a year for Master's degrees). The low number of projected annual graduates may be a challenge going forward. Please provide information to address concerns in relation to the THEC definition of low-producing program in the ENAPP.***

  Response:

  Table 10 on page 13 shows updated projections, based on a more realistic attrition rate for online MS in ISE students. The discussion specifies that the initial projections are based on the incremental addition of some new hires to build and deliver the program in conjunction with existing faculty. The long-term projections are for a sustainable enrollment that exceeds the THEC definition of a low-producing program.

- ***The enrollment projections seem to imply that the only full-time enrollment option will be for in person attendees. In the curriculum section of the ENAPP, make sure to describe the fulltime and part-time pathways through the program.***

  Response:

  Tables 19 and 20 on page 33 show examples for full-time enrollment of thesis and project options for both on-campus and online students. Full-time enrollment in either option would permit degree completion within two academic years. Both full-time and part-time student enrollment is expected, and the ENAPP addresses potential pathways and timelines, such as a student serving as a graduate assistant with reduced credit-hour requirements for full-time status

	or a fully employed professional taking courses online and part-time as the student's work schedule permits. ▪ The MS in Engineering Management informed projections for online enrollments since it is the only data set available. However, the program began in 2020 and the implementation has been impacted by the COVID-19 pandemic. The campus believes the part-time projections are extremely conservative.
Alignment with State Master Plan and institutional mission profile	▪ The proposed program aligns with the State Master Plan for Higher Education Update in three ways: o The program will prepare students for employment as industrial and systems engineers and as operations research analysts, both of which are in high-demand and offer high starting salaries. o The program's emphasis on data analysis and modeling addresses the goal to increase offerings in data analytics in the state. o The program aligns with the plan's imperative for stackable credentials by offering educational advancement for engineers of various disciplines through specialized training in industrial and systems engineering, without requiring significant pre-requisite work. ▪ The proposed program aligns in numerous ways with TTU's institutional mission to "create, advance, and apply knowledge to expand opportunity and economic competitiveness" through infusion of STEM, "enduring education, impactful research, and collaborative service." o The Industrial and Systems Engineering, MS is a STEM infused program and promotes efficiency in the workforce through imparting skills in data analysis, data modeling, system design, and operation. o Student thesis research and collaboration with faculty promotes "impactful research" and advances knowledge. o The MS-ISE project will focus on real-world problem solving and will be an opportunity for collaborative service and enhancing economic competitiveness. o The program will be offered in two modalities to support enduring education.
Student interest	▪ Surveys were distributed to cooperative education programs student participants, recent engineering alumni, and current students. ***When were these surveys distributed?*** Response:

	The timing of each of the surveys is included in the discussion of the surveys and summarized here. --Cooperative education students survey – October 2022 --Recent alumni survey – October 2022 --Current students survey – May 2023 --Employer survey – November 2022 ○ The cooperative ed student survey garnered 21 responses and indicated that 40 percent of students learned about some ISE topics during their co-op work assignment. Nineteen percent indicated an interest in one or more ISE topics. No students indicated interest in enrolling in a master's degree after graduation. ○ The recent alumni survey was distributed to 2,236 COE alumni and had 105 completions (about average completion rate for emailed surveys). Respondents were asked to indicate if they were interested in seeking a graduate degree and if so, in which field. Thirty-seven respondents (35 percent) indicated an interest in a graduate degree and two expressed interest in Industrial and Systems Engineering. ○ The survey of current students received 37 responses (of 2,300+ distributed). Twelve students indicated that it was likely or extremely likely that they would consider pursuing a degree in Industrial Systems Engineering in the future, which 27 indicated that an MS in Industrial Systems Engineering would "enhance my employment prospects." ▪ ***It may be beneficial to include additional information about enrollment in related concentrations or minors at TTU, or enrollment trends in comparable programs in other states, to substantiate student demand.*** Response: Enrollment in minors is discussed, and examples are given of enrollment trends in comparable programs in other states. ▪ ***Please make sure to address the lack of knowledge about industrial engineering as an in-demand career field in the marketing section of the ENAPP.*** Response: The methods selected for marketing the new degree program provide opportunities to address the lack of knowledge about industrial engineering as an in-demand career field.

Existing programs offered at public and private Tennessee universities	▪ No institutions offer a program covering both industrial and systems engineering. The proposed program offers instruction in both, rather than focusing on one. ▪ Industrial Engineering (CIP 14.3501) o UTK - BS, MS, and PhD in Industrial Engineering (CIP 14.3501). These programs do not have a systems engineering focus. A detailed curriculum comparison is provided on pg. 24 on the ELON. o The University of Tennessee, Martin's Engineering, BS (CIP 14.0101) offers Industrial Engineering as a concentration, but the concentration is not active in the catalog. ▪ Systems Engineering o UTK, Master of Science in Industrial Engineering, Systems Engineering Concentration. ▪ Engineering Management (CIP 15.1501) o TTU, Engineering Management, MS o Memphis, Engineering Management, MS: Concentrations in Manufacturing or Transportation o UTC, Engineering Management, MS: Concentration in construction management o UTK, Engineering Management, MS UTK, Industrial Engineering, MS: Concentration in Engineering management (Phasing out in Spring 2024). o MTSU, Professional Science, MS; Concentration in Engineering Management. ▪ Industrial and Systems Engineering related programs offered at private institutions in TN include: o Vanderbilt, ME: concentrations in Engineering management and Risk, Reliability, and Resilience engineering. o Christian Brothers, Engineering Management, MS. ▪ ***Please provide the number of degrees awarded in each MS program listed for each of the last three years.*** Response: Table 14 provides enrollments for the MS programs with published enrollments for each of the past three years.
Articulation and transfer	▪ Transfer credit for the proposed degree will be evaluated in compliance with existing policies for graduate transfer credit at TTU.
Public comments	▪ No public comments were received.

APPENDIX D – RESPONSE TO THEC COMMENTS IN ENAPP EVALUATION

The THEC evaluation of the ENAPP follows. Tennessee Tech responses are in red below the THEC comments in italicized and bold font.

Tennessee Higher Education Commission
Expedited New Academic Program Proposal
July 11, 2025

In keeping with THEC Policy A1.6 Expedited Academic Programs: Approval Process, the ENAPP is submitted in entirety to THEC at the time the campus seeks to request an external review and complements the Expedited Letter of Notification (ELON) by addressing the additional criteria explained further in the ENAPP checklist.

Institution: Tennessee Technological University	**ENAPP Submission Date:** June 10, 2025
Academic Program, Degree Designation: Industrial and Systems Engineering, Master of Science (MSISE) ***Please confirm if the degree designation is MS or MSISE. On the cover form, it is listed as MS, but in all other places it is MSISE.*** **Response:** The degree designation is MS in ISE. The designation has been changed in the document to align with other MS programs in the College of Engineering at Tennessee Tech.	
Proposed CIP Code: 14.3501 (Industrial Engineering)	
Proposed SOC Code(s): 11-3051 (Industrial Engineering); 11-3051 (Industrial Production Managers); 11-9041 (Architectural and Engineering Managers); 17-2112 (Industrial Engineers); 25-1032 (Engineering Teachers, Postsecondary) ***Please confirm whether the 25-1032 (Engineering Teachers, Postsecondary) SOC Code should remain, or if the program primarily prepares students for the industrial engineering, production management, and engineering management roles in the other codes.*** **Response:** The 25-1032 (Engineering Teachers, Postsecondary) SOC Code should remain. Although the MS in ISE program primarily prepares students for the industrial engineering, production management, and engineering management roles in the other codes, MS in ISE graduates could also be prepared to teach some courses in undergraduate BS in ISE or other engineering BS programs.	
Proposed Implementation Date: August 1, 2026 ***Please confirm the implementation date. The proposal only states Fall 2026.*** **Response:** The proposed implementation date is August 1, 2026.	
Time Period Posted on Website for Public Comment: September 20 – September 30, 2023	

Note: Comments in italics within this document should be addressed in the Revised ENAPP.

Criteria	Comments
Letter of support from President/Chancellor	▪ A letter of support from President Phil Oldham dated September 13, 2023 and addressed to THEC Interim Executive Director Bob Smith is included in the ELON.

Implementation timeline	▪ The timeline for the proposed program includes the following dates: o External site visit: July 2025 o Submission of external reviewer report: August 2025 o Institutional response to external review: August 2025 o Proposed timeline for accreditation: Not Applicable o Proposed institutional governing board consideration date: September 25, 2025 o Proposed THEC consideration date: November 13, 2025 o Proposed date when students will enroll: Fall 2026
Background narrative	▪ TTU is proposing a Master of Science (MSISE) in Industrial and Systems Engineering to address a demonstrable and growing demand for industrial and systems engineers in the state. This MSISE program allows a faster, less expensive (in terms of startup costs) response to workforce needs, as students can complete the program in 18 months, versus four years for a Bachelor of Science. Approval of the proposed program would provide several other benefits at TTU, including coursework that would support other MS programs in the College of Engineering, assistance with faculty research activities, and opportunity for research collaboration with the Engineering Management, MS (MSEM). ***Please explain why a master's degree is the preferred approach to address workforce needs rather than reestablishing a bachelor's program.*** **Response:** The MS degree in ISE can be targeted to BS engineering graduates in other disciplines who may be working as industrial engineers without the knowledge they would get from a BS in ISE degree. BS engineering students in other disciplines often develop an interest in ISE through co-operative education experience; however, having earned extensive credits in another major prior to the co-op experience, it is not attractive to change majors as an undergraduate. The MS in ISE will enable BS engineering and technical graduates to earn an advanced degree with less time than for a second BS degree. Students in the program will gain a broad knowledge of ISE as well as depth in data analysis and modeling. The depth in data analysis and modeling addresses industry needs in Tennessee and will be at a level beyond that typically attained in a BS program because the MS in ISE program can build on undergraduate coursework required in BS engineering and related technical programs. ▪ TTU previously offered BSIE and MSIE degrees in Industrial Engineering, but both programs were terminated in 2012 and 2010, respectively. Since the time of the termination of these programs, Industrial Engineering has become one of the fastest growing engineering disciplines in the US. ▪ The MSIE in Industrial Engineering was terminated in 2010 after being placed on inactive status in 2003 due to low enrollment. During this period, two vacant Industrial Engineering faculty

	positions were moved to other higher-priority programs. Both the BSIE and MSIE programs were ultimately terminated in 2010 to satisfy budget reduction requirements in the College of Engineering, with the rationale being to cut a single engineering discipline rather than harm all engineering disciplines with significant cuts. The sixty-plus students enrolled in the BSIE in 2010 either transferred to other universities or continued to graduation, with the last class graduating in Fall 2012. Since the termination, the current administration has encouraged program growth to enhance the University's technological mission and economic development. The new Ashraf Islam Engineering Building had its grand opening in October 2024, and a second new engineering building (Advanced Construction and Manufacturing Engineering building) is in the planning stages. ▪ The proposed program will not require extensive prerequisite coursework, which will attract students from non-industrial engineering disciplines. The curriculum will offer breadth across industrial and systems engineering and depth in data analysis and modeling, along with courses in engineering economics, human factors, and engineering or project management. ▪ The program is specifically designed to attract graduates from other engineering disciplines who would be interested in an advanced degree in industrial and systems engineering but would not be interested in seeking a graduate degree in their undergraduate discipline, supporting the concept of stackable credentials identified in the TN State Master Plan Update of 2020. ▪ The proposed program will require 32 credit hours and support both practitioner and research-focused students with a project option and thesis option. The program will be offered on-campus and online through full-time and part-time enrollment to accommodate working students. Please note that the program as proposed in the ENAPP requires 31 credit hours, not 32 as stated above. ▪ All students will have three core topics courses (9 credits) and two core professionalism courses (1 credit each). Please note that the program as proposed in the ENAPP requires only one core professionalism course for 1 credit, not two core professionalism courses as stated above. The reduction of one credit-hour was made to align with recent changes implemented by other programs in the College of Engineering at Tennessee Tech. ▪ Students will also take courses from three (thesis option) or four (project option) focused elective areas to ensure breadth.

	▪ Industrial engineering has been identified as an "in-demand occupation" in Tennessee, with employers telling TTU administrators that they need industrial engineers and are forced to hire other majors because they no longer offer this academic program. ▪ The program's emphasis on analytical methods and systems engineering will serve the needs of Tennessee employers for both industrial engineers and operations research analysts, both identified as "in-demand" occupations in Tennessee.
Justification for consideration of expedited policy	▪ Industrial engineers are cited as in-demand across eight of the nine industry clusters identified in THEC's 2021Supply and Demand Report (Food and agriculture; health and life sciences; rubber, ceramics, and glass; automotive; electrical equipment and appliances; headquarters, finance and technology; aerospace and defense; chemicals). Students with data analysis and modeling skills are often hired to work in the last career cluster, distribution and logistics, and the proposed program will offer such training. Additionally, Industrial engineering is cited as an ''in demand occupation" in the same source. Please note that the database associated with the current Academic Supply for Occupational Demand report shows industrial engineers as in-demand for all nine industry clusters. The ENAPP has been updated to reflect this change. ▪ The Bureau of Labor Statistics in 2022 projects a 13.1 percent national growth in employment from 2020-2030, which translates to 25,000 average job openings per year, higher than any other engineering field. BLS data also predicts that industrial engineering growth will be higher in Tennessee than in other states, likely due criticality of Industrial Engineering skills to the state's three major employment sectors, manufacturing, logistics, and healthcare. ▪ Despite the need for trained Industrial Engineers, few academic programs and graduates are available to fulfill the need. For example, in 2019-20, only 80 degrees BS and MS Industrial Engineering degrees were awarded in Tennessee, despite there being 6,930 jobs in the field. Anecdotal evidence reported by employers and alumni indicates that many industrial engineering positions are filled by engineers of other disciplines without the specialized training offered by an industrial engineering degree. ▪ ***Please provide more recent demand data to supplement the 2019-2022 figures. Given the time that has elapsed since the initial data collection, updated projections would help ensure the market analysis reflects current industry conditions and employment trends.***

	Response: Tables 5 through 7 have been updated with current data from the Bureau of Labor Statistics on employment projections and current employment in Tennessee. Table 7 and related discussions have been updated with the current data from the 2025 Academic Supply for Occupational Demand publication.
Existing programs of study at the institution	▪ The proposed MSISE does not come from an existing minor or certificate program. However, some courses are currently offered through other BS and MS programs in the College of Engineering, and an undergraduate minor in Industrial and Systems Engineering (ISE) was approved in Fall 2022. ▪ For the ISE Minor, financial aid restrictions have prevented students from taking courses outside their major, resulting in minimal enrollment in the ISE minor and other minors. ▪ Only one student is currently enrolled in the ISE minor, but enrollment is expected to increase starting Fall 2025 due to newly created scholarships for ISE minor students. ▪ ***If possible, please provide Fall 2025 enrollment figures in the ISE minor to demonstrate increased student interest.*** **Response:** Official Fall 2025 enrollment figures will not be available until after the fall census date, i.e., September 4, 2025. However, a student can add a minor at any time, including after the census date. ▪ Students take some ISE minor courses, but do not declare the minor, when these courses fulfill requirements for their degree programs, creating a potential student base for the MSISE program. ▪ Graduate students from other engineering disciplines and computer science frequently enroll in existing courses that would be part of the proposed MSISE degree. ▪ Table 8 contains three years of enrollment data for both undergraduate ISE minor courses and existing graduate courses planned for the MSISE program. ▪ Graduate ISE programs at other institutions have experienced growth in recent years, with the University of Alabama in Huntsville seeing an 82.4% increase from Fall 2021 to Fall 2024 and Virginia Tech growing 38.1% from Fall 2020 to Fall 2024, demonstrating increasing student demand for these programs.

Community and industry partnerships	▪ Letters of support for the proposed program dated in 2025 were provided by:
	  ○ Ethan Bernhardt, President, ATC
	  ○ Jeff A. Bowerman, Global MFG Director Cummins Filtration;
	  ○ Aashish Galaut, Vice President of Marketing, FedExTessa Powell, Human Resource Manager (South Division), JR Automation
	  ○ Gerald Hale, Senior Manager, Nissan Smyrna
	  ○ Jason Phillips, Plant Manager, Tenneco Automotive
	▪ One hundred seventy-one employer representatives who recruited TTU engineering students from Fall 2021 to Fall 2022 were sent a survey to determine employer need for academic training in Industrial Engineering. The survey had 35 responses, with 42 percent (roughly 15 respondents) indicating that their organization hires industrial engineers and another 42 percent (n=15) indicating

<table>
<tr><td></td><td>they would definitely or probably be interested in interviewing students of the proposed program.</td></tr>
<tr><td>Accreditation</td><td>▪ The Engineering Accreditation Commission of ABET (EAC-ABET) supports accreditation of engineering master's programs, but few programs in the US opt to seek it and instead focus on accrediting baccalaureate programs. TTU does not intend to seek accreditation for the proposed program.</td></tr>
<tr><td>Administrative Structure</td><td>▪ The proposed program will be housed in the General and Basic Engineering Department, one of six departments in the College of Engineering.

Please note that the Department's name was changed after the ELON to the General and Industrial Engineering Department.

▪ A program coordinator will be hired to lead the proposed MSISE in Industrial and Systems Engineering. The search for this coordinator will begin after THEC approval of the new MSISE program, anticipated in November 2025.</td></tr>
<tr><td>Enrollment and graduation projections</td><td>▪ Projected enrollments for part-time and full-time students are as follows and are based on persistence and graduation data in existing MS programs in engineering:
<table>
<tr><th>Academic Year</th><th>Projected Fall Enrollment</th><th>Projected Attrition</th><th>Projected Graduates</th></tr>
<tr><td>2026-27</td><td>9 (6 On-Campus, 3 Online)</td><td>2</td><td>0</td></tr>
<tr><td>2027-28</td><td>17 (12 On-Campus, 5 Online)</td><td>2</td><td>2</td></tr>
<tr><td>2028-29</td><td>25 (17 On-Campus, 8 Online)</td><td>3</td><td>6</td></tr>
<tr><td>2029-30</td><td>28 (18 On-Campus, 10 Online)</td><td>3</td><td>8</td></tr>
<tr><td>2030-31</td><td>31 (20 On-Campus, 11 Online)</td><td>3</td><td>10</td></tr>
</table>
▪ The MSEM informed projections for online enrollments since it is the only data set available. However, the program began in 2020 and the implementation has been impacted by the COVID-19 pandemic.
▪ The faculty members plan to develop certificate programs using selected MSISE courses, which should encourage additional enrollment.
▪ Both full-time and part-time student enrollment is expected, and the ENAPP addresses potential part-time student pathways and timelines, such as a student serving as a graduate assistant with</td></tr>
</table>

	reduced credit-hour requirements for full-time status or a fully employed professional taking courses online and part-time as the student's work schedule permits. ▪ ***The ELON mentions part-time enrollment, please provide these figures in the enrollment and graduation table.*** **Response:** Based on historical experience with the MSEM, all online students are assumed to be part-time, and these students are already included in the enrollment and graduation table (Table 10). Appendix B shows the number of online students specifically. On-campus graduate research assistants (GRAs) are usually enrolled in less than nine credits per fall or spring semester but are considered full-time if enrolled for six credits each term during the academic year. Table 10 includes one GRA enrolled in the first year and two enrolled in each year following the first year. Most on-campus students are full-time but will often be part-time during their final semester because they need to complete only the remaining course credits required for graduation. ▪ Appendix B includes the underlying data and analysis that resulted in the enrollment, attrition, and projected graduate figures in the table above.
Alignment with State Master Plan and institutional mission profile	▪ The proposed program aligns with the State Master Plan for Higher Education Update in three ways: o The program will prepare students for employment as industrial and systems engineers and as operations research analysts, both of which are in high-demand and offer high starting salaries. o The program's emphasis on data analysis and modeling aligns with the state's goal to increase data analytics offerings. o The program aligns with the plan's imperative for stackable credentials by offering educational advancement for engineers of various disciplines through specialized training in industrial and systems engineering, without requiring significant pre-requisite work. ▪ The proposed program aligns in numerous ways with TTU's institutional mission to "create, advance, and apply knowledge to expand opportunity and economic competitiveness" through infusion of STEM, "enduring education, impactful research, and collaborative service." o The Industrial and Systems Engineering, MSISE is a STEM infused program and promotes efficiency in the workforce through imparting skills in data analysis, data modeling, system design, and operation. o Student thesis research and collaboration with faculty promotes "impactful research" and advances knowledge.

	○ The MSISE project will focus on real-world problem solving and will be an opportunity for collaborative service and enhancing economic competitiveness. ○ The program will be offered in two modalities to support enduring education.
Student interest	▪ Surveys were distributed to cooperative education programs student participants, recent engineering alumni, and current students. ○ In October 2022, the cooperative ed student survey garnered 21 responses and indicated that 40 percent of students learned about some ISE topics during their co-op work assignment. Nineteen percent indicated an interest in one or more ISE topics. No students indicated interest in enrolling in a master's degree after graduation. ○ In October 2022, the recent alumni survey was distributed to 2,236 COE alumni and had 105 completions (about average completion rate for emailed surveys). Respondents were asked to indicate if they were interested in seeking a graduate degree and if so, in which field. Thirty-seven respondents (35 percent) indicated an interest in a graduate degree and two expressed interest in Industrial and Systems Engineering. ○ In May 2023, the survey of current students received 37 responses (of 2,300+ distributed). Twelve students indicated that it was likely or extremely likely that they would consider pursuing a degree in Industrial Systems Engineering in the future, which 27 indicated that an MS in Industrial Systems Engineering would "enhance my employment prospects." ▪ ***Given the time gap since the last survey, could you provide additional recent demand data to support this program?*** **Response:** Three of the four surveys have been updated, with responses reported in the revised ENAPP. The results of the three surveys are as supportive as the previous results. ▪ ***Given the previous enrollment challenges in this field, what enrollment strategies and student recruitment initiatives does TTU plan to implement to ensure the success of this new program?*** **Response:** The proposed MS in ISE program differs substantially from the MS in IE program that was previously terminated. The ENAPP provides a new summary of the programs' differences on page 23 including campus environment, prerequisite requirements, target market, faculty, and program courses.

	In addition, College of Engineering marketing personnel will assist with a plan for marketing to the target market. Marketing will address current students on campus, alumni of Tennessee Tech, and engineering employers. ○ To promote awareness of ISE on campus, the GIE Department will celebrate the first annual ISE Day on-campus on September 15, 2025. ISE Day is a new national initiative sponsored by the Institute for Industrial and Systems Engineers and aimed at improving the public's understanding of ISE contributions to society. An alumni panel will be invited to help with this celebration event. ○ Monthly events such as information sessions or guest speakers are planned to increase awareness on campus of Industrial and Systems Engineering. ○ The Office of Alumni Affairs will be asked to assist in promoting awareness of the new degree program to Tennessee Tech alumni. ○ College of Engineering industrial liaisons will be asked to help the GIE department chair and the ISE program coordinator in establishing relationships with Tennessee employers interested in MS in ISE graduates.
Existing programs offered at public and private Tennessee universities	▪ No institutions offer a program covering both industrial and systems engineering. The proposed program offers instruction in both, rather than focusing on one. ▪ Industrial Engineering (CIP 14.3501) ○ UTK - BS, MS, and PhD in Industrial Engineering (CIP 14.3501). These programs do not have a systems engineering focus. A detailed curriculum comparison is provided on pg. 24 on the ELON. ▪ Systems Engineering ○ UTK, Master of Science in Industrial Engineering, Systems Engineering Concentration. ▪ Engineering Management (CIP 15.1501) ○ TTU, Engineering Management, MS ○ Memphis, Engineering Management, MS: Concentrations in Manufacturing or Transportation ○ UTC, Engineering Management, MS: Concentration in construction management ○ UTK, Engineering Management, MS UTK, Industrial Engineering, MS: Concentration in Engineering management (Phasing out in Spring 2024). MTSU, Professional Science, MS; Concentration in Engineering Management. ▪ Industrial and Systems Engineering related programs offered at private institutions in TN include: ○ Vanderbilt, ME: concentrations in Engineering management and Risk, Reliability, and Resilience engineering. Christian Brothers, Engineering Management, MS. ▪ The number of degrees awarded in each public institution's MS programs is listed on Table 14 on pg. 26 of the ENAPP.

Articulation and transfer	▪ Transfer credit for the proposed degree will be evaluated in compliance with existing policies for graduate transfer credit at TTU.
Public comments	▪ No public comments were received.
Specific Items Required for the Expedited New Academic Program Proposal	
Section II: Curriculum	
Catalog description	▪ The Catalog description is provided on pg. 26 of the ENAPP. ▪ Students can choose either a thesis or a non-thesis (project) option: o Thesis option: This option requires 31 credit hours, which includes 22-25 credit hours of coursework and 6-9 credit hours of thesis research. o Non-thesis (project) option: This option requires 31 credit hours, which includes 28 credit hours of coursework and a 3-credit professional project. ▪ ***Please confirm that all students in this program will complete 31 credit hours, even with variable credits within categories.*** **Response:** Yes, all students will complete a minimum of 31 credit hours. Some students in the thesis option may register for more than the minimum credit hours for thesis research.
Program learning outcomes	▪ There are three program learning outcomes, which state that graduates of the MSISE program will: o Apply advanced expertise, leadership, and scholarship in industrial and systems engineering to create value for their employers in Tennessee and beyond. o Demonstrate a commitment to professional development and continued learning through participation in further graduate studies, continuing education, training programs, or self-study. o Use industrial and systems engineering methods to serve the profession, community, or society.
Student learning outcomes	▪ There are also three student learning outcomes, which state that students in the MSISE program will: o Demonstrate subject knowledge, technical competence, and professional skills associated with the human factors, economic, analytical modeling, and systems aspects of industrial and systems engineering. o Conduct research or apply advanced analytical methods in the development of solutions to industrial and systems engineering problems. o Give professional presentations or write scholarly documents worthy of publication in conference proceedings ▪ and/or peer-reviewed journals.

Academic program requirements	▪ The MSISE degree requires 31 credit hours and offers both a thesis and a non-thesis (project) option. o Table 16 on pg. 31 provides information on the planned courses for the thesis option. o Table 17 on pg. 32 provides information on the planned courses for the non-thesis (project) option. ▪ The thesis option is designed for those students who want a research experience and for those who might want to pursue a doctoral degree after graduation. ▪ The non-thesis (project) option is designed for students who are interested in applying industrial and systems engineering methods as a practitioner in industry or other organizations after graduation or in their current job.
Existing and new courses	▪ Five new (3 credit hour) courses are required for the MSISE degree.These include: o ISE 6500 Human Factors in Systems Design o ISE 5710 Economic Evaluation of Engineering Projects o ISE 6800 Systems Engineering and Life-Cycle Economics o ISE 5410 Systems Simulation o ISE 6460 Optimization Methods ▪ Four (3 credit hour) courses are existing courses in other disciplines in the College of Engineering. However, they still need to be approved through the appropriate institutional channels as "new" courses because they will have additional implementations to be in the MSISE program. These include: o ISE 5500 Reliability and Quality Engineering o ISE 6920 ISE Professionalism o ISE 6950 Professional Project o SE 6970 Special Topics in ISE ▪ All other courses are currently being offered and taken by students in existing degree programs. These courses will not require modifications to be included in the MSISE program. They are all 3 credit hours, except for the ones that have credit hours listed below. These include: o EMGT 6100 Engineering Management o EMGT 6210 Project Management I (1 credit hour) o EMGT 6300 Decision Analysis o ENGR 6200 Statistical Inference for Engineers o ISE 6990 Research and Thesis (1 to 9 credit hours) o MATH 6070 Applied Linear Statistical Methods I o MATH 6080 Applied Linear Statistical Methods II o MATH 6170 Experimental Design I o MATH 6180 Experimental Design II o ME 5450 Design for Manufacturability
	▪ Course Catalog descriptions for all courses are listed on pgs. 34-37 in the ENAPP and Course Syllabi are in Appendix D.

Program of study	▪ A program of study is provided for full-time on-campus and online students for the thesis option in Table 19 on pg. 38 of the ENAPP. ▪ A program of study is for full-time on-campus and online students for the non-thesis (project) option in Table 20 on pg. 38 of the ENAPP. ▪ The proposed program is designed to be completed in two academic years, though part-time students will take longer to complete the program. ▪ ***Do you plan to offer separate on-ground and online courses for each course to accommodate these two different student populations?*** **Response:** No, each of the courses will have the same content with recorded class sessions for online students. Online students will be able to participate synchronously if their schedules permit or asynchronously if their schedules do not. Each class time slot will be organized with two sections, one for on-campus students and one for online students, so that the needs of both categories of students can be addressed and so that tuition and enrollment fees can be calculated accurately.
Academic standards	▪ Students must meet the requirements of the College of Graduate Studies (CGS), the College of Engineering (COE), and the GIE Department. ▪ The CGS requirements are open to anyone holding a bachelor's or master's degree from an accredited college or university. A foreign degree must be equivalent to a U.S. bachelor's degree and must be accredited by its regional or national accreditation agency or Ministry of Higher Education. Each student needs to apply through CGS' website. ▪ The COE requirements are determined by each department. For the GIE department, the MSISE program requirements will be closely aligned with the MSEM program, and include the following: o Anyone holding a bachelor's or master's degree in engineering, computer science, or a closely related discipline. o GPA of 3.0 on a 4.0 scale o A student with a bachelor's degree must have mathematics at least through differential and integral calculus and including an upper division (junior or senior level) course in probability and statistics. o Two letters of references o Resume and statement of purpose ▪ The retention standards are included on pgs. 42-43 of the ENAPP. They include required progress in the program, continuous enrollment, and a time limit of completing the degree in six years. ▪ The graduation requirements are also included on pgs. 43-44 of the ENAPP. They include students completing at least nine credit hours

	at the 5000 level, maintaining a 'C' or better in all graduate courses taken, maintaining a GPA of 3.0, and the completion of either a thesis or a professional project.
Marketing and recruitment	▪ The plan for marketing and recruitment will be multipronged and include: o Developing brochures and a website o Sending emails and materials within the COE o Attending student-based professional society meetings, conferences, career development events, and job recruitment fairs, o Developing a network of connections with regional universities that have undergraduate engineering programs, but not graduate programs o Identifying undergraduate students who are the best "fit" for this program to establish pipelines o Using social media for advertising purposes. ▪ The brochures, website, and recruiting events listed above will address the lack of knowledge about industrial engineering as an in-demand career field. For example, co-op students who have industrial engineering experience, regardless of their undergraduate major, can be recruited.
Student support services	▪ Advisement of students will begin with their entrance into the MSISE program. The MSISE Coordinator will contact the student via email, telephone, or both for an introductory advising session. ▪ The CGS requires students in master's programs to form an advisory committee having a minimum of three faculty members by the time 15 semester hours are earned. The MSISE Coordinator serves as the academic advisor for each student until the student's advisory committee is formed. ▪ During the initial call, the MSISE Coordinator will determine whether the student has a particular area of interest or has already reached out to a faculty member to serve as chair of the student's advisory committee. If so, the student will be assigned for future advising to the appropriate faculty member, after consultation with that faculty member. The faculty advisor will chair the student's advisory committee and help the student select the additional committee members. ▪ After the advisory committee is formed, the chair serves as the primary academic advisor, with input from the committee. The advisory committee chair and other members help with issues related to coursework and the thesis or project, as applicable for the student's degree program. ▪ TTU's various academic and professional development support services are listed on pgs. 45-46 of the ENAPP.

Section IV: Instructional and Administrative Resources	
Current faculty	▪ The GIE department currently has four full-time tenure-track and tenured faculty positions and one lecturer. Additionally, the department regularly supplements online teaching with at least one adjunct faculty hire. All four full-time faculty hold the rank of associate professor, and three of four faculty members have graduate faculty status ▪ There are also two faculty members at the full professor rank from the mathematics department who will teach the technical math electives specified in the MSISE program. ▪ The current faculty roster is included in Table 21 on pg. 48 of the ENAPP.
Anticipated Faculty	▪ Two new faculty positions are planned for the MSISE program. A full or associate professor will be recruited to serve as the MSISE coordinator, with an anticipated salary of $150,000 and an effective start date of summer 2026. The other faculty member will be hired at the assistant professor level, with an anticipated salary of $105,000 and an effective start date of fall 2026. These hires will also bring expertise in human factors engineering and data analytics. ▪ The anticipated faculty with salary information is included in Table 22 on pg. 49 of the ENAPP. ▪ ***Please include a narrative regarding what is included in the planning year for the faculty and instructional staff costs.*** **Response:** A new section has been included at the end of the narrative to explain the Financial Projection Form entries. The new section includes an explanation of the planning-year costs for the faculty and instructional staff. ▪ ***Please include benefits and cost of living increases per year in the narrative to align with the financial projection form.*** **Response:** Information on benefits and cost of living increases is provided in the new section of the narrative explaining the Financial Projection Form.
Non-Instructional Staff	▪ No new position is anticipated for non-instructional staff. ▪ The GIE Department has a full-time administrative associate who will assist the MSISE Coordinator and students as needed. ▪ For laboratory and classroom support, the COE has a centralized technical staff pool to assist with equipment setup and maintenance in laboratories, along with three information technology support staff to provide support for computer hardware and software issues. ▪ The current staffing is sufficient for assisting faculty and students in the new MSISE program.

Section V: Institutional Capacity to Deliver Proposed Program	
Accreditation	▪ As stated earlier, the MSISE program will not seek accreditation by the EAC of ABET. Thus, expenses are not required for either initial or ongoing accreditation.
Consultants	▪ An external consultant will be needed for the one-time initial external review. A stipend of $3,000 is budgeted for this review. External consultants will be needed at a similar stipend every five years for program reviews, beginning in the fifth year of the program. ▪ An Advisory Board will be formed with employers and alumni who can provide input on the MSISE program. The Board will meet twice a year, with one of the meetings in person on campus. Expenses will be incurred for these on-campus meetings, and $500 is included annually in the budget.
Equipment	▪ Laboratories will be needed for the Human Factors and Simulation courses and research. Both equipment and software will be needed. ▪ Equipment expenditures of $20,000 during the planning year and $10,000 for each of the following two years are budgeted to enable the new faculty hires to develop the laboratories with the human factors and other equipment they need for teaching and research. In addition, recurring expenses of $2,000 per year are budgeted for repairs and replacements.
Information Technology	▪ Computing equipment for faculty and labs, simulation software, and software for human factors will be needed. In addition, some existing equipment will need to be replaced as it reaches the end of its useful life. ▪ During the first year, the human factors lab will need computers and software at an expense of $10,000. ▪ The simulation lab will also need software at a cost of $10,000. ▪ Additionally, during the first year, computers and software will be needed for two faculty hires at an expense of $3,500 per faculty member. These computers will be replaced after five years. ▪ A recurring information technology expense of $5,000 is budgeted annually for software licenses and equipment replacements.
Library Resources	▪ The existing library resources are sufficient to support the MSISE program. These resources are listed on pgs. 52-54 of the ENAPP.
Marketing	▪ Initial costs will be for brochures and business cards, and an expense of $2,000 is budgeted. ▪ Vendor registration fees will be incurred annually for recruiting events, and $1,000 is budgeted.

Facilities	▪ The GIE department has several lab spaces, but some renovation and re-equipping are needed. Lab furniture (benchtops, etc.) and lab equipment for conducting human factors research are needed. ▪ A one-time expenditure of $10,000 is included for renovation of lab spaces during the planning year. ▪ Office spaces will need some updating for two new faculty members. An expense of $4,000 is budgeted during the planning year for office renovations for the two faculty hires. The total one-time expenditure for facilities is $14,000.
Travel	▪ Recruitment and conferences are the main sources of recurring travel expenses for the program. A total of $1,000 annually is designated for recruitment travel, $5,000 annually is allocated for faculty travel to research conferences, and $2,500 annually is budgeted for student travel. ▪ Recruitment travel during the planning phase is also budgeted at $1,000.
Other resources	▪ An amount of $5,000 per year is estimated for operational expenditures such as paper, copies, postage, telephones, and similar support.

APPENDIX E – COURSE DESCRIPTIONS FOR NEW COURSES

Course descriptions are included for the nine new courses, plus the ISE 6990 Research and Thesis course, which is currently inactive.

ISE 5410 Systems Simulation
ISE 5500 and ENGR 5500 Reliability and Quality Engineering
ISE 5710 Economic Evaluation of Engineering Projects
ISE 6460 Optimization Methods
ISE 6500 Human Factors in Systems Design
ISE 6800 Systems Engineering for Life-Cycle Economics
ISE 6920 ISE Professionalism
ISE 6950 Professional Project
ISE 6970 Special Topics in ISE
ISE 6990 Research and Thesis

Tennessee Tech University
General and Industrial Engineering Department
ISE 5410 Systems Simulation

3 Credit Hours, Fall 202x

Instructor Information

Name:

Office:

Telephone Number: 931-

Email: xxxxx@tntech.edu

Office Hours:

Course Information

Prerequisites

Graduate standing. Completion of undergraduate, calculus-based statistics and probability course and undergraduate course in computer programming or consent of instructor.

Texts and References

Required

W. David Kelton, Jeffrey S. Smith, David T. Sturrock. 2021. Simio and Simulation: Modeling, Analysis, Applications, 6th edition.[27]

Reference Text

Course Welcome and Description

ISE 5410 addresses the computer modeling of systems subject to uncertainty using discrete-event simulation. Addressed are the development of system models, selection of statistical distributions, routing decision rules, and the design and analysis of simulation experiments.

[27] Available free, online https://textbook.simio.com/books/SASMAA6.php

Course Objectives/Student Learning Outcomes

- Develop simulation models of systems subject to risk
- Design simulation experiments
- Analyze, interpret and communicate simulation results
- Understand the management of simulation projects

Major Teaching Methods

On campus lecture, with online learning management system support.

Special Instructional Platform/Materials

iLearn Learning Management System
Simio software for students (campus-based and student download)
Microsoft Excel software.

Topics to be Covered

- Discrete-event systems characteristics
- Spreadsheet simulation
- Selecting probability distributions
- Measures of risk and error
- Experiment design
- Assessing sensitivity and model risk
- Random-number and random-variate generation
- Simulation optimization
- Use of simulation in industry, case studies

Grading and Evaluation Procedures

30 % Assignments
40% Projects
30 % Exams.
Exam 1: 10%
Exam 2: 10%
Exam 3: 10%

Grading Scale

Letter Grade	Grade Range
A	90-100
B	80-89.9
C	70-79.9
D	60-69.9
F	Below 60

Course Policies

Academic Integrity

Maintaining high standards of academic integrity in every class is critical to the reputation of Tennessee Tech, its students, faculty, alumni, and the employers of Tennessee Tech graduates. Academic integrity is at the foundation of the educational process and key to student success. Students with academic integrity are committed to honesty, ethical behavior, and avoiding academic integrity violations. All students must read and understand Policy 216: Student Academic Integrity. Please see the Academic Integrity website (https://www.tntech.edu/provost/academicintegrity/) for more information.

AI Policy Statement

In this course, Generative AI resources are permitted only on assignments cleared marked with permission. Part of the course focuses on research tools and Generative AI is discussed. Students are expected to do all coursework themselves, as an individual or collectively, as designated by the instructor per assignment. Unapproved use of a Generative AI Tool to complete coursework constitutes academic misconduct for this course.

Disability Accommodation

Students with a disability requiring academic adjustments and accommodations must contact the Accessible Education Center (AEC). An accommodation request (AR) should be completed as soon as possible, preferably by the end of the first week of the course. The AEC is located in the Roaden University Center, Room 112; phone 372-6119. For more information see Tennessee Tech Policy 340 (Services for Students with Disabilities) at www.tntech.edu/policies.

Tennessee Tech University

General and Industrial Engineering Department

ENGR 5500 and ISE 5500 Reliability and Quality Engineering

3 Credit Hours, Fall 202x

Instructor Information

Name:

Office:

Telephone Number: 931-

Email: xxxxx@tntech.edu

Office Hours:

Course Information

Prerequisites

Prerequisite: MATH 3470 or ENGR (CEE) 3720 or equivalent or consent of instructor.

Texts and References

Required

Zio, Enrico, and Yan-Fu Li. System Reliability Assessment and Optimization: Methods and Applications. Hoboken, New Jersey: John Wiley & Sons, Incorporated, 2022.[28]

[28] Available at TTU Bookstore. Publisher and other locations also sell textbook. https://www.amazon.com/Strategic-Cost-Fundamentals-Technologists-Engineering/dp/3031793935/ref=monarch_sidesheet

Course Description

This course covers basic engineering and statistics principles as well as advanced tools focusing on design of experiments, statistical process control, and reliability engineering. Theoretical and practical methods to improve the capability of systems to perform their designated functionalities, to predict the probability of their functioning without failures in certain environments for desired periods, to assess their maintainability, availability and safety based on sampled data, and to make decisions on corrective action and mitigation. Students enrolled in the 5000-level course will be required to complete additional work as stated in the syllabus.

Course Objectives/Student Learning Outcomes

- Develop understanding of failure rate models
- Apply failure rate models to analysis of system reliability.
- Gain knowledge of standard maintenance and availability modeling methods.
- Recognize how to plan for reliability testing and data analysis.

Major Teaching Methods

On campus lecture, with online learning management system support.

Special Instructional Platform/Materials

iLearn Learning Management System

Microsoft Excel software.

Topics to be Covered

- Review of probability, random variables, and distributions
- Failure rate, Conditional failure, failure modes
- Time-dependent failure models
- Reliability System Modeling
- State-dependent Modeling
- Maintainability
- Availability
- Reliability Testing

Grading and Evaluation Procedures

40 % Assignments
60 % Exams.
Exam 1: 20%
Exam 2: 20%
Exam 3: 20%

Grading Scale

Letter Grade	Grade Range
A	90-100
B	80-89.9
C	70-79.9
D	60-69.9
F	Below 60

Course Policies

Academic Integrity

Maintaining high standards of academic integrity in every class is critical to the reputation of Tennessee Tech, its students, faculty, alumni, and the employers of Tennessee Tech graduates. Academic integrity is at the foundation of the educational process and key to student success. Students with academic integrity are committed to honesty, ethical behavior, and avoiding academic integrity violations. All students must read and understand Policy 216: Student Academic Integrity. Please see the Academic Integrity website (https://www.tntech.edu/provost/academicintegrity/) for more information.

AI Policy Statement

In this course, Generative AI resources are permitted only on assignments cleared marked with permission. Part of the course focuses on research tools and Generative AI is discussed. Students are expected to do all coursework themselves, as an individual or collectively, as designated by the instructor per assignment. Unapproved use of a Generative AI Tool to complete coursework constitutes academic misconduct for this course.

Disability Accommodation

Students with a disability requiring academic adjustments and accommodations must contact the Accessible Education Center (AEC). An accommodation request (AR) should be completed as soon as possible, preferably by the end of the first week of the course. The AEC is located in the Roaden University Center, Room 112; phone 372-6119. For more information see Tennessee Tech Policy 340 (Services for Students with Disabilities) at www.tntech.edu/policies.

Tennessee Tech University
General and Industrial Engineering Department
ISE 5710 Economic Evaluation of Engineering Projects

3 Credit Hours, Fall 202x

Instructor Information

Name:

Office:

Telephone Number: 931-

Email: xxxxx@tntech.edu

Office Hours:

Course Information

Prerequisites

Graduate standing. Completion of undergraduate, calculus-based probability and statistics course or consent of instructor.

Texts and References

Required

Creese, Robert. Strategic Cost Fundamentals: For Designers, Engineers, Technologists, Estimators, Project Managers, and Financial Analysts. Vol. 32. Netherlands: Springer Nature, 2022[29]

[29] Available at TTU Bookstore. Publisher and other locations also sell textbook. https://www.amazon.com/Strategic-Cost-Fundamentals-Technologists-Engineering/dp/3031793935/ref=monarch_sidesheet

Course Welcome and Description

ISE 5710 addresses engineering economic techniques for analyzing investment opportunities under conditions of risk and uncertainty. The time value of investments and depreciation of capital are also explored.

Course Objectives/Student Learning Outcomes

- Demonstrate ability to recognize different economic analysis situations.
- Apply models, tools, and techniques to economic models that require value determinations.
- Apply decision-making techniques appropriate for cost and profit-oriented project definitions.

Major Teaching Methods

On campus lecture, with online learning management system support.

Special Instructional Platform/Materials

iLearn Learning Management System
Microsoft Excel software.

Topics to be Covered

- Fundamental economic terms and concepts
- Non-time-value economic analysis
- Interest rates applications to engineering analysis
- Time valued economic analysis
- Depreciation and cash flow
- Project risk analysis

Grading and Evaluation Procedures

40 % Assignments
60 % Exams.
Exam 1: 20%
Exam 2: 20%
Exam 3: 20%

Grading Scale

Letter Grade	Grade Range
A	90-100
B	80-89.9
C	70-79.9
D	60-69.9
F	Below 60

Course Policies

Academic Integrity

Maintaining high standards of academic integrity in every class is critical to the reputation of Tennessee Tech, its students, faculty, alumni, and the employers of Tennessee Tech graduates. Academic integrity is at the foundation of the educational process and key to student success. Students with academic integrity are committed to honesty, ethical behavior, and avoiding academic integrity violations. All students must read and understand Policy 216: Student Academic Integrity. Please see the Academic Integrity website (https://www.tntech.edu/provost/academicintegrity/) for more information.

AI Policy Statement

In this course, Generative AI resources are permitted only on assignments cleared marked with permission. Part of the course focuses on research tools and Generative AI is discussed. Students are expected to do all coursework themselves, as an individual or collectively, as designated by the instructor per assignment. Unapproved use of a Generative AI Tool to complete coursework constitutes academic misconduct for this course.

Disability Accommodation

Students with a disability requiring academic adjustments and accommodations must contact the Accessible Education Center (AEC). An accommodation request (AR) should be completed as soon as possible, preferably by the end of the first week of the course. The AEC is located in the Roaden University Center, Room 112; phone 372-6119. For more information see Tennessee Tech Policy 340 (Services for Students with Disabilities) at www.tntech.edu/policies.

Tennessee Tech University
General and Industrial Engineering Department
ISE 6460 Optimization Methods

3 Credit Hours, Fall 202x

Instructor Information

Name:

Office:

Telephone Number: 931-

Email: xxxxx@tntech.edu

Office Hours:

Course Information

Prerequisites

Graduate standing.
Completion of undergraduate, calculus-based probability and statistics course or consent of instructor.

Texts and References

Required

Rao, Singiresu S. (2020). *Engineering Optimization - Theory and Practice (5th Edition).* John Wiley & Sons. [30]

[30] Available at TTU Bookstore. Publisher and other locations also sell textbook. **E-book is also acceptable**, as assignments and exams are open book, open note style. Exams are conducted in the classroom.

Course Welcome and Description

ISE 6460 introduces optimization methods used in addressing modeling of engineering systems. Classical optimization techniques are addressed, including mathematical single-variable and multi-variable approaches, constrained problems, and search techniques. Linear and integer programming problems are addressed. Modern methods involving highly computational methods will also be examined.

Course Objectives/Student Learning Outcomes

- Demonstrate an ability to identify different types of optimization situations and definitions.
- Apply models, tools, and techniques to engineering models that require optimal or near-optimal solutions.

Major Teaching Methods

On campus lecture, with online learning management system support.

Special Instructional Platform/Materials

iLearn Learning Management System
MatLab™ software.
Microsoft Excel software.

Topics to be Covered

- Classical Optimization
  - Single and multivariable
  - Constraints
  - Necessary and Sufficient Conditions
  - Lagrange Multipliers
- Linear programming
- Integer programming
- Modern methods
  - Genetic Algorithms
  - Neural Networks
  - Fuzzy Systems

Grading and Evaluation Procedures

40 % Assignments
60 % Exams.
Exam 1: 20%
Exam 2: 20%
Exam 3: 20%

Grading Scale

Letter Grade	Grade Range
A	90-100
B	80-89.9
C	70-79.9
D	60-69.9
F	Below 60

Course Policies

Academic Integrity

Maintaining high standards of academic integrity in every class is critical to the reputation of Tennessee Tech, its students, faculty, alumni, and the employers of Tennessee Tech graduates. Academic integrity is at the foundation of the educational process and key to student success. Students with academic integrity are committed to honesty, ethical behavior, and avoiding academic integrity violations. All students must read and understand Policy 216: Student Academic Integrity. Please see the Academic Integrity website (https://www.tntech.edu/provost/academicintegrity/) for more information.

AI Policy Statement

In this course, Generative AI resources are permitted only on assignments cleared marked with permission. Part of the course focuses on research tools and Generative AI is discussed. Students are expected to do all coursework themselves, as an individual or collectively, as designated by the instructor per assignment. Unapproved use of a Generative AI Tool to complete coursework constitutes academic misconduct for this course.

Disability Accommodation

Students with a disability requiring academic adjustments and accommodations must contact the Accessible Education Center (AEC). An accommodation request (AR) should be completed as soon as possible, preferably by the end of the first week of the course. The AEC is located in the Roaden University Center, Room 112; phone 372-6119. For more information see Tennessee Tech Policy 340 (Services for Students with Disabilities) at www.tntech.edu/policies.

Tennessee Tech University
General and Industrial Engineering Department
ISE 6500 Human Factors in System Design

3 Credit Hours, Fall 202x

Instructor Information

Name:

Office:

Telephone Number: 931-xxx-xxxx

Email: xxxxx@tntech.edu

Office Hours:

Course Information

Prerequisites

Graduate standing. Completion of undergraduate, calculus-based probability and statistics course.

Texts and References

Required

Lee, John D, Christopher D Wickens, Yili Liu, and Linda Ng Boyle. *Designing for People: An Introduction to Human Factors Engineering. 3rd edition.* Charleston, SC: CreateSpace, 2017. [31]

[31] Available at TTU Bookstore. Also available through publisher online: https://www.amazon.com/Designing-People-Introduction-Factors-Engineering-dp-1539808009/dp/1539808009/ref=dp_ob_title_bk

Course Welcome and Description

Human Factors Engineering (HFE) in system design requires engineers to consider human capabilities and limitations in order to design technology that supports the users. Established engineering practices are covered in HFE design and evaluation methods. The human processing of data is addressed with cognition study and human-machine interfaces.

Course Objectives/Student Learning Outcomes

- Demonstrate an ability to evaluate HFE characteristics of engineering situations.
- Apply HFE standards to engineering system design or analysis problems.
- Application of appropriate HFE standards for use in human work development.

Major Teaching Methods

On campus lecture, with online learning management system support.

Special Instructional Platform/Materials

iLearn Learning Management System

Microsoft Excel software.

Topics to be Covered

- HFE design and evaluation methods
- Visual sensory systems
- Auditory environments
- Cognition and memory
- Controls
- Human-computer interaction
- Anthropometry
- Human work and workspace design

Grading and Evaluation Procedures

40 % Assignments
60 % Exams.
Exam 1: 20%
Exam 2: 20%
Exam 3: 20%

Grading Scale

Letter Grade	Grade Range
A	90-100
B	80-89.9
C	70-79.9
D	60-69.9
F	Below 60

Course Policies

Academic Integrity

Maintaining high standards of academic integrity in every class is critical to the reputation of Tennessee Tech, its students, faculty, alumni, and the employers of Tennessee Tech graduates. Academic integrity is at the foundation of the educational process and key to student success. Students with academic integrity are committed to honesty, ethical behavior, and avoiding academic integrity violations. All students must read and understand Policy 216: Student Academic Integrity. Please see the Academic Integrity website (https://www.tntech.edu/provost/academicintegrity/) for more information.

AI Policy Statement

In this course, Generative AI resources are permitted only on assignments cleared marked with permission. Part of the course focuses on research tools and Generative AI is discussed. Students are expected to do all coursework themselves, as an individual or collectively, as designated by the instructor per assignment. Unapproved use of a Generative AI Tool to complete coursework constitutes academic misconduct for this course.

Disability Accommodation

Students with a disability requiring academic adjustments and accommodations must contact the Accessible Education Center (AEC). An accommodation request (AR) should be completed as soon as possible, preferably by the end of the first week of the course. The AEC is located in the Roaden University Center, Room 112; phone 372-6119. For more information see Tennessee Tech Policy 340 (Services for Students with Disabilities) at www.tntech.edu/policies.

Tennessee Tech University
General and Industrial Engineering Department
ISE 6800
Systems Engineering and Life Cycle Economics

3 Credit Hours, Fall 202x

Instructor Information

Name:

Office:

Telephone Number: 931-

Email: xxxxx@tntech.edu

Office Hours:

Course Information

Prerequisites

Graduate standing. Completion of undergraduate, calculus-based probability and statistics course or consent of instructor.

Texts and References

Required

Khisty, C. Jotin Mohammadi, Jamshid Amekudzi, and Adjo A. (2012). *Systems Engineering with Economics, Probability and Statistics (2nd Edition).* J. Ross Publishing, Inc [32]

[32] Available at TTU Bookstore. Publisher and other locations also sell textbook.

Reference Text
Farr, John, V. and Isaac J. Faber. Engineering Economics of Life Cycle Cost Analysis. Available from: VitalSource Bookshelf, (2nd Edition). Taylor & Francis, 2023.
https://doi.org/10.1201/9781003254782-9

Course Welcome and Description

ISE 6800 addresses the analysis of engineering systems for statistical and economic performance. Statistical analysis of system performance is introduced. The risks of system design, project outcomes, and forecasting are presented, mostly in terms of economic performance.

Course Objectives/Student Learning Outcomes

- Demonstrate ability to adapt systems approach to engineering analysis decision-making processes.
- Recognize and apply both deterministic and probabilistic modeling approaches to systems.
- Demonstrate an ability to characterize system performance in economic terms.
- Apply decision-making techniques appropriate for cost and profit-oriented project definitions.

Major Teaching Methods

On campus lecture, with online learning management system support.

Special Instructional Platform/Materials

iLearn Learning Management System

Microsoft Excel software.

Topics to be Covered

- Systems Engineering Problem-Solving
- Engineering Economics Basics
- Systems planning with Microeconomics
- Probability Fundamentals
- Random Variables
- “Hard” Systems Analysis (vs. “Soft”)
- Systems Thinking

Grading and Evaluation Procedures

40 % Assignments
60 % Exams.
Exam 1: 20%
Exam 2: 20%
Exam 3: 20%

Grading Scale

Letter Grade	Grade Range
A	90-100
B	80-89.9
C	70-79.9
D	60-69.9
F	Below 60

Course Policies

Academic Integrity

Maintaining high standards of academic integrity in every class is critical to the reputation of Tennessee Tech, its students, faculty, alumni, and the employers of Tennessee Tech graduates. Academic integrity is at the foundation of the educational process and key to student success. Students with academic integrity are committed to honesty, ethical behavior, and avoiding academic integrity violations. All students must read and understand Policy 216: Student Academic Integrity. Please see the Academic Integrity website (https://www.tntech.edu/provost/academicintegrity/) for more information.

AI Policy Statement

In this course, Generative AI resources are permitted only on assignments cleared marked with permission. Part of the course focuses on research tools and Generative AI is discussed. Students are expected to do all coursework themselves, as an individual or collectively, as designated by the instructor per assignment. Unapproved use of a Generative AI Tool to complete coursework constitutes academic misconduct for this course.

Disability Accommodation

Students with a disability requiring academic adjustments and accommodations must contact the Accessible Education Center (AEC). An accommodation request (AR) should be completed as soon as possible, preferably by the end of the first week of the course. The AEC is located in the Roaden University Center, Room 112; phone 372-6119. For more information see Tennessee Tech Policy 340 (Services for Students with Disabilities) at www.tntech.edu/policies.

Tennessee Tech University
General and Industrial Engineering Department
ISE 6920 ISE Professionalism

1 Credit Hour, Spring 202x

Instructor Information

Name: TBA

Office: TBA

Telephone Number: 931-TBA

Email: xxxxx@tntech.edu

Office Hours: TBA

Course Information

Prerequisites

Graduate Standing in ISE

Texts and References

Required

No required textbooks.

Handouts and online references.

Course Description

ISE 6920 familiarizes graduate students with the various aspects of professionalism from the perspective of industrial engineering. Various aspects of professionalism from the perspective of industrial and systems engineering. Topics include degree requirements, resources available, research methods, engineering communications, engineering ethics, and professional growth and development.

Course Objectives/Student Learning Outcomes

- Demonstrate an understanding of graduate school in Tennessee Tech's environment of resources and support for the ISE Department
- Develop research and communication skills (listening, speaking, reading, and writing) needed for graduate school
- Understand ethical considerations and develop plans for personal and professional growth

Major Teaching Methods

Lecture and discussion

Special Instructional Platform/Materials

iLearn Learning Management System

Topics to be Covered

- Graduate degree requirements
- Resources for graduate students
- Research methods
- Engineering communications
- Ethics
- Professional growth and development

Grading and Evaluation Procedures

50% Homework Assignments
50% Attendance and Participation

Grading Scale

Letter Grade	Grade Range
A	[90-100]
B	[80-90)
C	[70-80)
D	[60-70)
F	Below 60

Course Policies

Academic Integrity

Maintaining high standards of academic integrity in every class is critical to the reputation of Tennessee Tech, its students, faculty, alumni, and the employers of Tennessee Tech graduates. Academic integrity is at the foundation of the educational process and key to student success. Students with academic integrity are committed to honesty, ethical behavior, and avoiding academic integrity violations. All students must read and understand Policy 216: Student Academic Integrity. Please see the Academic Integrity website (https://www.tntech.edu/provost/academicintegrity/) for more information.

AI Policy Statement

In this course, Generative AI resources are permitted only on assignments cleared marked with permission. Part of the course focuses on research tools and Generative AI is discussed. Students are expected to do all coursework themselves, as an individual or collectively, as designated by the instructor per assignment. Unapproved use of a Generative AI Tool to complete coursework constitutes academic misconduct for this course.

Disability Accommodation

Students with a disability requiring academic adjustments and accommodations must contact the Accessible Education Center (AEC). An accommodation request (AR) should be completed as soon as possible, preferably by the end of the first week of the course. The AEC is located in the Roaden University Center, Room 112; phone 372-6119. For more information see Tennessee Tech Policy 340 (Services for Students with Disabilities) at www.tntech.edu/policies.

Tennessee Tech University
General and Industrial Engineering Department
ISE 6950 Professional Project

3 Credit Hours, Spring 202x

Instructor Information

Name: TBA

Office: TBA

Telephone Number: 931-TBA

Email: xxxxx@tntech.edu

Office Hours: TBA

Course Information

Prerequisites

Consent of instructor based on the completion of at least 24 credit hours in the MS in ISE program.

Texts and References

Required

No required textbooks.

Handouts and online references.

Course Description

This course requires completion of an individualized professional project, documented in a written report and an oral presentation. The project report and presentation serve as a comprehensive examination that requires the student to demonstrate breadth of knowledge in the discipline, depth in specific areas, and the ability to integrate what has been learned.

Course Objectives/Student Learning Outcomes

- Writing professional documents.
- Making professional oral presentations.
- Demonstrating ISE concepts in a student-developed professional project.

Major Teaching Methods

Individualize student project .

Special Instructional Platform/Materials

iLearn Learning Management System

Topics to be Covered

- None

Grading and Evaluation Procedures

75% Written paper
25% Oral presentation and defense

Grading Scale

Letter Grade	Grade Range
A	[90-100]
B	[80-90)
C	[70-80)
D	[60-70)
F	Below 60

Course Policies

Academic Integrity

Maintaining high standards of academic integrity in every class is critical to the reputation of Tennessee Tech, its students, faculty, alumni, and the employers of Tennessee Tech graduates. Academic integrity is at the foundation of the educational process and key to student success. Students with academic integrity are committed to honesty, ethical behavior, and avoiding academic integrity violations. All students must read and understand Policy 216: Student Academic Integrity. Please see the Academic Integrity website (https://www.tntech.edu/provost/academicintegrity/) for more information.

AI Policy Statement

In this course, Generative AI resources can be used as permitted by the academic advisor and must be clearly documented.

Disability Accommodation

Students with a disability requiring academic adjustments and accommodations must contact the Accessible Education Center (AEC). An accommodation request (AR) should be completed as soon as possible, preferably by the end of the first week of the course. The AEC is located in the Roaden University Center, Room 112; phone 372-6119. For more information see Tennessee Tech Policy 340 (Services for Students with Disabilities) at www.tntech.edu/policies.

Tennessee Tech University
General and Industrial Engineering Department
ISE 6970 Special Topics in ISE

3 Credit Hours, Spring 202x

Instructor Information

Name: TBA

Office: TBA

Telephone Number: 931-TBA

Email: xxxxx@tntech.edu

Office Hours: TBA

Course Information

Prerequisites

Graduate standing. Approval by department chairperson.

Texts and References

Required

No required textbooks.
Handouts and online references.

Course Description

Special topics in ISE not otherwise covered in other ISE courses. May include lecture, laboratory, readings or any combination thereof. Course may be repeated for credit if topics are different.

Course Objectives/Student Learning Outcomes

- Writing professional documents.
- Making professional oral presentations.
- Studying topics of current interest in ISE.

Major Teaching Methods

To be determined by instructor.

Special Instructional Platform/Materials

iLearn Learning Management System

Topics to be Covered

- To be determined.

Grading and Evaluation Procedures

75% Written paper
25% Oral presentation and defense

Grading Scale

Letter Grade	Grade Range
A	[90-100]
B	[80-90)
C	[70-80)
D	[60-70)
F	Below 60

Course Policies

Academic Integrity

Maintaining high standards of academic integrity in every class is critical to the reputation of Tennessee Tech, its students, faculty, alumni, and the employers of Tennessee Tech graduates. Academic integrity is at the foundation of the educational process and key to student success. Students with academic integrity are committed to honesty, ethical behavior, and avoiding academic integrity violations. All students must read and understand Policy 216: Student Academic Integrity. Please see the Academic Integrity website (https://www.tntech.edu/provost/academicintegrity/) for more information.

AI Policy Statement

In this course, Generative AI resources can be use as permitted by the academic advisor and must be clearly documented.

Disability Accommodation

Students with a disability requiring academic adjustments and accommodations must contact the Accessible Education Center (AEC). An accommodation request (AR) should be completed as soon as possible, preferably by the end of the first week of the course. The AEC is located in the Roaden University Center, Room 112; phone 372-6119. For more information see Tennessee Tech Policy 340 (Services for Students with Disabilities) at www.tntech.edu/policies.

Tennessee Tech University
General and Industrial Engineering Department
ISE 6990 Research and Thesis

1-9 Credit Hours, Fall 202x

Instructor Information

Name: TBA

Office: TBA

Telephone Number: 931-TBA

Email: xxxxx@tntech.edu

Office Hours: TBA

Course Information

Prerequisites

Graduate Standing in Industrial & Systems Engineering and consent of instructor.

Texts and References

Required

No required textbooks.

Handouts and online references.

Course Description

This course is focused on independent research that requires the student to demonstrate breadth of knowledge in the discipline, depth in specific areas, and the ability to integrate what has been learned. A written thesis report and oral defense are required. Depending on the student's program of study, the student will need a minimum of 6-9 credit hours of ISE 6990.

Course Objectives/Student Learning Outcomes

- Writing professional documents.
- Making professional oral presentations.
- Demonstrating ISE concepts in a student-developed research thesis.

Major Teaching Methods

Individualized student thesis.

Special Instructional Platform/Materials

iLearn Learning Management System

Topics to be Covered

- None

Grading and Evaluation Procedures

100% Meetings with advisor and written progress report

Grading Scale: SP/NP

Course Policies

Academic Integrity

Maintaining high standards of academic integrity in every class is critical to the reputation of Tennessee Tech, its students, faculty, alumni, and the employers of Tennessee Tech graduates. Academic integrity is at the foundation of the educational process and key to student success. Students with academic integrity are committed to honesty, ethical behavior, and avoiding academic integrity violations. All students must read and understand Policy 216: Student Academic Integrity. Please see the Academic Integrity website (https://www.tntech.edu/provost/academicintegrity/) for more information.

AI Policy Statement

In this course, Generative AI resources can be used as permitted by the academic advisor and must be clearly documented.

Disability Accommodation

Students with a disability requiring academic adjustments and accommodations must contact the Accessible Education Center (AEC). An accommodation request (AR) should be completed as soon as possible, preferably by the end of the first week of the course. The AEC is located in the Roaden University Center, Room 112; phone 372-6119. For more information see Tennessee Tech Policy 340 (Services for Students with Disabilities) at www.tntech.edu/policies.

APPENDIX F – FACULTY VITAS

Faculty vitas are included for the following current faculty.

Dr. Mazen Hussein, General and Industrial Engineering Department
Dr. John Tester, General and Industrial Engineering Department
Dr. Chris Wilson, General and Industrial Engineering Department
Dr. Michael Allen, Mathematics Department
Dr. David Smith, Mathematics Department

Dr. Mazen Hussein

Tennessee Tech University
Associate Professor
General & Industrial Engineering
(931) 372-3827
mhussein@tntech.edu

Professional Positions

Associate Professor, Tennessee Tech University. (January 1, 2021 - Present).
Associate Professor, University of Wisconsin-Platteville. (August 19, 2019 - December 31, 2020).
Assistant Professor, University of Wisconsin-Platteville. (July 1, 2013 - August 18, 2019).

Education

PhD, Industrial & Manufacturing Engineering. University of Wisconsin-Milwaukee, 2012.
MS, Industrial Engineering/Manufacturing and Design. University of Jordan, 2002.
BS, Industrial Engineering. Applied Science University, 1999.

Professional Memberships

American Society for Engineering Education. (2016 - Present).
American Society for Quality. (2011 - Present).
Institute for Supply Management. (2011 - Present).
Institute of Industrial and Systems Engineers. (2011 - Present).
The Institute for Operations Research and the Management Sciences. (2010 - Present).
Jordan Engineers Association. (1999 - Present).

Awards and Honors

CITL Faculty Excellence in Online Teaching Award, Tennessee Tech University. (September 2022).

Publications

Hussein, M. (2024). *Block Relocation Problem Considering Maximum Feasible Cleaning Moves with One Degree of Freedom*. IISE.
Hussein, M. (2024). *Navigating the First Year: Adapting Engineering Education for Diverse Student Personalities*. ASEE.
Tester, J. T., Hussein, M. (2023). *Online Engineering Management Master's Program—Lessons Learned*. ASEE. 508 State Street
Hussein, M. (2023). *Block Relocation Problem with One Degree of Freedom and One*

Cleaning Move. IISE.

Hussein, M. (2023). *Survey of Online Graduate Industrial & Systems Engineering and Supply Chain Management Programs*. ASEE.

Hussein, M. (2022). *Teaching Statistics for Engineering and Master's in Engineering Management Programs*. ASEE.

Hussein, M. (2022). *An Extended Algorithm with Degrees of Freedom Concept for the Block Relocation Problem*. IISE.

Teaching Experience

EMGT 6220, Project Management 2, 4 courses.
EMGT 6300, Decision Analysis, 2 courses.
ENGR 1020, Connections to Engr & Tech, 3 courses.
ENGR 1210, Intro to Engineering, 4 courses.
ENGR 3720, Principles of Engr Statistics, 5 courses.
ENGR 6200, Statistical Inference for Engr, 4 courses.
ME 6960, Non-Thesis Project, 1 course.
VE 4500, Reliability & Quality Engr, 1 course.

Teaching Innovation and Curriculum Development

Revise Existing Course. ENGR 1020 – Connections to Engineering & Technology. August 2023 - Present. Revise and restructure some components

Revise Existing Course. ENGR 1210 – Introduction to Engineering. August 2023 - Present. Revise and restructure some components

Revise Existing Course. Statistics Review Pack - MSEM Program. August 2023 - Present. . Revise & update. 1-hr statistics review for the MSEM students. Available in iLearn for all MSEM students.

Professional Service

Committee Member, South Dakota School of Mines and Technology. (November 2023 - Present).
Reviewer/Referee, ASEE Southeast Section. (November 2023 - Present).
Interaction with Industry, TDOT. (April 2023 - Present).
Interaction with Industry, TDOT. (April 2023 - Present).
Attendee, Meeting, 3Dexperience World 2023 Conference. (February 2023 - Present).
Secretary, ASEE-SE. (March 2024 - March 2025).
President, ASEE-SE. (March 2023).
Officer, ASEE Southeast Section. (March 2022 - March 2023).

Dr. John Thomas Tester

Tennessee Tech University
Associate Professor
General & Industrial Engineering
(931) 372-6796
jtester@tntech.edu

Professional Positions

Associate Professor, Tennessee Tech University, General & Basic (now Industrial) Engineering. (June 1, 2020 - Present).
Coordinator, MSEM program, Department, approximately 400 hours spent per year. (June 2020 - Present).
Professor, Northern Arizona University, Mechanical Engineering. (June 2, 2016 - June 1, 2020).
Department Chairperson, Department, approximately 1000 hours spent per year. (August 2017 - August 2019).
Associate Professor, Northern Arizona University, Mechanical Engineering. (June 1, 2000 - June 1, 2016).

Education

PhD, Industrial & Systems Engineering, Manufacturing. Virginia Polytechnic Institute & State University, 1999.
MS, Systems Engineering, Mechanical Systems. Air Force Institute of Technology, 1990.
BS, Mechanical Engineering. Tennessee Tech University, 1983.

Professional Memberships

ASEE. (2000 - 2024).
SAE. (2000 - 2024).

Publications

Tester, J. T., Hussein, M. (2023). *Online Engineering Management Master's Program—Lessons Learned*. ASEE. 508 State Street
Tester, J. T., Nicewicz, K., Oswalt, J. T. (2021). *Development of Online Engineering Management Masters at Tennessee Tech University*. ASEM. 508 State Street

Contracts, Fellowships, Grants and Sponsored Research

Tester, J. T., "SAE Aero Design student club creation," Sponsored by ESCL@Te, Tennessee Tech University, $4,979.00. (January 23, 2023 - June 30, 2023).

Teaching Experience

EMGT 6100, Intro/Engineering Management, 5 courses.
EMGT 6210, Project Management 1, 4 courses.
EMGT 6230, Project Management 3, 3 courses.
EMGT 6900, Professional Project, 2 courses.
ENGR 4510, Engineering Management, 8 courses.
ME 4450, Design for Manufacturability, 1 course.

Mentoring

Charles ("Alex") Savage (Undergraduate). Approx. 60 hours. January 2022 - Present.

Teaching Innovation and Curriculum Development

New Course. ME 4450: Design for Manufacturability, Lecture and Lab. August 2024 - Present.
Development of course materials and assessments. Development of laboratory work. Personal supervision of students on mills, lathes, cutting and thermal forming machines. Instruction of computer-aided design tools supporting manufacturing.

New Degree Program. Masters of Science in Engineering Management. June 2020 - Present.
Developed EMGT6100, EMGT6210, EMGT6230, and EMGT6900. Coordinated content with the other newly developed courses of EMGT6220 and EMGT6300. Learned iLearn; programmed embedded online exams and assignments. Developed advising procedures for new MSEM students. Coordinated with College of Business MBA program, as they offered core courses in the MSEM program.

New Course. EMGT 6230: Engineering Project Management III. January 2022 - 2024.
Development of 3rd Engineering Project Management course. Asynchronous and online.

New Course. EMGT 6900: Engineering Management Capstone. January 2022 - 2024.
Development of project-based report course. Asynchronous and online, with synchronous final oral presentation.

Revise Existing Course. ENGR 4510: Introduction to Engineering Management. August 2021 - 2024.
Development of dual campus (TN Tech and ETSU) course, supporting ETSU and TN Tech General Engineering BS degree and TN Tech Engineering Elective option. Exams and assignments conducted online via the Learning Management System and internet streaming.

New Course. EMGT 6210: Engineering Project Management I. January 2021 - 2024.
Development of 1st Engineering Project Management course for MSEM. Asynchronous and online. Expanded for TN Tech campus graduate credit to non-MSEM graduate students.

New Course. EMGT 6100: Introduction to Engineering Management. August 2020 - 2024.
Development of first Engineering course for MSEM students. Asynchronous and online. Expanded to offer to non MSEM engineering graduate students.

Professional Service

Member, ASEE. (January 2020 - Present).
Member, SAE International. (January 2020 - Present).
Attendee, Meeting, International Future-Ready Engineering Ecosystem Workshop, hosted by ASEE, online. (October 21, 2023 - October 28, 2023).
Board of Advisors, 2022 SAE Baja East Competition, Cookeville, TN. (August 12, 2021 - May 15, 2022).

Dr. Christopher D. Wilson

Tennessee Tech University
Chairperson and Associate Professor
General and Industrial Engineering
(931) 372 -3217
chriswilson@tntech.edu

Professional Positions

Tennessee Technological University
Dates: 1997 to present
Title: Chairperson and Associate Professor, General and Basic (now Industrial) Engineering—2018 to present
Title: Associate Professor, Mechanical Engineering—1997 to 2018
Title: Associate Chairperson, Mechanical Engineering—2012 to 2014
Title: Assistant Professor, Mechanical Engineering—1997 to 2002

NASA George C. Marshall Space Flight Center
Dates: 1988 to 1992
Title: Structural Analyst/Aerospace Structural Technologist
Description: Structural analysis engineer and fracture mechanics specialist. Performed stress, fatigue, and fracture analyses of space shuttle propulsion systems and in-house shuttle payloads. Developed structural design requirements for major elements of Space Station Freedom. Applied fracture mechanics to the design of a meteoroid/debris shield for the habitat and lab modules of Space Station Freedom. Applied fracture mechanics to in-house design of shuttle engine main combustion chamber. Served on NASA Fracture Control Panel. Developed fracture mechanics short course. Received outstanding performance rating three years.

Education

PhD, Engineering Science and Mechanics, The University of Tennessee, 1997
MS, Mathematics, University of Alabama in Huntsville, 1995
MS, Mechanical Engineering, Tennessee Technological University, 1988
BS, Mechanical Engineering, Tennessee Technological University, 1986

Licensures and Certifications

- Tennessee Engineer-in-Training (EIT), Oct. 26, 1985.

Professional Memberships

- American Society for Materials and Testing (ASTM International)
- American Society for Mechanical Engineers (ASME)
- American Society for Engineering Education (ASEE)

Awards and Honors

- Research 100 Award 2019-2023 (five years consecutively at Tennessee Tech University)

Contracts, Fellowships, Grants and Sponsored Research

1. 2024 Governor's School for Emerging Technologies, Tennessee Department of Education, Chris Wilson, $123,973. PI/Co-PI. Funded.
2. 2016-2023 Governor's School for Emerging Technologies, Tennessee Department of Education, Chris Wilson, $133,973 each year, eight-year total of $1,071,784. PI/Co-PI.

Teaching Experience (2016 – present)

1. ENGR 1020 Connections to Engineering and Technology
2. ENGR 1120 Programming for Engineers/Honors Programming for Engineers
3. ENGR 1210 Introduction to Engineering
4. ENGR 1220 Introduction to Emerging Technologies
5. ENGR 4900 Engineering Design, Professionalism, and Ethics
6. ENGR 4950 Senior Design I
7. ENGR 6970 Graduate Engineering Analysis I
8. ME 4010 Machine Design
9. ME 4020 Applied Machine Design
10. ME 4180 Finite Element Method in Mechanical Design
11. ME 4190 Advanced Mechanics of Materials/Intermediate Mechanics of Solids
12. ME 6360 Introduction to Continuum Mechanics
13. ME 6610 Fatigue and Wear in Mechanical Design
14. ME 6620 Plasticity and Creep in Mechanical Design
15. ME 6830 Advanced CAD and Manufacturing
16. ME 7640 Theory of Inelastic Material Behavior
17. ME 7660 Fracture Mechanics

Teaching Innovation and Curriculum Development

- Developed new course: HON 4013 The Role of Materials and Processes in Emerging Technologies
- Developed new course: ENGR 6310 Graduate Engineering Analysis I
- Developed new course: ENGR 6320 Graduate Engineering Analysis II
- Developed new course: ENGR 4900 Engineering Design, Professionalism, and Ethics
- Developed new course: ENGR 1000 Introduction to Engineering Analysis
- Developed new course: ENGR 1300 Introduction to Engineering Computations
- Developed new course: ENGR 2100 Introduction to Engineering Communication
- Developed General Engineering Studies Minor
- Co-developed Industrial and Systems Engineering Minor
- Co-developed Materials Science and Engineering Minor

Dr. Michael R. Allen
Tennessee Tech University
Full Professor
Mathematics
(931) 372-3569
mallen@tntech.edu

Education

BS, Tennessee Tech University, 2011.
Major: Mechanical Engineering
PhD, University of Georgia, 1997.
Major: Statistics
Supporting Areas of Emphasis: Bootstrapping
Dissertation Title: Bootstrapping Times Series Models
MS, Tennessee Tech University, 1991.
Major: Mathematics
Supporting Areas of Emphasis: Statistics
Dissertation Title: Distributions of Two and Three State Markov Chains with Applications
BS, Tennessee Tech University, 1989.
Major: Mathematics

Professional Positions

Professor, Tennessee Tech University, Mathematics. (August 1, 2020 - Present).
Department Chairperson, College, approximately 1000 hours spent per year. (June 1, 2020 - Present).

Professional Memberships

Society of Automotive Engineers. (2004 - 2023).

Teaching Experience

MATH 6470, section 001, Environmental Statistics. 3 credit hours. 4 enrolled.
MATH 3470, section 002, Intro/Prob & Stats. 3 credit hours. 51 enrolled.
MATH 4993, section 002, Mathematical Research. 3 credit hours. 2 enrolled.
MATH 1910, section 001, Calculus I. 4 credit hours. 39 enrolled.
MATH 1910, section 011, Calculus I. 86 enrolled.
MATH 3470, section 002, Intro/Prob & Stats. 3 credit hours. 53 enrolled.
MATH 1910, section 004, Calculus I. 4 credit hours. 118 enrolled.
MATH 1911, section 800, Calculus I Honors Seminar. 0 credit hours. 8 enrolled.
MATH 3470, section 002, Intro/Prob & Stats. 3 credit hours. 41 enrolled.

MATH 6990, section 002, Research & Thesis. 6 credit hours. 1 enrolled.
MATH 6470, section 001, Environmental Statistics. 3 credit hours. 11 enrolled.
MATH 3470, section 002, Intro/Prob & Stats. 3 credit hours. 51 enrolled.
MATH 4560, section 001, Mathematics of Investment II. 3 credit hours. 1 enrolled.
MATH 5560, section 001, Mathematics of Investment II. 0 enrolled.
MATH 6990, section 004, Research & Thesis. 6 credit hours. 1 enrolled.
MATH 3470, section 002, Intro/Prob & Stats. 3 credit hours. 40 enrolled.
MATH 4550, section 001, Mathematics of Investment I. 3 credit hours. 3 enrolled.
MATH 5550, section 001, Mathematics of Investment I. 0 enrolled.
MATH 3470, section 002, Intro/Prob & Stats. 3 credit hours. 42 enrolled.
MATH 1911, section 800, Calculus I Honors Seminar. 0 credit hours. 13 enrolled.
MATH 3470, section 003, Intro/Prob & Stats. 3 credit hours. 39 enrolled.
MATH 6470, section 001, Environmental Statistics. 3 credit hours. 5 enrolled.
MATH 4480, section 001, Probability & Statistics II. 3 credit hours. 6 enrolled.
MATH 5480, section 001, Probability & Statistics II. 0 enrolled.
MATH 4470, section 001, Probability & Statistics I. 3 credit hours. 12 enrolled.
MATH 5470, section 001, Probability & Statistics I. 3 credit hours. 3 enrolled.
MATH 1910, section 500, Calculus I. 4 credit hours. 23 enrolled.
MATH 1910, section 500, Calculus I. 4 credit hours. 21 enrolled.
MATH 6180, section 500, Experimental Design II. 3 credit hours. 6 enrolled.
MATH 3470, section 002, Intro/Prob & Stats. 3 credit hours. 62 enrolled.
MATH 1910, section 500, Calculus I. 4 credit hours. 21 enrolled.
MATH 6170, section 500, Experimental Design I. 3 credit hours. 23 enrolled.
MATH 3470, section 002, Intro/Prob & Stats. 3 credit hours. 75 enrolled.
MATH 6080, section 001, App Linear Stat Meth II. 3 credit hours. 7 enrolled.
MATH 6470, section 001, Environmental Statistics. 3 credit hours. 9 enrolled.
MATH 3470, section 002, Intro/Prob & Stats. 3 credit hours. 65 enrolled.
MATH 6990, section 001, Research & Thesis. 3 credit hours. 1 enrolled.
MATH 6070, section 001, App Linear Stat Meth I. 3 credit hours. 18 enrolled.
MATH 3470, section 002, Intro/Prob & Stats. 3 credit hours. 75 enrolled.
MATH 6910, section 001, Special Topics in Math. 3 credit hours. 6 enrolled.
MATH 3470, section 001, Intro/Prob & Stats. 3 credit hours. 16 enrolled.
MATH 1530, section 001, Introductory Statistics. 3 credit hours. 15 enrolled.
MATH 1130, section 002, College Algebra. 3 credit hours. 65 enrolled.
MATH 3470, section 002, Intro/Prob & Stats. 3 credit hours. 67 enrolled.
MATH 6990, section 003, Research & Thesis. 3 credit hours. 1 enrolled.
MATH 1130, section 001, College Algebra. 3 credit hours. 85 enrolled.
MATH 1530, section 002, Introductory Statistics. 3 credit hours. 87 enrolled.
MATH 1910, section 001, Calculus I. 4 credit hours. 19 enrolled.
MATH 3470, section 001, Intro/Prob & Stats. 3 credit hours. 23 enrolled.
MATH 6470, section 001, Environmental Statistics. 3 credit hours. 5 enrolled.
MATH 3470, section 002, Intro/Prob & Stats. 3 credit hours. 74 enrolled.
MATH 3470, section 003, Intro/Prob & Stats. 3 credit hours. 26 enrolled.
MATH 1530, section 001, Introductory Statistics. 3 credit hours. 116 enrolled.

MATH 1910, section 002, Calculus I. 4 credit hours. 9 enrolled.
MATH 1530, section 001, Elem Probability & Statistics. 3 credit hours. 17 enrolled.
MATH 2110, section 006, Calculus III. 4 credit hours. 36 enrolled.
MATH 3470, section 002, Intro/Prob & Stats. 3 credit hours. 38 enrolled.
MATH 2010, section 005, Matrix Algebra. 3 credit hours. 30 enrolled.
MATH 4480, section 001, Probability & Statistics II. 3 credit hours. 9 enrolled.
MATH 5480, section 001, Probability & Statistics II. 0 enrolled.
MATH 6991, section 001, Research & Ind Study. 3 credit hours. 1 enrolled.
MATH 1910, section 007, Calculus I. 4 credit hours. 37 enrolled.
MSCI 1020, section 001, First Year Connections. 1 credit hours. 22 enrolled.
MATH 3470, section 003, Intro/Prob & Stats. 3 credit hours. 38 enrolled.
MATH 1730, section 002, Pre-Calculus Math. 5 credit hours. 34 enrolled.
MATH 4470, section 001, Probability & Statistics I. 3 credit hours. 22 enrolled.
MATH 5470, section 001, Probability & Statistics I. 3 credit hours. 2 enrolled.
MATH 1530, section 001, Elem Probability & Statistics. 3 credit hours. 10 enrolled.
MATH 3470, section 001, Intro/Prob & Stats. 3 credit hours. 23 enrolled.
MATH 6080, section 001, App Linear Stat Meth II. 3 credit hours. 7 enrolled.
MATH 6470, section 001, Environmental Statistics. 3 credit hours. 7 enrolled.
MATH 3470, section 002, Intro/Prob & Stats. 3 credit hours. 69 enrolled.
MATH 6070, section 001, App Linear Stat Meth I. 3 credit hours. 22 enrolled.
MATH 3470, section 001, Intro/Prob & Stats. 3 credit hours. 94 enrolled.
MATH 6990, section 005, Research & Thesis. 3 credit hours. 1 enrolled.
MATH 2120, section 001, Differential Equations. 3 credit hours. 25 enrolled.
MATH 1530, section 001, Elem Probability & Statistics. 3 credit hours. 9 enrolled.
MATH 6180, section 001, Experimental Design II. 3 credit hours. 9 enrolled.
MATH 3470, section 001, Intro/Prob & Stats. 3 credit hours. 40 enrolled.
MATH 3470, section 002, Intro/Prob & Stats. 3 credit hours. 41 enrolled.
MATH 1920, section 006, Calculus II. 4 credit hours. 37 enrolled.
MATH 6170, section 001, Experimental Design I. 3 credit hours. 21 enrolled.
MATH 3470, section 002, Intro/Prob & Stats. 3 credit hours. 33 enrolled.
MATH 3470, section 002, Intro/Prob & Stats. 3 credit hours. 37 enrolled.
MATH 4480, section 001, Probability & Statistics II. 3 credit hours. 7 enrolled.
MATH 5480, section 001, Probability & Statistics II. 0 enrolled.
MATH 6990, section 002, Research & Thesis. 6 credit hours. 1 enrolled.
MATH 6910, section 001, Special Topics in Math. 3 credit hours. 6 enrolled.
MSCI 1020, section 001, First Year Connections. 1 credit hours. 12 enrolled.
MATH 1730, section 001, Pre-Calculus Math. 5 credit hours. 46 enrolled.
MATH 1730, section 002, Pre-Calculus Math. 5 credit hours. 46 enrolled.
MATH 4470, section 001, Probability & Statistics I. 3 credit hours. 28 enrolled.
MATH 5470, section 001, Probability & Statistics I. 3 credit hours. 1 enrolled.
MATH 1530, section 021, Elem Probability & Statistics. 3 credit hours. 12 enrolled.
MATH 6180, section 001, Experimental Design II. 3 credit hours. 6 enrolled.
MATH 3070, section 001, Statistical Methods I. 3 credit hours. 31 enrolled.
MATH 3070, section 002, Statistical Methods I. 3 credit hours. 32 enrolled.

MATH 2110, section 005, Calculus III. 4 credit hours. 41 enrolled.
MATH 6170, section 001, Experimental Design I. 3 credit hours. 14 enrolled.
MATH 3070, section 004, Statistical Methods I. 3 credit hours. 31 enrolled.
MATH 1530, section 001, Elem Probability & Statistics. 3 credit hours. 147 enrolled.
MATH 3070, section 003, Statistical Methods I. 3 credit hours. 30 enrolled.
MATH 1530, section 001, Elem Probability & Statistics. 3 credit hours. 148 enrolled.
MATH 2110, section 001, Calculus III. 4 credit hours. 27 enrolled.
MATH 2120, section 001, Differential Equations. 3 credit hours. 33 enrolled.
MATH 2110, section 005, Calculus III. 4 credit hours. 34 enrolled.
MATH 4480, section 001, Probability & Statistics II. 3 credit hours. 10 enrolled.
MATH 5480, section 001, Probability & Statistics II. 3 credit hours. 1 enrolled.
MATH 1910, section 005, Calculus I. 4 credit hours. 37 enrolled.
MATH 4470, section 001, Probability & Statistics I. 3 credit hours. 15 enrolled.
MATH 5470, section 001, Probability & Statistics I. 3 credit hours. 1 enrolled.
MATH 6080, section 001, App Linear Stat Meth II. 3 credit hours. 3 enrolled.
MATH 2110, section 004, Calculus III. 4 credit hours. 32 enrolled.
MATH 6991, section 002, Research & Ind Study. 3 credit hours. 1 enrolled.
MATH 6070, section 001, App Linear Stat Meth I. 3 credit hours. 10 enrolled.
MATH 1910, section 005, Calculus I. 4 credit hours. 38 enrolled.
MATH 6990, section 001, Research & Thesis. 3 credit hours. 1 enrolled.

Directed Student Learning

Dissertation Committee Member. (February 2025 - Present).
Advised: James Femi-Oyetoro
Dissertation Committee Member. (August 2022 - Present).
Advised: Martine Patiance Bowombe Toko
Master's Thesis Committee Member, "INVESTIGATING A SMALL WATER TREATMENT PLANT'S WATER CHEMISTRY AND SOURCE WATER BLENDING CAPABILITIES." (August 2023 - May 2024).
Advised: Kalei Hair
Dissertation Committee Member. (August 2018 - May 2024).
Advised: Astrit Imeri
Dissertation Committee Member, "A STUDY OF RHEOLOGY, PARAMETER OPTIMIZATION, AND MICROSTRUCTURAL ANALYSIS OF METALLIC PASTE USED FOR MATERIAL EXTRUSION." (January 2022 - December 2023).
Advised: Marshall Norris
Master's Thesis Committee Chair, "ESTIMATION COMPARISON OF THE AR(1) MODEL USING THE LEAST SQUARES METHOD AND MULTI-LAYER PERCEPTRON." (January 2022 - December 2023).
Advised: Isaac Gyasi
Master's Thesis Committee Chair, "ON NON-UNIFORM INFORMATIC POLYMATROIDS." (August 2022 - May 2023).
Advised: Angus Bryant

Master's Thesis Committee Member, "INDUCTION OF DIVERSITY IN CLASSIFIER MODELS." (January 2022 - April 2023).
Advised: Jeremy Carew

Publications

Zhang, Z., Femi-Oyetoro, J., Fidan, I., Ismail, M., & Allen, M. (2021). Prediction of Dimensional Changes of Low-Cost Metal Material Extrusion Fabricated Parts Using Machine Learning Techniques. *Metals*, *11*(5), 690–703. https://doi.org/https://doi.org/10.3390/met11050690

Zhang, Z., Femi-Oyetoro, J., Fidan, I., & Allen, M. R. (2021). Prediction of Dimensional Changes of Low-Cost Metal Material Extrusion Fabricated Parts Using Machine Learning Techniques. *Metals*, *11*(5), 690–703. https://doi.org/https://doi.org/10.3390/met11050690

Imeri, A., Fidan, I., Allen, M. R., & Perry, G. (2018). Effect of Fiber Orientation in Fatigue Properties of FRAM Components. *Procedia Manufacturing*, *26*, 892–899. https://doi.org/https://doi.org/10.1016/j.promfg.2018.07.115

Mohammadizah, M. R., Allen, I. R., Allen, M. R., & Imeri, A. R. (2018). Creep behavior analysis of additively manufactured fiber-reinforced components. *The International Journal of Advanced Manufacturing Technology*, *99*, 1225–1234. https://doi.org/https://doi.org/10.1007/s00170-018-2539-z

Imeri, A., Fidan, I., Allen, M. R., Wilson, D. R., & Canfield, I. L. (2018). Fatigue analysis of the fiber reinforced additively manufactured objects. *The International Journal of Advanced Manufacturing Technology*, *98*, 2717–2724. https://doi.org/https://doi.org/10.1007/s00170-018-2398-7

Edwards, M. R., Combs, D. L., Cook, S. B., & Allen, M. R. (2003). Comparison of single-pass electrofishing to depletion sampling for surveying fish assemblages in small warmwater streams. *Journal of Freshwater Ecology*, *18*(4), 625–634.

Allen, M. R., & Datta, S. (1999). Estimation of the index parameter for autoregressive data using the estimated innovations. *Statistics & Probability Letters*, *41*(3), 315–324. https://doi.org/10.1016/s0167-7152(98)00167-9

Intellectual Property

"TechBot - A Mobile Multitasking 3D Printer." (Submitted: 2018, Application: 2019).

Media Appearances and Interviews

The Herlinger Report. (July 2023).

Faculty Development Activities Attended

Workshop, "LEAD Masterclass," https://k2ohsolutions.com/, Cookeville, TN, United States. (August 2023 - May 2024).

Conference Attendance, "International Leadership Conference," The Chair Academy, Scottsdale, AZ, United States. (November 6, 2022 - November 9, 2022).

University Service

Member, Compensation Committee. (January 2023 - Present).
Member, Teacher Education Committee. (July 2019 - Present).
Member, University Curriculum Committee. (July 2019 - Present).
Member, Budget Advisory Committee. (August 2024 - May 2025).
President, Faculty Senate. (July 1, 2023 - June 30, 2024).

Professional Service

Reviewer/Referee, Rapid Prototyping Journal. (January 2019 - Present).
Reviewer/Referee, American Society of Engineering Education (ASEE). (January 2018 - Present).

Dr. David Smith

Tennessee Tech University
Full Professor
Mathematics
ddsmith@tntech.edu

Education

PhD, Statistics. University of Georgia, 2001.
MS, Statistics. University of Georgia, 1997.
BBA, Accounting. Georgia State University, 1976.

Research Activity

"Brawley's Crayfish Power Analysis" (On-Going). (July 2023 - Present).
A new species of crayfish was recently found by a TTU student in middle TN. This species may qualify for protection under certain State and Federal agencies. This work on power analysis quantifies the amount of sampling required to adequately monitor changes in the population. Statistical analysis that provide evidence of a downward population trend can then be used to suggest intervention to preserve the species.

It is anticipated that this work will also be used in a publication highlighting the nature of this species. A technical report supporting my work is available upon request.

"A Repeated Measures Approach for Modeling of Mean NO3 Flux Measurements Taken at Unequally Spaced Time Points." (Writing Results). (June 2023 - Present).
Statistical analysis for data collected by Dr. Justin Murdock and a team of graduate students. The data originated from a study of how flooding impacts soil nutrients during flooding for different habitats. This was a non-standard statistical analysis requiring a literature review and comparing several methodologies using SAS software.

A technical report supporting my work is available upon request.

"DSC: Data Science Education and Workforce Development in Rural Communities" (Planning).
(January 2025 - December 2027).
Senior Personal**, NSF Grant 24-560: Data Science Corps** *Tennessee Technological University* (May 2024 - Present)
Actively engaged in the NSF-funded initiative, "Data Science Workforce Development in Rural Communities," which aims to bolster data science education and application in economically challenged areas. Responsible for the development and leadership of the Ethics modules component, crafting curriculum that incorporates real-world ethical considerations into data science education. Facilitate Data Science Days and Summer

Workshops, providing hands-on learning experiences for high school students, teachers, and community leaders, enhancing their understanding of data science's potential impact. Mentor students and community members in collaborative projects that apply data science solutions to local challenges, reinforcing the practical benefits and broad applicability of data science skills. Oversee the creation of engaging educational materials and activities that encourage participation from diverse, underserved rural populations, fostering a more inclusive and knowledgeable future workforce.

Teaching Experience

MATH 3070, Statistical Methods I, 1 course.
MATH 3470, Intro/Prob & Stats, 1 course.
MATH 6080, App Linear Stat Meth II, 1 course.

Directed Student Learning

Master's Thesis Committee Member, "WIP: Study of invasive carp and methods to control populations.." (June 2023 - Present). Advised: Rachael Irby

Teaching Innovation and Curriculum Development

Curricular Development. NSF Data Science Corp. June 1, 2024 - Present.
Submitted three learning modules for the Statistics portion of this grant.

Experimental Design Project - Before course vs after course. Math6170 - Experimental Design I.
August 2023 - Present.
This activity is based on readings in "The American Statistician" from an article written by a Virginia Tech Professor teaching the same course. Students are given a simple problem at the beginning of the course from which to design an experiment to answer a question. At the end of the course, the students are asked to redesign their experiment. Based on their design, simulated data is provided to each student. Each dataset is unique and reflects the student's design. The students are then asked to 1) reflect what were the weaknesses of their original design, 2) improve the design, and 3) analyze the data based on their new design.

Utilized "Retention Practice" from directed readings supplied by CITL in the Summer of 2023.
Math3470 - Introduction to Mathematical Statistics. August 2023 - Present.
During a 75 minute class meeting time, I am stopping pausing throughout the class to allow the students to practice "retention" through short problem solving. The topic can be what we may be currently covering or a related topic tangential to understanding the current one. Several students have commented that they are glad to have a short break to practice during classtime.

Source of practice: "Powerful Teaching: Unleash the Power of Learning" by Agarwal and Bain.

University Service

Chair, Statistics Curriculum. (January 2023 - Present).
Committee Member, Internal Review Board (IRB). (August 2023 - July 2026).

Agenda Item Summary

Date: September 25, 2025

Division: Planning and Finance

Agenda Item: Tenure Upon Appointment Recommendations

☐ **Review** ☒ **Action** ☐ **No action required**

PRESENTER: Dr. John Liu, Interim Provost

PURPOSE & KEY POINTS:

The tenure recommendation is being presented at the September 2025 Board meeting, as Dr. Steven Thomas, Dr. Shoaib Usman, and Dr. KeKe Wu were hired after the June 2025 Board meeting. Dr. Steven Thomas was hired as Chair/Professor for the Department of English. Dr. Shoaib Usman was hired as Professor for the Department of Mechanical and Nuclear Engineering. Dr. KeKe Wu was hired as Associate Dean for the College of Business. All supporting documents are included.

Recommendation for tenure for each of these individuals is supported by their respective department faculty, college dean, and the provost.

STEVEN W. THOMAS

Department of English, Wagner College
[redacted]

PROFESSIONAL POSITIONS HELD

Professor, English Department, Wagner College, 2023 – present.
Director of Integrated Learning, 2024 – present.
Associate Professor, English Department, Wagner College, 2016 – 2023.
English Department Chair, spring 2020 and spring 2022 – summer 2023.
Barra Sabbatical Fellow, McNeil Center for Early American Studies, University of Pennsylvania, September 2018 – May 2019.
Fulbright Scholar, Graduate Program in Film, Addis Ababa University, September 2016 – January 2017.
Assistant Professor, English Department, Wagner College, 2012 – 2016.
Assistant Professor, English Department, College of St. Benedict|St. John's University, 2007 – 2012.

EDUCATION

Ph.D. in English Literature, Penn State University, University Park, May 2006.
M.A. in English Literature, University of Maryland, College Park, May 2001.
B.A. in English Literature and Religious Studies, Brown University, May 1994.

FELLOWSHIPS

Barra Sabbatical Fellowship, McNeil Center for Early American Studies, U. Pennsylvania, 2018 – 2019.
Fulbright Scholar, Addis Ababa University, Ethiopia, 2016 – 2017.
Maureen Robinson Fellowship, Wagner College, 2015 – 2016.

AWARDS

Exceptional Performance in Service, Wagner College, 2024.
Exceptional Performance in Teaching, Wagner College, 2023
Internationalization Action Council Award, Wagner College, 2022.
MLK Agent of Change, Wagner College, 2021.
Addis Ababa Bureau of Culture and Tourism, Certificate of Appreciation, Ethiopia, 2017.
Society of Early Americanists Essay Award, 2015.
Diversity Action Council Award, Wagner College, 2014.
American Society for Eighteenth-Century Studies (ASECS) Innovative Course Design Award, 2014.

PUBLICATIONS

Books

The Cinematic Eighteenth Century: History, Culture, and Adaptation. Co-editor, with Srividhya Swaminathan. New York: Routledge, 2017.

Scholarly Essays in Peer-Reviewed Journals and Edited Volumes

"Screening Slavery, a Genealogy of Film from 1903 to 2020." In *Slavery, Literature, and Memory*. Ed. Mads Anders Baggesgaard, Karen-Margrethe Simonsen, and Madeleine Dobie. Amsterdam: John Benjamins Publishing Company, forthcoming 2025.

"African Cinema on American Slavery." In *Early America and the Modern Imagination:*

Rewriting the Past in the Present. Ed. Patrick M. Erben and Rebecca L. Harrison. Edinburgh: Edinburgh University Press, forthcoming 2025.

"Ethiopian Cinema." In *African Film Studies: an Introduction*, 2nd edition. Ed. Boukary Sawadogo. New York: Routledge, 2023.

"Pirate Assemblage." *Pirates in English Literature and Culture*, vol. 2, ed. Manushag N. Powell and Susanne Gruß, special issue of *Humanities* vol. 11, no. 5 (2022), 1-17.

"Early Ethiopian Cinema, 1964-1994," co-authored with Eyerusaleam Kassahun. *African Studies Review* vol. 65, no. 2 (2022): 308-330.

"Theorizing Globalization in Ethiopia's Movie Industry," *Black Camera* vol. 11, no. 2 (2020): 60-84.

"The Context of Multi-ethnic Politics for Ethiopian American Literature," *MELUS* vol. 45, no. 1 (2020): 117-138.

"A Wide People with a Small Screen: Oromo Cinema at Home and in Diaspora," co-authored with Teferi Nigussie Tafa. In *Cine-Ethiopia: The History and Politics of Film in the Horn of Africa*. Ed. Aboneh Ashagri, Alessandro Jedlowski, and Michael W. Thomas. East Lansing: Michigan State University Press, 2018. 181-295.

"Cinematic Slavery and the Romance of *Belle*." In *The Cinematic Eighteenth Century: History, Culture, and Adaptation.* Ed. Srividhya Swaminathan and Steven W. Thomas. New York: Routledge, 2017. 170-186.

"Transnational Networks for an International Education: Teaching Film Production and Media Literacy in Ethiopia and the United States." In *Beyond Bystanders: Educational Leadership for a Humane Culture in a Globalizing Reality*. Eds., Nimrod Aloni and Lori Weintrob. Rotterdam: Sense Publishers, 2017. 143-156

"The Labor of Regions: A Comparative Analysis of the Economic and Literary Production of Three Southern Regions in the Eighteenth-Century Atlantic World." In *Bordering Establishments: Mapping Regions in Early American Writing*. Ed., John Funchion, Edward Watts, and Kerin Holt. Athens: University of Georgia Press, 2015. 99-120.

"Taxing Tobacco and the Metonymies of Virtue: the Poetics of Thomson, Browne, Byrd, and Cooke." In *Global Economies, Cultural Currencies of the Eighteenth Century*. Ed. Michael Rotenberg-Schwartz. New York: AMS Press, Inc. 2012. 77-33.

"The New James Bond and Globalization Theory, Inside and Out," *CineAction* 78 (2009): 32-39.

"Doctoring Ideology: James Grainger's *The Sugar Cane* and the Bodies of Empire." *Early American Studies* vol. 4, no. 1 (2006): 78-111.

Magazine Articles

"Where Is African Cinema in Hollywood?" *Africa Is a Country* (November 3, 2023): https://africasacountry.com/2023/11/where-is-african-cinema-in-hollywood

"How We Tell the Story of African Film History." *Africa Is a Country* (July 4, 2022): https://africasacountry.com/2022/07/how-we-tell-the-story-of-african-film-history.

"Turning the Camera Back Home." *Africa Is a Country* (January 21, 2022): https://africasacountry.com/2022/01/turning-the-camera-back-on-home.

"The Women Blowing Up Ethiopia's Film Industry." *Zócalo Public Square* (September 11, 2020): https://www.zocalopublicsquare.org/. Republished as "Ethiopian Women Making Movies" in *Africa Is a Country* (May 7, 2021): https://africasacountry.com/2021/05/ethiopian-women-making-movies.

Other Publications: Encyclopedia Entries, Interviews, and Reviews

Review of *African Impressions: How African Worldviews Shapes the British Geographical Imagination across the Early Enlightenment*, by Rebekah Mistein. *Eighteenth-Century Fiction* vol. 36, no. 2 (2024): 349-352.

Review of *Stories from the Fireplace: Theological Meditations on Haile Gerima's Cinema*, by Tekleksadik Belachew. *African Studies Review* vol. 66. No. 3 (2023).

"Review of the New York African Film Festival, Lincoln Center, May 12-17, 2002." *The Journal of Social Encounters* vol. 7, no. 1 (2023).

Review of *Anbessa* (dir. Mo Scarpelli) and *Faya Dayi* (dir. Jessica Beshir). *African Studies Review* vol. 64, no. 4 (December 2021): E11-E16.

Interviewed by Tigist Gamme, "Industirii Fiilmii fi Gahee Dubartoonni Tabachaa Jiran" (Women's Roles in the Film Industry), *Voice of America* (May 24, 2021): https://www.voaafaanoromoo.com/a/5902135.html.

Conference Review: Enduring Slavery: Resistance, Public Memory, and Transatlantic Archives, October 10-12, 2019. *Early American Literature*, vol. 55, no. 2 (spring 2020): 582-585.

Conference Review: American Literature Association, May 2011. *Early American Literature* 46:3 (2012): 243-251.

"Mercantilism." *Africa and the Americas: Culture, Politics, and History: A Multidisciplinary Encyclopedia*, vol. 2. Ed. Richard Juang and Noelle Morrissette. Oxford: ABC-CLIO, 2008. 746-8.

"William Byrd II." *The Greenwood Encyclopedia of American Poets and Poetry*. Ed. Jeffrey Gray. Vol. 1. Westport, CT: Greenwood Press, 2006. 223-4.

"James Grainger." *The Greenwood Encyclopedia of American Poets and Poetry*. Ed. Jeffrey Gray. Vol. 2. Westport, CT: Greenwood Press, 2006. 636-7.

Review of *Multitude: War and Democracy in the Age of Empire*, by Antonio Negri and Michael Hardt, and *Debating Empire*, ed. Gopal Balakrishnan. *Gramma: Journal of Theory and Criticism* 13 (2005): 208-12.

Review of *The Commonplace Book of William Byrd II of Westover*, ed. Kevin Berland, Jan Kirsten Gilliam, and Kenneth Lockridge. *The Southern Quarterly* 41:2 (2003): 148-9.

PRESENTATIONS

Invited Lectures

"Ethiopia's Movie Business, the Oromo Irreechaa 2016, and the Cultures of Democracy," College of St. Benedict, St. Joseph, Minnesota, July 28, 2024.

Panelist on "Author Meets Reader: Boukary Sawadogo's African Film Studies: an Introduction," African Cinema Forum, Virtual, April 8, 2023.

"Screening Slavery," Centre for the Study of the Literatures and Cultures of Slavery, Aarhus University, Denmark (virtual), March 15, 2021.

Discussion of Ethiopian Cinema at Zellan Creative and Cultural Center, Addis Ababa, Ethiopia, January 2, 2020.

"Multiethnic Ethiopia, Racial America: A Literary History," Seton Hall University, South Orange, April 4, 2019.

"Ethiopian Cinema, Oromo Democracy, and the Significance of the Irreechaa," Arcadia University, Glenside, February 12, 2019 and Franklin and Marshall College, Lancaster, March 23, 2019.

Workshop organized on *Cine-Ethiopia: The History and Politics of Film in the Horn of Africa*, with Eyerusalem Kassahun at the Oromo Culture Center, Addis Ababa, Ethiopia. January 5, 2019.

"Indigenous Oromo Movies during a Time of Political Crisis in Ethiopia," with Teferi Nigussie Tafa, Bennington College, October 30, 2017 and Pace University, New York, March 10, 2018.

"Academic Publishing on the Movie Industry: Ethiopian and American Connections," Bahir Dar University, May 2017, Mekele University, Ethiopia December 28, 2016 and Hawassa University, Ethiopia, December 14, 2016

"Multiethnic Ethiopia and American Literary History: The Transatlantic Routes of a Symbolic Root," Bristol Institute for Research in the Arts and Humanities, Bristol University, England, March 9, 2016.

"Transnational Networks for an International Education: Teaching Film Production and Media Literacy in the United States and Ethiopia," Bristol Institute for Research in the Arts and Humanities, Bristol University,
England, March 11, 2016.

"Multiethnic Ethiopia in the American Literary Imagination," American Studies Seminar, Columbia University, October 13, 2015

"African Cinema and Ethiopia's Film Industry," Rift Valley University, Addis Ababa, Ethiopia, December 19, 2014.

"The Future of Ethiopia's Film Industry: Roundtable," Rift Valley University, Addis Ababa, Ethiopia, December 17, 2013.

"Ethiopia in the American Literary Imagination," Osher Lifelong Learning Institute, University of California, Irvine. January 5, 2011.

"Ethiopia and Harlem Renaissance Drama," Addis Ababa University Theater Department, Addis Ababa, Ethiopia. June 18, 2010.

"Oromo Arts in Diaspora," Oromo Christian Fellowship Church, Nairobi, Kenya. June 18, 2009.

"Ethiopia in the American Literary Imagination, "Bunkyo Gakuin University, Tokyo, Japan. May 26, 2009.

"The Oromo Renaissance," Oromo Fundraiser, Minneapolis, Minnesota. October 25, 2008.

National and International Academic Conferences

"Ethiopianism and Ethiopian Exceptionalism at the Intersection of American Race and African Ethnicity." North American Society for the Study of Romanticism Conference, Washington DC, August 16, 2024.

"The Oromo "Other" in the Discourse of Race and Ethnicity." Oromo Studies Association Annual Conference, Minneapolis, August 2, 2024.

"Ethiopia and African Democracy at the Vatican." American Society for Eighteenth-Century Studies Annual Meeting, Toronto, April 5, 2024.

"Labor and Migration in New African Cinema," Northeast Modern Language Association Annual Convention, Boston, March 9, 2024.

"Ethnicity, Race, and the Meanings of Ethiopia across the Eighteenth Century." African Studies Association Annual Meeting, San Francisco, December 2, 2023.

Routable Participant on the ASA Film Prize: Winner and Recent Trends. African Studies Association Annual Meeting, San Francisco, November 30, 2023.

Roundtable Participant on Nathaniel Hawthorne Society Panel "A Is for Abortion: Reading Hawthorne's Political Relevance Today." American Literature Association, Boston, May 26, 2023.

"The Legacy of African Cinema for New Television and Film," American Society for Eighteenth-Century Studies Annual Meeting, St. Louis, March 11, 2023.

"Remapping Ethiopian Cinema," African Studies Association Annual Meeting, Virtual, November 20, 2021.

"African Cinema on American Slavery," South Atlantic Modern Language Association Annual Conference, Virtual, November 4, 2021.

"Early Ethiopian Cinema," African Studies Association Annual Meeting, Virtual, November 21, 2020.

"Early American Studies and Ethiopian Studies, Race and Ethnicity," Society of Early Americanists Biennial Conference, Virtual, March 6, 2021.

"Theorizing Globalization in Ethiopia's Movie Industry," African Studies Association Annual Meeting, Boston, November 21, 2019.

"What's New about Slavery on TV?" Society of Early Americanists Biennial Conference. Eugene, Oregon: March 2, 2019.

"Cinematic Slavery." Slavery, Authorship, and Literary Culture. Columbia University. New York: January 25, 2019.

"Biblical Ethiopia," Special Topics Conference of the Society of Early Americanists: Religion and Politics in Early America. St. Louis, March 1, 2018.

"Multiethnic Ethiopia, American Literary History, and African-American Philosophy in the Nineteenth Century," African Studies Association Annual Meeting, Chicago, November 16, 2017.

"The Cinematic Eighteenth Century: Reconsidered," Canadian Society for Eighteenth-Century Studies Conference, Toronto, October 21, 2017.

"Toward a Theory of Cinematic Form for Gada Democracy in Oromo Movies," Oromo Studies Association Conference, Washington D.C., July 30, 2017.

"The Circum-Atlantic Surrogation of Ethiopia," Early Americanists Summit, College Park, Maryland, June 5, 2016.

"Reach Back and Get It: Slaves on Screen," American Society of Eighteenth Century Studies, Pittsburgh, PA. April 1, 2016.

"Film Education in Oromia and Sandscribe Communications," Oromo Studies Association Annual Conference, Washington D.C., August 1, 2015.

"The Assurance of *Belle*, the Insurance of the Zong, and the Speculation of Cinema," American Society of Eighteenth Century Studies, Los Angeles. March 20, 2015.

"Roundtable: The Eighteenth Century in Hollywood," American Society of Eighteenth Century Studies, Los Angeles, March 20, 2015.

"Pirate Assemblages/Creole Texts," Early Caribbean Society Symposium. Kingston University, London. July 21, 2014.

"The Circum-Atlantic Surrogation of Ethiopia in the London Public Sphere," London and the Americas, 1492-1812 Conference. Society of Early Americanists. Kingston University, London. July 18, 2014

"Pirates, Puritans, and the Revolutionary Atlantic World." American Literature Association Conference. Boston, Massachusetts. May 2013.

"Ethiopia and African-American Literature across Deep Time." Society of Early Americanists Conference. Savannah, Georgia. February 2013.

"The Performance of Ethiopia in African-Atlantic Culture: A Transnational and Multiethnic Genealogy." Triumph in My Song: Conference on 18th and 19th-Century African Atlantic Culture, History, and Performance. College Park, Maryland. June 2012.

"The Poetry of Cash Crops and the New Economic Criticism," American Literature Association Conference. Boston, Massachusetts. May 2011.

"Ethiopian History in African-American Literature," MELUS Conference. Boca Raton, Florida. April 2011.

"Ethiopia, American Literature, and Human Rights," Society of Nineteenth-Century Americanists Conference. State College, Pennsylvania. May 2010.

"Against Gilroy?": The Political Atlantic," Early American Borderlands Conference. St. Augustine, Florida. May 2010.

"The Black Enlightenment and the Network Concept," Society of Early Americanists Biennial Conference. Hamilton, Bermuda. March 2009.

"The Oromo Renaissance within the Marketplace of World Literature," Oromo Studies Association Conference. Minneapolis, Minnesota. August 2008.

"The Cultural Politics of Single Mothers and *The Scarlet Letter* Today," Nathaniel Hawthorne Society Summer Meeting. Brunswick, Maine. June 2008.

"William Byrd and the Tobacco Acts," Northeast American Society for Eighteenth-Century Studies: Transatlantic Destinies Conference. Dartmouth, New Hampshire. October 2007.

"Taxing Tobacco and the Metonymies of Virtue," East Central/American Society for Eighteenth-Century Studies Annual Meeting. Gettysburg, Pennsylvania. October 2006.

"Clubical Liberty's Fatal Cake," Society of Early Americanists Fourth Biennial Meeting. Alexandria, Virginia. March 2005.

"The Specters of the Native and the Purloined Letter of the American Land in *The House of the Seven Gables*." Nathaniel Hawthorne Society. Salem, Massachusetts. July 2004.

"Critical Pedagogy and American Literature." Modern Language Association Annual Convention. San Diego, California. December 2003.

"Doctoring Ideology: Sugar, Slaves, and Sailors in the Atlantic World," McNeil Center Interdisciplinary Graduate Student Conference on "Roots and Routes." Philadelphia, Pennsylvania. October 2003.

"The Meaning of Liberty in Mercantilist Culture." International American Studies Association First World Conference. Leiden, The Netherlands. May 2003.

TEACHING

Courses Taught at Wagner College, 2012 – 2024

EN 400: Senior Reflective Tutorial (2013, 2014, 2015, 2016, 2020, 2021, 2022, 2023, and 2024)
EN 332/AN291-ILC: Pirates, Colonizers, and the Cultures of Capitalism (spring 2018)

EN 332: Pirates, Puritans, and the Revolutionary Atlantic World (fall 2014 and spring 2022)
EN331/GOV375-ILC: Women and World Cinema (fall 2021)
EN 331/HI321-ILC: Slavery in History and Film (spring 2021)
EN 331: Topics in World Cultures and Cinemas (spring 2017, fall 2022, and spring 2024)
EN 318: American Literature: From Romanticism to Realism (spring 2013)
EN 317: American Literature: From the European to the American Renaissance (fall 2012)
EN 315: African-American Literature (fall 2015)
EN 314: Postcolonial Literature (spring 2014, 2018, 2021, and 2023)
Title changed to Decolonizing the Mind in 2021.
EN 291-EYH: Special Topics: Global Literature from Africa to Poland (spring 2020)
EN 291 (W)-ILC-TT: Special Topics: African Cinema (spring 2015 and 2016)
EN 291 (W)-ILC-TT: Special Topics: Movies, Media, and Global Citizenship (spring 2013)
EN 291-LC8-FH: Special Topics: American Literature/World Identities (fall 2012 and 2013)
EN 230 Introduction to Film (fall 2017, 2020, and winter 2022)
EN 230-LC8: Introduction to Film (fall 2015)
EN 230-ILC: Introduction to Film (spring 2014)
EN 227: American Literature from Its Origins to 1865 (spring 2015, fall 2019)
EN 226: American Cultures and Literatures (fall 2014 and 2017)
EN 216: African-American Literature (fall 2020)
EN212: Introduction to Literary Analysis and Theory (spring 2022, fall 2022, and spring 2023)
EN205: Eighteenth-Century Literature (fall 2022 and fall 2023)
EN 111: World Literature (spring 2013, 2017, 2018 and fall 2021, 2023, and 2024)
EN 109: World Literature (fall 2019 and 2020)
RFT-FYP: Reflective Tutorial for First-Year Program (fall 2012, 2013, 2014, 2015, 2017, 2019, 2020, 2021, 2023, and 2024)

PROFESSIONAL SERVICE

Film Review Editorial Board, *African Studies Review*, 2024—present.
Chair of American Society for Eighteenth-Century Studies (ASECS) Innovative Course Design Award Committee, 2024—present.
Member of CARE (Campus Assistance for Resources and Empowerment) Team, Wagner College, 2024—present.
Director of Integrated Learning, Wagner College, 2024—present.
Film Prize Committee, African Studies Association, 2023—present.
Alternate Representative to the Board of Trustees, Wagner College, 2023—present.
Academic and Cultural Enrichment Committee, Wagner College, 2019—present.
Committee Chair, 2021—present.
Academic Policy Committee, Wagner College, 2022—present.
English Department Chairperson, spring 2020 and February 2022—July 2023.
Faculty Hearing and Appeals Committee, Wagner College, 2017—2018 and 2019—2023.
Priorities and Budget Committee, Wagner College, spring 2021—summer 2022.
Society of Early Americanists Essay Award Committee Chair, 2016-2018.
Interim Faculty Advisor to My Sistah's Keeper, Wagner College, spring 2014 –fall 2014.
Director of Film and Media Minor, Wagner College, fall 2013 – fall 2015.
First Year Program Review Committee, Wagner College, fall 2013 – spring 2016.
Committee for Learning Assessment, Wagner College, spring 2013 – 2016.

PRIMARY REFERENCES

Patrick Erben, Professor, English Department, University of West Georgia
e-mail: [redacted]

Eyerusaleam Kassahun, Lecturer, Addis Ababa University, Ethiopia
e-mail: [redacted]

Lindsay Sabatino, Director of Writing Center, Wagner College, New York
e-mail: [redacted]

Srividhya Swaminathan, Associate Dean, Undergraduate Studies, St. John's University, New York
e-mail: [redacted]

ADDITIONAL REFERENCES

Jonathan Haynes, Professor retired, English Department, Long Island University, New York
e-mail: [redacted]

Li Ping Lo, Press Officer, Bureau of African Affairs, United States State Department
e-mail: [redacted]

Tesfaye Mekonnen, Manager, Sandscribe Communications, Ethiopia
e-mail: [redacted]

Madhu Mitra, Professor, English Department, College of St. Benedict and St. John's University, Minnesota
e-mail: [redacted]

Carla Mulford, Professor, English Department, Penn State University, State College
e-mail: [redacted]

Daniel Richter, Emeritus Director of the McNeil Center for Early American Studies and Professor, History Department, University of Pennsylvania, Philadelphia
e-mail: [redacted]

Boukary Sawadogo, Associate Professor of Cinema Studies and Black Studies, City College of New York
e-mail: [redacted]

Cristobal Silva, Associate Professor, English Department, University of California, Los Angeles
e-mail: [redacted]

Kamil Wielecki, Faculty of Artes Liberales, University of Warsaw, Poland
e-mail: [redacted]

Arsema Worku, Board Member of Ethiopian Film Producers Association, Ethiopia
e-mail: [redacted]

Shoaib Usman, PhD.

CONTACT INFORMATION

Associate Professor & Associate Chair for Research
Missouri University of Science & Technology
Department of Nuclear Engineering & Radiation Science
[redacted]
[redacted]

RESEARCH INTERESTS

Nuclear supply chain and licensing code compliance, Thermal-hydraulics and passive safety, Radiation detection, Health physics, Radiological pathway analysis, Machine learning, Uncertainty quantification, Digital Twin, Consent-Based Siting, Community Engagement Opportunities.

PhD **University of Cincinnati**, NUCLEAR ENGINEERING **1997**
- On the Spectral Theory of Turbulence and Atmospheric Dispersion
- Advisor: Dr. Henry B. Spitz

MSc **University of Cincinnati**, HEALTH PHYSICS **1996**
- Response of Electret Radon Detector to Interference from Ambient Gamma Radiation
- Advisor: Dr. Henry B. Spitz

MSc **University of Cincinnati**, NUCLEAR ENGINEERING **1993**
- Development of a Phenomenological Model for Predicting CHF Under Low Quality and Subcooled Swirl Flow Conditions
- Advisor: Dr. Joel Weisman

BSc **N.E.D. University of Engineering and Technology**, MECHANICAL ENGINEERING **1988**
- Design of a System for Ethylene Production from Naphtha
- Advisor: Dr. Syed F. Ali

HONORS AND AWARDS

Keynote Speaker NURER2024
7th International Conference on Nuclear and Renewable Energy Resources **October 2024**
Invited Speaker at 2023 Laufer Energy Symposium, **March 2023**
Mines & Metallurgy Academy, Senior Faculty Achievement Awards, **April 2023**
Foreign Faculty Award, 42 nd International Nathiagali Summer College on Physics **July 2017**
NPIC & HMIT 2006, International Secretary Award. **November 2006**

STUDENTS HONORS AND AWARDS

[redacted](Dr. Usman's graduate student), received Best Poster Award for; "A Parallel Plate Model Using Porous Media Approach," Penn State Hosts iNuc - the American Nuclear Society National Student Conference, April 18, 2014.

[redacted](Dr. Usman's graduate student) was awarded University Research Alliance 2010 DOE Innovations in Fuel Cycle Research Award for Universities with Less Than $500 million in 2008 R&D Expenditures for the paper "Feasibility of 106Ru peak measurement for MOX fuel burnup analysis", Nuclear Engineering and Design 240 (10), pp. 3687-3696.

[redacted](Dr. Usman's graduate student), was awarded Winner in the ICONE-24 Student Best Poster Competition – North America for the poster "Isothermal Rectangular Roughness Elements in a Rectangular Cavity Heated at the Bottom" during the 24th International Conference on Nuclear Engineering- ICONE-24 Charlotte, NC, June 26-30, 2016.

ACADEMIC EXPERIENCE

Missouri University of Science and Technology **Aug 2004 – 2008 – Present**
Assistant/Associate Professor, Nuclear Engineering
Responsibilities include teaching undergraduate and graduate level courses for the nuclear engineering program, developing a research program in the areas of nuclear science and engineering, supervising student research, participating in the outreach effort to other institutions, including minority partners, and providing services to the university and scientific community.

King Abdulaziz University **June 2003 – Present**
Jeddah, Kingdom of Saudi Arabia, Adjunct Professor, Nuclear Engineering
Responsibilities include providing; guidance to the program in the development and growth, undergraduate teaching support for various nuclear engineering courses, promote collaborative research between the faculty and students of KAU and Missouri S&T and other US universities. Also, taught a class on reactor physics during summer 2013 and supervised King Abdullah City for Atomic and Renewable Energy (KACARE) nuclear engineering undergraduate students during their training visit to Lowell, Massachusetts, USA.

University of Cincinnati **January 2003 – August 2004**
Research Assistant Professor, Nuclear Engineering
Developed funded research program on radio-turbulence and reactor operations and taught graduate-level courses for nuclear engineering program on need basis. Research activities included radio-turbulence, radiation detector development and computer-based procedures system for safe nuclear reactor operations. Educational activities included a major federally funded "Bridge-building" program to establish academic partnership between Tuskegee University and the University of Cincinnati. Served as co-Direct of this program till departure to Missouri S&T. Responsible for conducting summer programs for Tuskegee students which included field trips to NRC, DOE, NIST and Westinghouse facilities.

University of Cincinnati **June 1999 – December 2002**
Adjunct Assistant Professor, Nuclear Engineering
This engagement with the department included need-based teaching, participating in ongoing research projects and developing new research concepts and proposals for external funding. Areas of research interest included system automation and safety enhancement, radio-turbulence & radon diffusion, radiation measurement, and radiation effects.

RESEARCH EXPERIENCE

DOE: Consent-Based Siting, Assessment after Engagement, Education Experimental-learning (A-EEE) This project is to establish a consortium to help DOE find communities willing and able to host spent nuclear fuel for an interim period till the nation reach a long-term resolution on the geological repository or recycling of used nuclear fuel. My role as consortium director includes, overall project management with three sub-contracts (University of Missouri, Saint Louis University and University of Illinois, Urbana-Champaign). Project goal is to collect public perception data from four different communities; North Saint Louis (Communities in the proximity of legacy nuclear waste), Urbana-Champaign (Proposed site for a university owned and operated micro-reactor), Callaway County (home of the Callaway Nuclear Power Plant) and Rolla, Missouri (home of the MIssouri S&T Research Reactor). Public opinion surveys will be conducted both before and after providing them with education material on four subject areas; Risk and risk perception, Nuclear fuel cycle, Radiological Pathway Analysis and Health Physics. The goal of this exercise is to quantify the impact education on public perception about nuclear installations.

Advanced nuclear Reactors Consortium ARC :The Advanced nuclear Reactor Consortium (ARC) is a member driven research and education consortium which includes a combination of industrial and academic members coming together to address common pre-competitive challenges for large scale deployment of Small and Micro-Modular nuclear reactors. I am taking the lead role as the **new Consortium Director**. Consortium will seek state and federal funding to help leverage membership fees to accomplish projects aligned with consortium goals. There is significant interest in this consortium as indicated by major companies including the Westinghouse (Founding member), AMEREN (Founding member), Dow Chemical company, Nano Nuclear, Flibe, Mirion Technologies, Inc. All these companies are focused on de-carbonizing and have express interest in joining the ARC consortium. As the consortium director, my roles includes, new member recruitment, arrange and hosting all regular and special meetings, membership communication, managing and accounting of consortium funds including membership fee and overall consortium administration. (Students:To be identified).

Nuclear Supply Chain and design code harmonization: There are several advanced micro and small nuclear reactor designs at different stages of development. Success of these designs will heavily depend on the readiness of the nuclear supply chain. A well-developed and fully coordinated supply chain not only brings down the direct EPC cost but also provides cheaper design options. Most importantly, a local well-established supply chain reduces uncertainty and risks associated with construction time, project cost overrun and hence limits the contingencies which are about 15 % of total project costs. This project is focused on understanding the status of nuclear supply chain for various design options and geographic locations. Manufacturing and procurement issues along with immaturity of design and licensing, have caused delays and cost overruns in Gen-III FOAK construction projects in the United Sates and elsewhere. Applicable codes and standards pertinent to nuclear industry are being analyzed with harmonization and the potential challenges for globalization of nuclear supply chain. Adoptability and acceptance of cross-region nuclear codes/standards by regulatory is also a focus of this effort. (Students: Farooq Ahmad, PhD S&T - est. 2027).

ICRP Lung Model Mechanical Simulator: This research is continuation of our already published work on construction, calibration and testing of a mechanical replica of human lung. ICRP publications (66-Human Respiratory Tract Model for Radiological Protection and 30 Part 1–Limits for Intakes of Radionuclides by Workers) provide sophisticated scientific basis for modeling bio-kinetics of material inhaled by "Reference Man". Using these foundations, a portable mechanical lung is being developed which will allow air sampling from environmental sites of interest. In addition to providing a system for air quality monitoring the same apparatus will also be able to help pharmaceutical industry to analyze inhalation pathway-based drug delivery. (Students: Manuela I. A. Alvarez, PhD S&T - est. 2028).

Radiation Detector Paralysis & Deadtime Measurements: This research has developed an enhanced two-parameter detector deadtime correction scheme and a measurement technique to determine the two parameters, namely paralysis factor and the total deadtime. High intensity short lived radionuclides are produced at Missouri S&T reactor for collecting the required data. We have investigated deadtime dependence on operational conditions, voltage, radiation energy and temperature etc. Results from this research have wide applications. Current efforts are focused on departure from classical Poisson statistics as the radiation events are process through various stages of electronics. (Students: A. Wazzan – Ph.D., S&T Exp. 2025, B. Almutairi - Ph.D., S&T, 2020, M. Yousaf - Ph.D., S&T, 2016, T. Akyurek - Ph.D. S&T May 2015, A. Patil– Ph.D. M.S., S&T – 2010, & D. Gallego-M.S., S&T – 2010).

NEUP - Experimental and Computational Investigations of Plenum-to-Plenum Heat Transfer Under Natural Circulation in a Prismatic Very High Temperature: The project has developed sophisticated measurement techniques for heat transfer coefficients and coolant dynamics in a scaled down prismatic blocks representative of post shut down HTTF/MHTGR cooling under natural convection conditions. The effort will enhance our understanding of the phenomenon of natural convection and provide benchmark experimental data to validate CFD code like FLUENT, Star CCM+ and RELAP5-3D. The project involves two additional universities as subcontractors, ORNL and AREVA as our industry partner. (Students: S. Alshehri (2019), I. A. Said (2017) and M. T. Moharam (2017) - Ph.D. S&T).

AMEREN/Callaway Nuclear Power Plant - Meteorological Data Mining & Synthesis for Site Data Supplementation: This project has provided high fidelity correlations which will allow to use of off-site data to fill gaps in the on-site meteorological data due to potential instrument failures or malfunctions. This data is critical for any nuclear power plant to comply with NRC regulations. Nuclear Regulatory Commission (NRC) requirement for any operating nuclear power plant. Radiological/Environmental Report by each nuclear power station includes site specific meteorological data. Typically, hourly data (8,760 weather data sets) are recorded for wind direction, wind speed, atmospheric stability, and accumulated precipitation to evaluate the impact to human health and safety. Callaway on-site meteorological monitoring system is used for this study as our test case and off-site data is obtained from the surrounding airports and weather stations. The results of this study can also accelerate the site licensing of new power plant where NRC requires a minimum of three years of historical site specific data to accompany combined licensing application. (Students: B. Sonpon - Ph.D. 2024 S&T).

SMR Consortium - Condensation Heat Transfer Experiment and Scaling: The Passive Containment Cooling System (PCCS) is one of the integral passive cooling systems used in various new nuclear reactor designs, including various Small Modular Reactor (SMR) designs. Heat transfer via condensation on the inside of containment walls is anticipated as a passive way to keep Containment Vessel pressure within design limits, therefore, condensation is the key heat transfer phenomenon in the design of the PCCS. The presence of even a small quantity of non-condensable gases can greatly influences the condensation process. In this experiment a scaled-down facility is constructed to investigate the effect of non-condensable gas on the phenomenon of condensation heat transfer and natural convection. (Students: V. Kalra - M.S. S&T, P. Bhowmik, Ph.D., S&T, both under Dr. Schlegel)

AREVA/K.A.CARE - Hydraulic conductivity and retardation coefficient characterization of soil from Riyadh, Saudi Arabia: The project was related to radiological safety analysis of a proposed nuclear site in the Kingdom of Saudi Arabia. The soil sample shipped to our lab and

analyzed for hydraulic conductivity and retardation coefficient using flow-through (column). CsNO3 and SrNO3 was tested using mass spectroscopy. This data was collected in support of Environmental Impact Analysis of a proposed site for a research reactor. (Students: Mohammed R. Alsubhi Enrolled Ph.D. S&T).

Missouri Attorney General - Phytoforensics study of a superfund radioactive waste site near Saint Louis: The project is focused on investigating any possible leaching of radioactive material from a superfund site in the Saint Louis Metro area. The PIs were required to collect samples, perform measurement and appear as expert witness in the impending trial. (Students: LIST CANNOT BE DISCLOSED DUE TO LEGAL NATURE OF THE PROJECT).

Research Reactors Simulation and Upgrade: Benchmarking research reactor and subcritical critical assembly. Experiments are conducted to unfold the neutron energy spectrum for the Missouri S&T Nuclear Reactor. Experimental data validation for determining the location of the hot channel and hot channel factor, flux shape, and criticality calculation. Computational methods for thermo-hydraulics coupled burnup analysis and determination of thermal and poison feedback effects. Reactor power upgrade and safety analysis. (Students: S. Sipaun - Ph.D. S&T - 2014, B. Richardson - M.S., S&T – 2011, K. O'Bryant - Enrolled M.S. S&T - 2013).

Conduction-Convection Transition for Rayleigh-Benard Experiment: Benchmark experiments and simulations were conducted observing the on-set of convection in a Bénard cell experiment. Dimensionless numbers were identified and a very useful analogy between RC-circuit and convective heat transfer is reported. Data collected is compared with the literature to examine validity of the experimental set-up. The set-up is also calibrated for alpha convection study to be performed. The results let to the development of a new phenomenological model for the on-set of natural convection. (Students: M. Yousaf - Ph.D. S&T, 2016, V. Khane- M.S., S&T – 2010, B. S. Mohammad-M.S. S&T 2007, M. J. Scarangella - M.S. UC 2004, & M. I. Hawwari-M.S. UC 2004).

Effect Of Surface Roughness on Natural Convection: Research is focused on investigating the effect of surface properties on the on-set of natural convection for vertical and horizontal surfaces. Using LBM simulation frame-work we have analyzed the shape and depth of surface roughness in the flow induced due to the thermal instabilities. (Student: M. Yousaf - Ph.D., S&T 2016).

Radio-Turbulence and Alpha Convection: Investigation of this newly discovered phenomenon of induced micro-scale turbulence in liquids. Preliminary results provide sufficient experimental evidence that diffusion is enhanced due to "radio-turbulence". Future research will develop understanding of the phenomenon and investigate its potential impact on various applications including nano-systems & radiological transport of radionuclides. P.I. on two DoE funded projects on this topic totaling $396,421 expanding the research. (Students: M. Yousaf - Ph.D., S&T, 2016 & S. Syahrir-Ph.D. UC -2004).

MOX Fuel Online Burnup Analysis: This research involves non-destructive analysis of spent fuel using γ-spectroscopy to enable burnup analysis. MOX burnup and decay simulations were performed using ORIGEN-ARP. Results were analyzed and used to determine performance specifications of a detection system for field applications. Analysis of isotopic activity from simulated irradiated fuel were used to develop correlations to determine burn-up, and Plutonium content of MOX fuel supporting nuclear safeguard and proliferation deterrence. Missouri S&T Reactor was used to collected gamma spectra for validation of proof of concept. Subsequently, delayed neutron data was also collect for burnup analysis and determination of Plutonium in the Missouri S&T Reactor's fuel elements. (Student: J. Joshi - MS S&T 2017, T. Akyurek - Ph.D. S&T 2015, L. Tucker - Ph.D. S&T 2016 & M. L. Dennis-M.S. S&T -2008).

Thorium Use In Current Reactor: There are over one hundred commercial power reactor running in the country. This feasibility study is to examine the impact of modified fuel supply to these reactors, in particular using Thorium in the fuel mix. Thorium will act as burnable poison in the first stage of the burnup cycle and subsequently transform into 233U fuel. Work is being conducted to compare various fuel loading options, and operational compliance with the safety guidelines established by NRC. This research involves extensive use of MCNP, MCNPX and ORIGEN-ARP for burnup simulations. Feasibility of using Thorium based fuel will be investigated both in BWR and PWR. (Student: L. Tucker - Ph.D., S&T 2016)

Annihilation Coincidence Photons Measurement: Initial experimental data (using therapy machine) was collected for annihilation photons produced by high energy photon interaction with mm-size lead target. Coincidence measurements (using 2 NaI(Tl) detectors) were made which offers the capability to measure absolute activity at the target without having to know the detection efficiencies. Simulations are under way. Collaboration with Medical Physics faculty is being developed. (Students: T. Goter-B.S. S&T 2007, A. Patil–Ph.D. S&T 2010, & D. Konate-M.S. UC 2004).

Photoconductive & Neutron Induced Conductivity: The concept of photoconductive gamma dosimeter is being extended for neutron measurements. Experimental detectors for neutron are being constructed and will be tested using Missouri S&T nuclear reactor. Data on the effect of thermal neutrons on various kinds of PN junctions have already been collected and results are analyzed for publication. (Student: D. Gallego - M.S., S&T – 2010).

NRC Curriculum Development Project - Educational: This University of Tennessee - Missouri S&T joint project was funded by the US Nuclear Regulatory Commission ($350,000) to develop teaching material in the areas of; technology implementation and teaching material development for distance learning of radiation measurements laboratory (including distance experimentation), development of teaching materials for radiological engineering and environmental assessment, nuclear material shipping and handling protocol, environmental sample collection and analysis techniques including neutron activation analysis.(Student: D. Gallego - M.S., S&T – 2010).

NRC Curriculum Development Project - Educational: This US Nuclear Regulatory Commission funded project is to develop new teaching material in the areas of; radio-chemistry and nuclear forensics. As a Co-PI of this project, I contributed in developing course material for environmental radioactivity and transport through atmosphere, surface and ground water, concentration mechanism in bio-sphere and mathematical modeling of the system. (Student: D. Gallego - M.S., S&T – 2010).

Neutron Generator Laboratory - Infrastructure Upgrade: This Department of Energy funded project is to establish a flexible neutron source at the university. The system that we have acquired is based on D-D reaction producing 2.5 MeV neutrons. At full capacity the system can produce 109 neutrons. Because of the small size of the target the neutron source can be approximated as a point source. We have performed safety analysis of the system. Installation of the system required due consideration of the potential experiments. (Students: Several)

NRC Curriculum Development Project - Educational: This NRC subcontract from Southern University and A&M College (SUBR) is to assist SUBR in their effort to launch a nuclear engineering program at their campus. Southern University at Baton Rouge is a well-recognized minority institute of higher learning in science and engineering. With a potential of developing a major in nuclear engineering in south eastern quarter of the country. SUBR is keen to initiate some fundamental courses in nuclear engineering. As a Co-PI of the project I developed teaching materials for the fundamental in nuclear engineering class and provided support in the class delivery. I also introduced the remote accessibility of the nuclear reactor to the SUBR faculty and the capability of collaborative teaching and research. Student: M. Yousaf - Ph.D. S&T, 2016)

CURRENT GRANTS

Department of Energy - 2023 Consent-Based Siting for Interim Storage Program – Community Engagement Opportunities
FOA: DE-FOA-0002575
Role: **PI**
Title: Assessment after Engagement, Education & Experiential-learning (A-EEE)
Collaborators: **UIUC** (C. Brooks, T. Kozlowski & T. Grunloh), **Saint Louis University** (J.S. O. Sandoval, & V. Sagan), **University of Missouri** (R. Rotman), **U. Nevada** (N. Tsoulfanidis), **MIT** (S. Islam), **Pattonville Schools** (B. Nelson)
Amount: $1,999,789 / Status: **On going, in year 2**

Taylor Geo-spatial Institute, Saint Louis
Title: Artificial intelligence & machine learning-driven framework for meteorological data mining & synthesis for Health Systems (2023-2024)
Role: **PI**

Amount: $67,298 / Status: **On going, second year extension**

U.S. Nuclear Regulatory Commission
Title: Graduate Fellowships in Nuclear Engineering at Missouri S&T (2023-2026)
Role: **PI**
Amount: $400,000 / Status: **On going**

PENDING DECISION

U.S. Nuclear Regulatory Commission
Title: Graduate Fellowships in Nuclear Engineering at Missouri S&T (2025-2029)
Role: **PI**
Amount: $400,000 / Status: **Pending new second project of similar type & nature.**

STATE SERVICE

Presentation – **Missouri House of Representatives**, Jefferson City, Missouri — April 17, 2014
Presentation – **Missouri House of Representatives**, Jefferson City, Missouri — February 22, 2011
Presentation – **Congresswoman JoAnn Emerson**, Missouri, February 25 — 2011
Expert Witness – At the request of Attorney General Chris Koster [Link] — 2016

BOOK CHAPTERS

[1] M. S. Hassan, A H. Khan, R. Verma, D. Kumar, K. Kobayashi, **S. Usman**, S. B. Alam, Handbook of Smart Energy Systems, Springer. Machine Learning and Artificial Intelligence-Driven Multi-Scale Modeling for High Burnup Accident-Tolerant Fuels for Light Water-Based SMR Applications, Springer International Publishing, Handbook of Smart Energy Systems: Vol. 1-4, pp. 2131 - 2154, 2023

[2] K. Kobayashi, **S. Usman**, C. Castano, A. Alajo, D. Kumar, S.B. Alam. Surrogate Modeling-Driven Physics-Informed Multi-fidelity Kriging for the Prediction of Accident-Tolerant Fuel Properties, Springer International Publishing, Handbook of Smart Energy Systems: Vol. 1-4, pp. 1313 - 1323, 2023

[3] **S. Usman**, Nuclear Energy Encyclopedia: Science, Technology, and Applications, John Wiley & Sons, 2011 – Chapter 11- Uranium-Plutonium Nuclear Fuel Cycle.

[4] J. D. Smith, K. Buchheit, H. Al-Rubaye, **S. Usman**, Y. Zhou, G. Gelles, Next Generation Nuclear Power for Non-Power Applications in the Middle-East Region, Submitted to Energies Manuscript ID: energies-1763672

INVITED TALKS

[5] **S. Usman**, Status of nuclear supply chain the Midwest, USA. Chemical Engineering, Rowan University, November 14, 2024.

[6] **S. Usman**, Building a sustainable nuclear ecosystem , Istanbul Technical University, Energy Institute -Istanbul, Türkiye, November 1, 2024.

[7] **S. Usman**, Internal Dosimetry and Radiation Protection, Nuclear Science: From Energy to X-Rays, The Science Seminar Series by The Academy of Science-St. Louis, April 4, 2018.

[8] **S. Usman**, Supply chain of SMRs, Distinguished Speaker, 42nd International Nathiagali Summer College, Islamabad - PAKISTAN, July 17-29, 2017.

[9] **S. Usman**, Fundamentals of natural convection and circulation, Distinguished Speaker, 42nd International Nathiagali Summer College, Islamabad - PAKISTAN, July 17-29, 2017.

[10] **S. Usman**, Plenum-to-Plenum Heat Transfer and Gas Dynamics under Natural Circulation - I, Distinguished Speaker, 42nd International Nathiagali Summer College, Islamabad - PAKISTAN, July 17-29, 2017.

[11] **S. Usman**, Plenum-to-Plenum Heat Transfer and Gas Dynamics under Natural Circulation - II, Distinguished Speaker, 42nd International Nathiagali Summer College, Islamabad - PAKISTAN, July 17-29, 2017.

[12] T. Akyurek, and **S. Usman**, (2016) Nuclear MOX Fuel Analysis and Monitoring Using Non-destructive Method, 1st International Underground Resources and Energy Conference, Middle Anatolia Development Agency, Vol.1. pp. 2. Yozgat-TURKEY, October 6-8, 2016.

[13] **S. Usman**, and T. Akyurek, LWR Design Impact on Radiological Source Term, 1st International Underground Resources and Energy Conference, Middle Anatolia Development Agency, Vol.1. pp. 32, Yozgat-TURKEY, October 6-8, 2016.

SPECIAL REPORTS TESTIMONIES & PRESENTATIONS

[14] ATTORNEY GENERAL CHRIS KOSTER - STATE OF MISSOURI AND MISSOURI DEPARTMENT OF NATURAL RESOURCES, vs. REPUBLIC SERVICES, INC., ET AL, VIDEOTAPED DEPOSITION OF AS EXPERT WITNESS - September 22, 2015. (Trial to continue - -)

[15] **S. Usman**, Thorium Energy Potential - Presentation to the Missouri House of Representatives, Jefferson City, Missouri, April 17, 2014. Provided expert's opinion to the state law makers on the potential of Thorium. The expert testimony was followed by a question & answer.

[16] **S. Usman**, Thorium Energy Potential - Presentation to the Missouri House of Representatives, Jefferson City, Missouri, February 22, 2011. Provided expert opinion to the state law makers on the potential of Thorium. The expert testimony was followed by a question & answer.

[17] **S. Usman**, Presentation to Congresswoman JoAnn Emerson, Pea Ridge Mine, Sullivan, Missouri, February 25, 2011. Gave a seminar on rare earth and accompanying thorium reserves in Missouri and the potential of developing a thorium based nuclear fuel cycle to augment the current energy portfolio of the country. The seminar was followed by a question and answer section.

JOURNAL PUBLICATIONS

[1] M. H. Tusar, P. K. Bhowmik, K. Kobayashi, S. B. Alam3, & **S. Usman**. Impact of surface and physical property on multiphase flow in sealed vessel: Liquid dropdown performance. Experimental and Computational Multiphase Flow, (Accepted for Publication). [Link] **Impact Factor: 4.20**

[2] B. Sonpon, **S. Usman**, J. Smith, S. Kovaleski, & J. A. Wibbenmeyer. Meteorological Data Mining and Synthesis for Supplementing On-Site Data for Regulatory Compliance, Energies, 17(15),3691, August, 2024. [Link] **Impact Factor: 3.30**

[3] M. H. Tusar, P.K. Bhowmik, K. Kobayashi, S.B. Alam & **S. Usman**. Porous media model simulates thermal-hydraulics of nuclear research reactors with flat and curved plate fuel assembly, International Communications in Heat and Mass Transfer, Vol. 153, 107334, April, 2024. [Link] **Impact Factor: 5.00**

[4] P. K. Bhowmik, **S. Usman**, J. P. Schlegel, Film condensation with high heat fluxes and scaled experiments using pure steam for reactor containment cooling, Applied Thermal Engineering, Vol. 229, Article number 120610, July 2023. [Link] **Impact Factor: 6.47**

[5] M.M.Taha, S. Ibrahim, Z. Zeitoun, **S. Usman**, & M. H. Al-Dahhan. Effect of non-uniform heating on temperature and velocity profiles of buoyancy driven flow in vertical channel of prismatic modular reactor core, Applied Thermal Engineering, Vol. 225, Article number 120209, May 2023. [Link] **Impact Factor: 6.47**

[6] K. Kobayashi, **S. Usman**, C. Castano, A. Alajo, D. Kumar, S.B. Alam. Data-Driven Multiscale Modeling and Robust Optimization of Composite Structure with Uncertainty Quantification, Springer Handbook of Smart Energy Systems, 2023. [Link] **Impact Factor: 7.30**

[7] K. Kobayashi, M. Bonney, D. Kumar, K. Paaren, **S. Usman**, S.B. Alam. Uncertainty Quantification and Sensitivity Analysis for Digital Twin Enabling Technology: Application for BISON Fuel Performance Code, Springer Smart Energy Systems, January 2023. [Link] **Impact Factor: 7.30** 2022.[Link] **Impact Factor: 4.91**

[8] P. K. Bhowmik, J. P. Schlegel, V. Kalra, S. Alam, S. Hong, **S. Usman**, CFD validation of condensation heat transfer in scaled-down small modular reactor applications, Part 2: Steam and non-condensable gas, Experimental and Computational Multiphase Flow, July, 2022, 4(4): 424-434, [Link] **Impact Factor: 4.91**

[9] W. Hao, K. F. Kapiamba, V. Abhayaratne, **S. Usman**, Y. Huang & Y. Wang, A filter-based system mimicking the particle deposition and penetration in human respiratory system for secondhand smoke generation and characterization, Inhalation Toxicology, May 2022.[Link] **Impact Factor: 3.01**

[10] B. Almutairi, S. Jaradat, D. Kumar, C.S. Goodwin, **S. Usman**, A. Alajo, S. Alam, Weight Loss and Burst Testing Investigations of Sintered Silicon Carbide Under Oxidizing Environments for Next Generation Accident Tolerant Fuels for SMR Applications, Materials Today Communications, March 2022, 102958. [Link] **Impact Factor: 5.40**

[11] D. Kumar, F. Ahmed, bf S. Usman, A. Alajo, S. B. Alam, Recent advances in uncertainty quantification methods for engineering problems, AI Assurance: Towards Trustworthy, Explainable, Safe, and Ethical AI, January 2022, 453-472, [Link] **Book Chapter 13th**

[12] P. K. Bhowmik, J. P. Schlegel, V. Kalra, S. Alam, S. Hong, **S. Usman**, CFD validation of condensation heat transfer in scaled-down small modular reactor applications, Part 1: Pure steam, Experimental and Computational Multiphase Flow, August, 2021, 4(4): 409-423, [Link] **Impact Factor: 4.91**

[13] T. Akyurek, S.B. Shoaib, **S. Usman**, Delayed fast neutron as an indicator of burn-up for nuclear fuel elements, Nuclear Engineering and Technology, Vol. 53(10), pp. 3127-3132, October, 2021. [Link] **Impact Factor: 2.82**

[14] P.K. Bhowmik, J.P. Schlegel, V. Kalra, C., Mills, **S. Usman**, Design of condensation heat transfer experiment to evaluate scaling distortion in small modular reactor safety analysis, Journal of Nuclear Engineering and Radiation Science, 7(3),031406, July 2021. [Link] **Impact Factor: 0.44**

[15] R. Alsulami, M. Albarqi, S. Jaradat, **S., Usman**, J. Graham, Optimizing the moderator geometry and thickness for a reactor-based slow positron source, Nuclear Instruments and Methods in Physics Research, Section B: Beam Interactions with Materials and Atoms, 497, pp. 39-46, June, 2021. [Link] **Impact Factor: 1.28**

[16] B. Almutairi, S. Alam, C.S. Goodwin, **S. Usman**, T. Akyurek, Simultaneous experimental evaluation of pulse shape and deadtime phenomenon of GM detector, Scientific Reports, 11(1),3320, February 2021. [Link] **Impact Factor: 4.60**

[17] S.M. Alshehri, I.A., Said, **S. Usman**, A review and safety aspects of modular high-temperature gas-cooled reactors, International Journal of Energy Research, 45(8), pp. 11479-11492, December 2020. [Link] **Impact Factor: 4.67**

[18] B. Almutairi, S. Alam, T. Akyurek, C.S. Goodwin, **S. Usman**, Experimental evaluation of the deadtime phenomenon for GM detector: deadtime dependence on operating voltages, Scientific Reports, Vol. 10(1), 19955, November, 2020. [Link] **Impact Factor: 4.60**

[19] S. M. Alshehri, I.A. Said and **S. Usman**, Effect of nonuniform isoflux heating on natural convection heat transfer in a prismatic modular reactor, Applied Thermal Engineering, 176,115369, July, 2020. [Link] **Impact Factor: 6.40**

[20] T. Akyurek, W.S. Vas, A.B. Alajo, J.C. King, **S. Usman**, and C.H.C. Giraldo, Neutron reflector analysis for the beam-port of the Missouri S&T Reactor, Journal of Radioanalytical and Nuclear Chemistry, Vol. 322, pp. 975-981, September, 2019. [Link] **Impact Factor: 1.75**

[21] T.Akyurek, and **S. Usman**, Determination of Plutonium and Uranium Content and Burnup Using Six Group Delayed Neutrons, Nuclear Engineering and Technology, Vol. 51(4), pp. 943-948, July, 2019. [Link] **Impact Factor: 2.82**

[22] B. J. Almutairi, T. Akyurek, and **S. Usman**, Voltage dependent pulse shape analysis of Geiger-Müller counter, Nuclear Engineering and Technology, Vol. 51(4), pp. 1081-1090, July, 2019. [Link] **Impact Factor: 2.82**

[23] S. M. Alzahrani and **S. Usman**, CFD simulations of the effect of in-tube twisted tape design on heat transfer and pressure drop in natural circulation, Thermal Science and Engineering Progress, Vol. 11, pp. 325-333, June, 2019. [Link] **Impact Factor: 4.56**

[24] R. Alsulami M. Albarqi, S. Jaradat, **S. Usman**, J. Graham, Calculation and tabulation of efficiencies for tungsten foil positron moderators, Journal of Applied Physics, Vol. 125(20), 205304, May, 2019. [Link] **Impact Factor: 2.29**

[25] M. M. Taha, I. A. Said, **S. Usman**, and M. H. Al-Dahhan, Temperature and velocity instrumentation and measurements within a separate-effects facility representing modular reactor core, International Journal of Thermal Sciences, Vol. 136, pp. 148-158, February, 2019. [Link] **Impact Factor: 4.78**

[26] I. A. Said, M. M. Taha, V. Alexander, **S. Usman**, and M. H. Al-Dahhan, Axial dispersion and mixing of coolant gas within a separate-effect prismatic modular reactor, Nuclear Energy and Technology, Vol. 4(3), pp. 167-178, December, 2018. [Link] **Impact Factor: 2.82**

[27] **S. Usman** and A Patil, Radiation Detector Deadtime and Pile Up: A Review of the Status of Science, Nuclear Engineering and Technology, Vol. 50(7), pp. 1006-1016, October, 2018. [Link] **Impact Factor: 2.82**

[28] Salman M. Alshehri, Ibrahim A. Said, Muthanna H. Al-Dahhan, **Shoaib Usman**, Plenum-to-plenum natural convection heat transfer within a scaled-down prismatic modular reactor facility, Thermal Science and Engineering Progress, Vol. 7, pp. 288-301, September, 2018. [Link] **Impact Factor: 4.56**

[29] M. M. Taha, I. A. Said, **S. Usman**, and M. H. Al-Dahhan, Buoyancy-driven air flow within plenum-to-plenum facility down-comer channel, Experimental Thermal and Fluid Science, Vol. 94, pp. 205-214, June, 2018. [Link] **Impact Factor: 3.37**

[30] M. M. Taha, I. A. Said, **S. Usman**, and M. H. Al-Dahhan, Natural convection inside heated channel of a facility representing prismatic modular reactor core, AIChE Journal Vol. 64(9), pp. 3467-3478, April, 2018. [Link] **Impact Factor: 4.17**

[31] I. A. Said, M. M. Taha, **S. Usman**, and M. H. Al-Dahhan, Experimental investigation of the helium natural circulation heat transfer in two channels facility using varying riser channel heat fluxes, Experimental Thermal and Fluid Science, Vol. 93, pp. 195-209, May, 2018. [Link] **Impact Factor: 3.37**

[32] I. A. Said, M. M. Taha, **S. Usman**, and M. H. Al-Dahhan, Effect of helium pressure on natural convection heat transfer in a prismatic dual-channel circulation loop, International Journal of Thermal Sciences, Vol. 124, pp. 162-173, February, 2018. [Link] **Impact Factor: 4.78**

[33] L. P. Tucker, and **S. Usman**, Thorium-based Mixed Oxide Fuel in a Pressurized Water Reactor: A burnup analysis with MCNP, Annals of Nuclear Energy, Vol. 111, pp. 163-175, Jauary, 2018. [Link] **Impact Factor: 1.81**

[34] M. Xing, M., K. Awuah-Offei, S. Long, and **S. Usman**, The effect of local supply chain on regional economic impacts of mining, Extractive Industries and Society, Vol. 4(3), pp. 622-629, July, 2017. [Link] **Impact Factor: 3.81**

[35] B. Richardson, J. King, A. Alajo, **S. Usman** and C.H. Castano, Modeling and Validation of Temperature and Void Coefficients of Reactivity Experiments at the Missouri S&T Research Reactor (MSTR), Nuclear Science and Engineering, Vol. 187(1), pp. 100-106, May, 2017. [Link] **Impact Factor: 1.46**

[36] I. A. Said, M. M. Taha, **S. Usman**, B. Woods, and M. H. Al-Dahhan, Investigation of natural convection heat transfer in a unique scaled down dual-channel facility, AIChE Journal Vol. 63(1), pp. 387-396, November 2016. [Link] **Impact Factor: 4.17**

[37] T. Akyurek, L.P. Tucker, X Liu, **S. Usman**, Portable spectroscopic fast neutron probe and 3He detector dead-time measurements, Progress in Nuclear Energy, Vol. 92(1), pp. 15-21, September, 2016. [Link] **Impact Factor: 2.46**

[38] L. P. Tucker, A. Alajo and **S. Usman**, Upgrade and Simulation of the Subcritical Assembly at Missouri University of Science and Technology, Nuclear Technology, Vol. 194(1), pp. 97-110, April, 2016. [Link] **Impact Factor: 1.67**

[39] M. Yousaf, and **S. Usman**, Sinusoidal Roughness Elements in a Square Cavity, Int'l J. of Mechanical, Aerospace, Industrial, Mechatronic and Manufacturing Engineering, Vol. 9(3), pp. 435-439, 2015. [Link] **Impact Factor: 1.20**

[40] M.Yousaf, and **S. Usman**, Natural convection heat transfer in a square cavity with sinusoidal roughness elements, International Journal of Heat and Mass Transfer, Vol. 90, pp. 180-190, November, 2015. [Link] **Impact Factor: 5.43**

[41] T.Akyurek, and **S. Usman**, Spent fuel interrogation using delayed fast neutron spectrum at Missouri University of Science and Technology Reactor, Progress in Nuclear Energy, Vol. 85, pp. 525-540, November, 2015. [Link] **Impact Factor: 2.46**

[42] M.Yousaf, and **S. Usman**, Role of Surface Roughness during Natural Convection, World Journal of Engineering and Technology, Vol. 3, pp. 140-148, October, 2015. [Link] **Impact Factor: 5.92**

[43] M.Yousaf, and **S. Usman**, Effects of Roughness Elements on Heat Transfer during Natural Convection, International Journal of Chemical, Molecular, Nuclear, Materials and Metallurgical Engineering, Vol. 9, pp. 1287-1292, 2015. [Link] **Impact Factor: 0.90**

[44] M.Yousaf, T.Akyurek, and **S. Usman**, Comparison of Traditional and Hybrid Radiation Detector Dead Time Models and Detector Behavior, Progress in Nuclear Energy, Vol. 83, pp. 177-185, August, 2015. [Link] **Impact Factor: 2.46**

[45] S. Sipaun, and **S. Usman**, Prediction of Missouri S&T Reactor's natural convection with porous media approximation, Nuclear Engineering and Design, Vol. 285(15), pp. 241-248, April, 2015. [Link] **Impact Factor: 1.90**

[46] T. Akyurek, M.Yousaf, X. Liu, and **S. Usman**, GM Counter Deadtime Dependence on Applied Voltage, Operating Temperature and Fatigue, Radiation Measurements Vol. 73, pp. 26-35, February, 2015. [Link] **Impact Factor: 1.97**

[47] L. P. Tucker, A. Alajo and **S. Usman**, Thorium-based Mixed Oxide Fuel in a Pressurized Water Reactor: A Beginning of Life Feasibility Analysis with MCNP, Annals of Nuclear Energy Vol. 76, pp. 323-334, February, 2015. [Link] **Impact Factor: 1.81**

[48] T. Akyurek, L.P. Tucker, **S. Usman**, Review and characterization of best candidate isotopes for burnup analysis and monitoring of irradiated fuel, Annals of Nuclear Energy 69, pp. 278–291, July, 2014. [Link] **Impact Factor: 1.81**

[49] Z.A. Kulage, C.H. Castano, **S. Usman**, G. Mueller, Characterization of the neutron flux energy spectrum at the Missouri University of Science and Technology Research Reactor (MSTR), Nuclear Engineering and Design, Vol 261, pp. 174–180, August, 2013. [Link] **Impact Factor: 1.90**

[50] B. Richardson, C.H. Castano, J. King, A. Alajo, **S. Usman**, Modeling and validation of approach to criticality and axial flux profile experiments at the Missouri S&T Reactor (MSTR), Nuclear Engineering and Design, Vol 245, pp. 55–61, April, 2012. [Link] **Impact Factor: 1.90**

[51] E. Grant, G. Mueller, C. Castaño, **S. Usman**, A. Kumar, Internet accessible hot cell with gamma spectroscopy at the Missouri S&T nuclear reactor, Nuclear Engineering and Design, Vol. 241(8) pp 3306-3316, August, 2011. [Link] **Impact Factor: 1.90**

[52] M. L. Dennis, and **S. Usman**, Feasibility of 106Ru peak measurement for MOX fuel burnup analysis, Nuclear Engineering & Design, Vol. 240(10) pp. 3687-3696, October, 2010. [Link] **Impact Factor: 1.90**

[53] V. Khane and **S. Usman**, Further on integrator circuit analogy for natural convection, Nuclear Engineering & Design, Vol. 240(3) pp. 609-615, March, 2010. [Link] **Impact Factor: 1.90**

[54] A. Patil and **S. Usman**, Measurement and Application of Paralysis Factor for Improved Detector Dead-time Characterization, Nuclear Technology, Vol. 165(2), pp. 249-256, April, 2009. [Link] **Impact Factor: 1.67**

[55] **S. Usman**, B. S. Mohammad and S. Abdallah, Natural Convection's Transient Behavior, Nuclear Technology, Vol. 159(3), pp. 310-318, 2007. [Link] **Impact Factor: 1.67**

[56] A. S. Radovic and **S. Usman**, Dead-Time Correction for Non-paralyzing Detectors when Measuring Short-Lived Nuclides Nuclear Technology, Vol. 157(1), pp. 106-109, 2007. [Link] **Impact Factor: 1.67**

[57] **S. Usman**, S. Abdallah, M. Hawwari, M. Scarangella, and L. Shoaib Integrator Circuit As An Analogy for Convection, Nuclear Technology Vol. 157(1) pp. 65-73, 2007. [Link] **Impact Factor: 1.67**

[58] **S. Usman**, L. Shoaib, and J.N. Anno, Gamma Induced Photoconductivity in Pyrex, Quartz and Vycor, IEEE Transaction on Nuclear Science, Vol. 52(6), pp. 3054- 3058, 2005. [Link] **Impact Factor: 1.70**

[59] **S. Usman**, M. G. Paravatiyar and H. B. Spitz, Microscopic Aspects of Turbulent Transport –Atmospheric Dispersion of Pollutants – Part 2, IASME Transactions Issue 1 vol. 2, pp. 195-204, 2005. [Link] **Impact Factor: X.YZ**

[60] **S. Usman**, and S. Abdallah, N. Katragadda, Microscopic Aspects of Turbulent Transport – Conduction and Convection Unification – Part 1, IASME Transactions Issue 3 Vol. 1, pp. 566-573, 2004. [Link] **Impact Factor: X.YZ**

[61] **S. Usman**, H.B. Spitz, and S Lee Analysis of Electret Ion Chamber Radon Detector Response to Radon and Interference from Background Gamma Radiation, Health Physics, 76(1): pp. 44-49, January, 1999. [Link] **Impact Factor: 2.92**

[62] J. Weisman, J.Y. Yang, and **S. Usman**, A Phenomenological Model for Boiling Heat Transfer and Critical Heat Flux in Tubes Containing Twisted Tapes, International Journal of Heat and Mass Transfer, Vol. 37(1), pp. 69-80, January, 1994. [Link] **Impact Factor: 5.43**

REFEREED CONFERENCE PROCEEDINGS

[63] B. Sonpon, **S. Usman**, Joseph Smith, Sarah Kovaleski, Jason A. Wibbenmeyer. Meteorological Data Analysis: Atmospheric Stability and Correlation Calculations, Transactions of the American Nuclear Society, Vol. 128, pp. 26-29, 2023.

[64] J. Joshi, **S. Usman**, W. S. Charlton, B. J. Adigun, M. T. Swinhoe, H. O. Menlove, A. C. Trahan, Statistical Errors in Doubles Count Rates with 252Cf and AmLi Active Interrogation Sources on Fresh MTR Research Reactor Fuel, Transactions of the American Nuclear Society (TBD), 2020 ANS Virtual Winter Meeting.

[65] R. Alsulami, M. Albarqi, S. Q. Jaradat, J. Graham, **S. Usman**, Efficiency optimization of a positron moderator foil, Transactions of the American Nuclear Society, Vol. 120, pp. 232-234, 2019.

[66] B. Almutairi, S.B. Alam, C. S. Goodwin, **S. Usman**, Benchmarking calculation of a soluble-boron-free SMR lattice model using deterministic, hybrid Monte Carlo & Monte Carlo codes. Pacific Basin Nuclear Conference, pp. 136-145, 2019.

[67] B. Almutairi, D. Kumar, T, Ridwan, S.B. Alam, G. Park, C. S. Goodwin, **S. Usman**, Reactor physics analysis of thorium-based fuel for long-life SMR cores using seed-blanket fuel concept, Transactions of the American Nuclear Society, Vol. 120, pp. 875-878, 2019.

[68] S. Alzahrani, and **S. Usman**, Numerical investigation of flow in rod bundle subchannels on natural convection: Effect of twisted tapes, Transactions of the American Nuclear Society, Vol. 120, pp. 1031-1034, 2019.

[69] B. Almutairi, S.B. Alam, T. Akyurek, C. S. Goodwin, A. Olson, **S. Usman**, Pulse Shape Dependence on Applied Voltage of Geiger-Mueller Detector.The 5th International Conference on Sensors and Electronics Instrumentation Advances (SEIA-2019), 2019.

[70] T. Akyurek, and **S. Usman**, (2018) Spent Fuel Analysis Using Six Group Delayed Neutron Parameters, Transactions of the American Nuclear Society, Vol. 119, pp. 309-310, 2018.

[71] R. Alsulami, M. Albarqi, J. Graham, **S. Usman** (2018) Optimizing Moderator Thickness for Reactor Based Positron Sources, Transactions of the American Nuclear Society, Vol. 119, pp. 539-541, 2018.

[72] S. Alzahrani, and **S. Usman**, (2018) Investigation of flow through a 2x2 PWR rod bundle: Effect of twisted tapes, Embedded Topical International Topical Meeting on Advances in Thermal Hydraulics – ATH 2018, pp. 1189-1201. 2018.

[73] M. Yousaf, and **S. Usman**, (2018), Effects of amplitude of roughness on heat transfer, Embedded Topical International Topical Meeting on Advances in Thermal Hydraulics - ATH 2018, pp. 1091-1099. 2018.

[74] S. M. Alshehri, I. A. Said, M. H. Al-Dahhan, and **S. Usman**, (2018), Experimental investigation on heat transfer in a prismatic modular reactor under cosine heat flux, Embedded Topical International Topical Meeting on Advances in Thermal Hydraulics - – ATH 2018, pp. 682-693, 2018.

[75] S. M. Alshehri, I. A. Said, M. H. Al-Dahhan, and **S. Usman**, (2018), Plenum-to-plenum natural circulation heat transfer in a prismatic very high-temperature reactor for different coolants, Embedded Topical International Topical Meeting on Advances in Thermal Hydraulics - 2018, ATH 2018, pp. 670-681. 2018.

[76] S. M. Alshehri, I. A. Said, M. H. Al-Dahhan, and **S. Usman**, (2018), Experimental Investigation of Plenum-to-Plenum Natural Circulation Heat Transfer in a Prismatic Very- High-Temperature Reactor, Transactions of the American Nuclear Society, Vol. 118, pp. 1097-1100, 2018.

[77] S. M. Alshehri, I. A. Said, M. H. Al-Dahhan, and **S. Usman**, (2018), Experimental Investigation on Heat Transfer Characteristics with Nonuniform Heat Flux Distribution Under Natural Circulation, A Transactions of the American Nuclear Society, Vol. 118, pp. 1101-1104, 2018.

[78] S. M. Alzahrani, and **S. Usman**, (2018), Effect of Twisted Tapes on the Natural Circulation, Heat Transfer, and Pressure Drop Enhancements, Transactions of the American Nuclear Society, Vol. 118, pp. 1203-1206, 2018.

[79] M. M. Taha, I. A. Said, **S. Usman**, M. H. Al-Dahhan, (2017) Effect of cooling on natural circulation velocity and temperature measurements inside vertical heated channel representing prismatic modular reactor core, 2017 AIChE Annual Meeting in Minneapolis, MN, October 31, 2017.

[80] **S. Usman**, B. Almutairi, and T. Akyurek, (2017) A New Phenomenological Model for Geiger-Müller Deadtime, Transactions of the American Nuclear Society, Transactions Vol. 17 pp. 496-498 November, 2017.

[81] I. A. Said, M. M. Taha, **S. Usman**, M. H. Al-Dahhan, (2017) Experimental Study on Helium Natural Convection Heat Transfer For Two Coolant Flow Channels within Prismatic Very High Temperature Reactor, Transactions of the American Nuclear Society, Washington, DC, USA, October 29 - November 2, 2017.

[82] **S. Usman**, (2017) Natural Convection – A Case of Simple Harmonics, Proceedings of the 25th International Conference on Nuclear Engineering, ICONE25-67500.

[83] S. Sipaun and **S. Usman**, (2016) Convective cooling in a pool-type research reactor, - AIP Conference Proceeding (1704, 020002).

[84] T. Akyurek, and **S. Usman**, (2016) Deadtime Calculations of Liquid Scintillator Neutron Detector Using Attenuation Law, Transactions of the American Nuclear Society, vol. 115, pp. 339-341. November 6-10, 2016.

[85] T. Akyurek, L.P. Tucker and **S. Usman**, (2016) Deadtime Determination of Helium Detector Using MCNP Code, T Transactions of the American Nuclear Society, vol. 115, pp. 342-344. November 6-10, 2016.

[86] M. M. Taha, I. A. Said, **S. Usman**, and M. H. Al-Dahhan (2016) Thermal hydraulics natural convection heat transfer characterization in Missouri S&T prismatic scaled-down dual channel facility (PDCF-MS&T), AICHE16 Annual meeting, San Francisco, CA, USA

[87] I. A. Said, M. M. Taha, **S. Usman**, and M. H. Al-Dahhan (2016), Investigation of free convection heat transfer in Missouri S&T prismatic scaled down facility (MSTF), The 24th International symposium on Chemical Engineering (ISCRE24), Minneapolis, Minnesota, USA.

[88] M. Yousaf, and **S. Usman**, (2016) Isothermal Rectangular Roughness Elements in a Rectangular Cavity Heated at Bottom, International Conference on Nuclear Engineering (ICONE24), vol 5, pp. ICONE24-60908.

[89] I. A. Said, M. M. Taha, **S. Usman**, and M. H. Al-Dahhan (2015) Experimental and computational investigations of plenum-to-plenum heat transfer and gas dynamics under natural circulation in a prismatic very high temperature reactor, AICHE15th Annual meeting, 121216, pp. 97-107.

[90] M.M. Kao, P. Jain, **S. Usman**, I.A. Said, M.M. Taha, M. Al-Dahhan and Rizwan Uddin NURETH-15, (2015) Investigation of Plenum-to-Plenum Heat Transfer and Gas Dynamics under Natural Circulation in a Scaled-Down Dual Channel Module Mimicking Prismatic VHTR core using CFD, 16th International Topical Meeting on Nuclear Reactor Thermal Hydraulics, Chicago, Illinois, USA, vol 2, pp. 979-995.

[91] M.M. Kao, P. Jain, I.A. Said, M.M. Taha, **S. Usman**, M. Al-Dahhan and Rizwan Uddin, (2015) Study of Plenum to Plenum (P2P) Natural Circulation Phenomena in a Dual Channel Scaled Module of Very High Temperature Reactor Design By Using CFD, AICHE15th Annual meeting, 121216, pp. 30-43.

[92] M. Xing, K. Awuah-Offei, S. Long, **S. Usman**, (2015) The impact of a strong local supply chain on regional economic impacts of mining, SME Annual Conference and Expo and CMA 117th National Western Mining Conference - Mining: Navigating the Global Waters, pp. 152-156.

[93] M.Yousaf, and **S. Usman**, (2015) Heat Transfer during Natural Convection between Two Rough Horizontal Parallel Plates, Transactions of the American Nuclear Society, vol. 112, pp. 933-936.

[94] M.Yousaf, T. Akyurek, A. Alajo, and **S. Usman**, (2015) Distance Education of Reactor Laboratory at Missouri S & T, Transactions of the American Nuclear Society, vol. 112, pp. 41-44.

[95] S. Sipaun, S. Long, **S. Usman**, K. Awuah-Offei, (2014) Supply Chain Feasibility Analysis of Small Modular Reactor Technology, Proceeding of the American Society for Engineering Management, 35th International Annual Conference of the American Society for Engineering Management, pp. 1.

[96] L. P. Tucker, A. B. Alajo, and **S. Usman**, (2013), Feasibility of fueling the current PWR fleet with thorium-based MOX, Transactions of the American Nuclear Society, 109(PART 2), pp. 1480-1482.

[97] M.Yousaf, S. Sipaun, C. Yigit and **S. Usman**, (2013) Velocity profile under natural convection between two parallel plates, Transactions of the American Nuclear Society, vol. 108, pp. 1008-1010.

[98] A. Hussain, M. S. Aljohani, **S. Usman**, (2013) Steady state and transient thermal hydraulic analysis of PHWR using COBRA-3C/RERTR, Transactions of the American Nuclear Society, 109(PART 2), pp. 1751-1753.

[99] S. Sipaun, K. O'Bryant, M. Yousaf, C. Yigit, C. Castano, A. Alajo, **S. Usman**, CFD modeling of a coolant channel for Missouri S&T Reactor, Transactions of the American Nuclear Society, Atlanta, GA, USA, June 2013.

[100] M. Yousaf, **S. Usman**, Comparison of traditional and hybrid dead time models for radiation detector, Transactions of the American Nuclear Society vol. 106, pp. 291-292.

[101] K. O'Bryant, S. Sipaun, **S. Usman**, C.H. Castano, A. Alajo, (2012) Determination of hot channel of Missouri S&T nuclear reactor, Transactions of the American Nuclear Society vol. 106, pp. 817-818.

[102] T. Akyurek, M. Yousaf, **S. Usman**, Operating voltage dependence of detector deadtime - GM counter, (2012) Transactions of the American Nuclear Society vol. 106, pp. 817-818.

[103] B. Richardson, C. H. Castaño, J. King, A. Alajo, **S. Usman**, (2011) Model Benchmarking for Missouri S&T Reactor Part 1: Approach to Criticality and Axial Flux Profile, Transactions of the American Nuclear Society vol. 105, pp. 842-843.

[104] B. Richardson, C. H. Castano, J. King, A. Alajo, **S. Usman**, (2011) Model Benchmarking for Missouri S&T Reactor Part 2: Moderator Temperature and Void Coefficients of Reactivity, Transactions of the American Nuclear Society vol. 105, pp. 844-845.

[105] L.P. Tucker, and **S. Usman**, (2011) Subcritical Assembly at Missouri University of Science and Technology, Transactions of the American Nuclear Society vol. 104, pp. 113-114.

[106] Z.A. Kulage, C. Castaño, G.E. Mueller, and **S. Usman**, (2011) Neutron Flux Characterization at the Missouri S&T Nuclear Reactor, Transactions of the American Nuclear Society vol. 104, pp. 918-919.

[107] E. J. Grant, G.E. Mueller, C. Castaño, A.S. Kumar, and **S. Usman**, (2011) Internet Accessible Hot Cell with Gamma Spectroscopy at the Missouri S&T Nuclear Reactor, Transactions of the American Nuclear Society vol. 103, pp. 122-123.

[108] D. L. Gallego, **S. Usman**, (2010) Neutron fluence measurement using common PNP transistors, Transactions of the American Nuclear Society 102, pp. 195-196.

[109] A. Patil, **S. Usman**, S. Jarugumilli, S. E. Grasman, (2010) Application of queueing theory for detector dead time estimation, Transactions of the American Nuclear Society 102, pp. 197-198.

[110] M.L. Dennis and **S. Usman**, (2008) Online Burnup Analysis of MOX Fuel Using Gamma Spectroscopy Transactions of the American Nuclear Society, vol. 99, pp. 181-183.

[111] A. Patil and **S. Usman**, (2008) Paralysis Factor& Dead-time, Measurement Technique and Count Rate Correction, ANS Transactions Vol. 99, pp. 631-632.

[112] V. Khane and **S. Usman**, (2008) Extension of RC Circuit Analogy for Natural Convection, ANS Transactions, Vol. 99, pp. 788-789, November 2008, Reno, NV.

[113] S. Yu, W. Bonzer, and **S. Usman** (2006) Prototype Computer Based Procedure Implementation at University of Missouri-Rolla Reactor, November 2006, Albuquerque, NM.

[114] **S. Usman**, B.K. Hajek, and S. F. Ali, (2006) Needs Analysis of a Flexible Computerized Management Infrastructure, 5th International Topical Meeting on Nuclear Plant Instrumentation, Control and Human-Machine Interface Technologies (NPIC&HMIT) November, 2006, Albuquerque, NM.

[115] M.L. Dennis, and **S. Usman**, (2006) Feasibility Study of MOX Fuel Burnup Analysis, International Congress on Advances in Nuclear Power Plants, Embedded International Topical Meeting at the 2006 ANS Annual Meeting, Paper 6417.

[116] **S. Usman**, B.S. Mohammad, L. Shoaib and S. Abdallah, (2006) Transient Response of a Natural Convection System, International Congress on Advances in Nuclear Power Plants, Embedded International Topical Meeting at the 2006 ANS Meeting, Paper # 6418.

[117] A. Patil, Dramane Konate, Thomas P. Goter and Shoaib Usman, (2006) Isodose Mapping Using Coincidence Measurement of Annihilation Photons, American Nuclear Society Annual Meeting June 2006, Reno, Nevada., Vol. 94, pp. 410-411.

[118] **S. Usman**, S. Abdallah, M. Hawwari, M. Scarangella and L. Shoaib, (2005) Integrator Circuit an Analogy for Convection, ANS Annual Meeting Summer 2005.

[119] N. Xoubi, **S. Usman**, and G. I. Maldonado, (2004) Subcritical Reactor Experiments at the University of Cincinnati, ANS Annual Meeting Summer 2004.

[120] Syahrir, **S. Usman**, H. Spitz, J. Weisman, (2004) Transport of Radon in Still Water under Steady-State and Transient Conditions, International Radiation Protection Association (IRPA 11th International Congress), May 23-28, 2004, Madrid, Spain.

[121] S.F. Ali, J. Christenson, P. K. Ray, **S. Usman**, (2004) Building an effective educational bridge between Tuskegee University and the University of Cincinnati Nuclear and Radiological Engineering Program, ANS Annual Meeting Summer 2004.

[122] K. Kang, B.K. Hajek, **S. Usman** and J.M. Christenson, (2001) A Study for Soft-Landing from Paper Procedure to Digital Procedure, Proceedings of ANS Topical Meeting on Research, Development, and Emerging Technologies for Power Reactors, Reno, Nevada, November 2001.

[123] **S. Usman** B.K. Hajek and J.M. Christenson, (2000) Demonstration of a Prototype Paperless Reactor Operations Module, International Topical Meeting on Nuclear Plant Instrumentation, Controls and Human-Machine Interface Technologies (NPIC&HMIT 2000), Washington DC, November 2000.

[124] **S. Usman** and H.B. Spitz, (1998) Atmospheric Dispersion Under Various Stability Classes, 1998 ANS Annual Meeting and Embedded Topical June 7-11, 1998.

[125] **S. Usman**, H.B. Spitz, L. Shoaib and J. O'Hare, (1996) Response of Electret Radon Detector to Interference from Ambient Gamma Radiation, the 29th Mid Year Topical Meeting of the Health Physics Society, January 7-10, 1996.

[126] **S. Usman**, L. Shoaib and J.N. Anno, (1994) Development of a Photoconductive Gamma Dosimeter for Space Application, SAE Aerospace Atlantic Conference & Exposition' 94, Dayton, Ohio, April 1994.

[127] J. Weisman, and **S. Usman**, (1993) A Critical Heat Flux Model for Tubes Containing Twisted Tapes, ANS Meeting San Diego, Summer 1993.

POSTER & CONFERENCES

[128] **S. Usman**, Small Modular Reactor Research and Education Consortium, Advanced Manufacturing and Nuclear Supply Chain Development Conference, Saint Louis, MO, September 12, 2016.

[129] **S. Usman**, Development of SMR Supply chain in the Midwest, Oral Presentation at 5th Annual Small Modular Reactor Summit, Charlotte, NC, April 14-15, 2015.

[130] **S. Usman**, Feasibility of 106Ru peak measurement for MOX fuel burnup analysis, Oral Presentation at Physics Colloquia Series, Truman State University, December 1, 2010.

[131] D. Gallego and **S. Usman**, Providing Lab Courses to Distance Students, , Teaching and Learning Technology 2010, Missouri University of Science and Technology, March 11-12, 2010.

[132] M. L. Dennis, Proliferation Deterrence by Spent Fuel Monitoring, Poster at DOE FCRD Annual Meeting Poster Competition, October 28, 2010.

[133] **S. Usman**, and M. L. Dennis, Proliferation Deterrence by Spent Fuel Monitoring, Poster at Missouri Energy Summit, Columbia, MO., April 22-23, 2009.

[134] **S. Usman**, and A. Patil, Detector Paralysis Factor and Dead-time Measurements, Poster at Missouri Energy Summit, Columbia, MO., April 22-23, 2009.

[135] **S. Usman**, and K. Khane, Analogy Based Modeling for Natural Convection, Poster at Missouri Energy Summit, Columbia, MO., April 22-23, 2009.

[136] C. H. Castano, G. E. Mueller, **S. Usman**, A. S. Kumar, and J. C. King, Heavily Shielded Hot-Cell at Missouri S&T, Poster at Missouri Energy Summit, Columbia, MO., April 22-23, 2009.

[137] A. Patil and **S. Usman**, Measurement and Application of Paralysis Factor for Improved Detector Dead-time Characterization, Council on Ionizing Radiation Measurements and Standards 16th Annual Meeting, "Measurements and Standards for Radiation-based Imaging " Gaithersburg, MD, Oct. 22 - 24, 2007.

[138] **S. Usman**, Experimental Observation of Radio-Turbulence, Guest Speaker - Special Seminar, National Institute of Standards and Technology, Gaithersburg, MD, Feb. 10, 2004.

[139] **S. Usman**, Syahrir, H. Spitz, J. Weisman, Transport of Radon in Still Water, Council on Ionizing Radiation Measurements and Standards 12th Annual Meeting, Gaithersburg, MD, Oct. 27-29, 2003.

[140] **S. Usman**, Spectral Theory of Turbulence and Atmospheric Dispersion, Guest Speaker at a Special Seminar, National Oceanic & Atmospheric Administration, Oak Ridge, TN., April 23, 1997.

MEDIA COVERAGE

[141] **Invited Speaker at 2023 Laufer Energy Symposium,2023** [Link]

[142] **Featured as a grant awardee "Missouri S&T researchers awarded seed grants from Taylor Geospatial Institute," 2023** [Link]

[143] **Supervising Ph.D. student on advanced nuclear concepts, July 2019.** [Link]

[144] **Supply chain of SMRs, featured as "Distinguished Speaker," 42nd International Nathiagali Summer College, Islamabad - Pakistan, July 17-29, 2017.** [Link]

[145] **Featured on "West Lake Landfill Tree Core Analysis Report," 2015.** [Link]

SOFTWARE PRODUCTS

[146] **S. Usman**. SAAM: Critical Path Method. 1988.

[147] **S. Usman**. PulseGen. 2015.

[148] **S. Usman**. Critical Heat Flux Prediction. 1994.

GRADUATE RESEARCHERS

NAME	DEGREE - YEAR	ROLE
Manuela I. A. Alvarez	PhD - (est. 2028)	PhD Advisor
Farooq Ahmad	PhD - (est. 2027)	PhD Advisor
Sunny Tummala	PhD - (est. 2027)	PhD Advisor
Eric A. Feisslel	PhD - (est. 2026)	PhD Advisor
Abdallah Wazzan	PhD - (est. 2025)	PhD Advisor
Ben Sonpon	PhD - 2024	PhD Advisor
Bader J. Almutairi	PhD - 2020	PhD Advisor
Mubarak M. Albarqi	PhD - 2019	PhD Co-Advisor
Salman M. Alshehri	PhD - 2019	PhD Advisor
Raed A. M. Alsulami	PhD - 2019	PhD Advisor
Salman M. Alzahrani	PhD - 2019	PhD Advisor
Mahmoud T. Moharam	PhD - 2017	PhD Co-Advisor
Ibrahim A. Said	PhD - 2017	PhD Co-Advisor
Muhammad Yousaf	PhD - 2016	PhD Advisor
Lucas P. Tucker	PhD - 2016	PhD Advisor
Tayfun Akyurek	PhD - 2015	PhD Advisor
Susan Sipaun	PhD - 2014	PhD Advisor
Amol Patil	PhD - 2010	PhD Advisor
Syahrir Syahrir	PhD - 2004	PhD Co-Advisor
Ali A.A.M.A. Alkandari	MS - (est. 2026)	MS Advisor
Nathan W. Jackson	MS - (est. 2025)	MS Advisor
Mehedi H. Tusar	MS - 2023	MS Advisor
Jay P. Joshi	MS - 2017	MS Advisor
Eric A. Feisslel	MS - 2017)	MS Advisor
Kelly O'Bryant	MS - 2012	MS Co-Advisor
Brad Richardson	MS - 2012	MS Co-Advisor
Lucas P. Tucker	MS - 2011	MS Advisor
Edwin Grant	MS - 2010	MS Co-Advisor
Zachary A. Kulage	MS - 2010	MS Co-Advisor
Amol Patil	MS - 2008	MS Advisor
Vaibhav B. Khane	MS - 2009	MS Advisor
David Gallego	MS - 2009	MS Advisor
Matt L. Dennis	MS - 2008	MS Advisor
Bassam S. Mohammad	MS - 2007	MS Advisor
Majd I. Hawwari	MS - 2004	MS Advisor
Dramane Konate	MS - 2004	MS Advisor
Michael J. Scarangella	MS - 2004	MS Advisor
Ned Xoubi	MS - 2003	MS Advisor
Turki Ali	MS - 2020	MS (Non-Thesis)
Jonathan Frasch	MS - 2008	MS (Non-Thesis)
Saima Rashid	MS - 2015	MS (Non-Thesis)

THESIS COMMITTEE

Shreekanta B. Aradhya	PhD - 2013	PhD Dissertation Reviewer
Vaibhav Sinha	PhD - 2013	PhD Dissertation Reviewer
Moses O. O. Kagumba	PhD - 2013	PhD Dissertation Reviewer
Faraj Muftah Zaid	PhD - 2013	PhD Dissertation Reviewer

Jessika V. Rojas	PhD - 2014	PhD Dissertation Reviewer
Chrystian M. Posada	PhD - 2014	PhD Dissertation Reviewer
Manish K. Sharma	PhD - 2016	PhD Dissertation Reviewer
Abdelsalam Efhaima	PhD - 2016	PhD Dissertation Reviewer
Fitri B. AbdulRahman	PhD - 2017	PhD Dissertation Reviewer
Huseyin Sahiner	PhD - 2017	PhD Dissertation Reviewer
Laith S. Sabri	PhD - 2018	PhD Dissertation Reviewer
Abbas J. Sultan	PhD - 2018	PhD Dissertation Reviewer
Shaikat M. Galib	PhD - 2019	PhD Dissertation Reviewer
Ashraf Alsafasfeh	PhD - 2020	PhD Dissertation Reviewer
Abdulaleem A. Bugis	PhD - 2020	PhD Dissertation Reviewer
Palash K. Bhowmik	PhD - 2021	PhD Dissertation Reviewer
Kennard Callender	MS - 2007	MS Thesis Reviewer
Frank A. Strantz	MS - 2011	MS Thesis Reviewer
Muhammad I. K. Abir	MS - 2011	MS Thesis Reviewer
Jessika V. Rojas	MS - 2011	MS Thesis Reviewer
Chrystian M. Posada	MS - 2011	MS Thesis Reviewer
Jason J. Pleitt	MS - 2012	MS Thesis Reviewer
Lifeng Wang	MS - 2013	MS Thesis Reviewer
Brandon J. Lahmann	MS - 2014	MS Thesis Reviewer
William Kirby Compton	MS - 2015	MS Thesis Reviewer
Meiyu Xing	MS - 2015	MS Thesis Reviewer
Shaikat M. Galib	MS - 2015	MS Thesis Reviewer
Brendan Dsouza	MS - 2015	MS Thesis Reviewer
Varun Kalra	MS - 2017	MS Thesis Reviewer

UNDERGRADUATE RESEARCHERS

NAME	DEGREE - YEAR	SCHOLARSHIPS
S. Yu	BS - 2006	Opportunities for UG Research Experience ANS Presentation
Thomas P. Goter	BS - 2007	Opportunities for UG Research Experience ANS Presentation
Fatin N. Binti Padzli	BS - 2018	Opportunities for UG Research Experience
Jack Vande Polder	BS - 2022	Special Problems

VISITING RESEARCHERS

NAME	DATES	LEVEL - INSTITUTION
Syed Farasat Ali	2005	Prof., Tuskegee University, AL
Tayfun Akyurek	2017	Professor - Marmara University, Turkey
Bader Almutairi	2023	Scientist - Kuwait Institute Scientific Research

TEACHING

MISSOURI UNIVERSITY OF SCIENCE & TECHNOLOGY

Nuclear Technology Applications (Extension at Lincoln Uni.) – NE 25	Fall 06
Nuclear Technology Applications – NE 25	Spring 10
Interactions of Radiation with Matter – NE 203	Summer 07
Nuclear Radiation Detection &Measurements – NE 204	Spring 05
Fundamentals of Nuclear Engineering – NE 205/NE 3205	Fall 04-08, 10
Reactor Laboratory I (Lab & Lecture) – NE 304/NE 4428	Fall 05-08, 10-22
Reactor Laboratory II (Lab &Lecture) – NE 308/NE 4438	Spring 06 and 16
Nuclear Rad. Measure'ts & Spectro. – NE 312/NE 4312	Spring 06-08,10-12,14-15,21-22
Radiological Engineering – NE 301/NE 327/NE4357 & 5347	Spring 07-19, 23-24
Applied Health Physics – NE 333/NE4363 & 5363	Fall 11-12, 14-17, 23-24
Radiochemistry and Nuclear Forensics – NE 301 (20%)	Spring 12
Advanced Nuclear Thermal-Hydraulics – NE 407	Fall 13

Licensing of Nuclear Power Plants – NE4259	Fall 17, 18, 21, 22, 23-24
Reactor Physics I NE – 4203/5203	Spring 19
Nuclear Fuel Cycle NE – 4207/5207	Fall 19
Nuclear Engineering Seminar NE – 6010	Fall 16,17, 18 – Spring 17
Radiation Shielding NE – 6331	Fall 20, 21
Radiation Interaction with Matters NE – 3103	Spring 23-24

UNIVERSITY OF CINCINNATI

Nuclear Reactor Eng. I – NE 604	Winter 99
Nuclear Reactor Eng. II – NE 605	Spring 99
Radiation Effects on Materials – NE 644	Fall 99
Radiation Measurement I - NE 521/523	Fall 01, 03, Winter 04
Radiation Measurement II - NE 522/524	Winter 02, 03, 04 (Spring)
Nuclear Reactor Lab - NE 599	Spring 02, Fall 03

PEER REVIEWING

Editorial Board

Frontiers in Energy Research **2016 – present**
Journal of Nuclear Engineering and Radiation Science **2018 – 2024**

Manuscript Referee

Annals of Nuclear Energy
Nuclear Engineering and Design
Nuclear Science and Engineering
Nuclear Technology
Journal of Fluid Mechanics
Progress in Nuclear Energy
Progress in Computational Fluid Dynamics
Desalination and Water Treatment
Energy
Nuclear Engineering and Technology
Applied Radiation and Isotopes
Chemical Engineering Science
Swiss National Science Foundation
Journal of Nuclear Engineering and Radiation Science
Journal of Nuclear Energy Science & Power Generation Technology
Nuclear Science and Techniques
Progress in Nuclear Energy

Grant Proposal Referee

Dept. of Energy Nuclear Energy University Programs
U.S. Nuclear Regulatory Commission
U.S. DOE SBIR/STTR
U.S. DOE NEER & NERI
International Agencies: Georgia

INTERNATIONAL SERVICE

IAEA Technical Meeting on Developing a Sustainable Nuclear Supply Chain for Near Deployment Reactors December 10 - 12, 2024

Invited as a US Nominee to attend meeting aimed at supporting Member States in the development of management systems, and other related activities required for nuclaer power plant deployment and human performance, leadership, and stakeholder involvement for construction and operation of NPPs. Another objective is to support Member States in the development of supply chains, industrial involvement, procurement, quality assurance and quality control, codes and standards, and harmonization efforts for NPPs. As the Technical Working Group of Nuclear Power Plants Operations has found the supply chain of nuclear to be one of the most important topics affecting reliable operation. Role of the US nominee is to share the status of the nuclear supply chain in the US and identify areas where harmonization of design code and regulatory standards can safely accelerate the deployment of nuclear reactors.

Consulting support for Curriculum Review of Nuclear Engineering Program at King Abdulaziz University, Jeddah, Kingdom of Saudi Arabia March 23 - 27, 2014 The main goal of this assignment was to enhance the nuclear engineering Bachelors, Masters and Doctoral programs at King Abdulaziz University in Saudi Arabia. As a part of four members international committee provided guidance on the overall structure of the degree programs as well as specific lecture and laboratory classes: 2. Suggested various degree program structure and degree paths with a list of required and elective courses. 3. Prepare courses syllabi with suggestions for the most appropriate textbooks and teaching materials including the course content, outline and the learning objectives for the classes.

IAEA program for Mentorship on Nuclear Reactor Design in the Master Course, Abuja, Nigeria June 25 - 29, 2012
The main goal of this assignment was to teach Nuclear Reactor Design to graduate students of the Nigeria nuclear engineering and science program and interact with the Home-instructor for knowledge sharing and expertise development. Following tasks were performed to achieve the mission goals: 1. Prepare teaching material for Nuclear Reactor Design using up-to-date engineering literature at an appropriate level for the students. 2. Deliver the requisite lectures in nuclear reactor design in accordance with the program developed by administrators of the nuclear engineering and science program. 3. Mentor the students throughout the duration of the mission and share some research ideas for them to continue their graduate program. 4. Transfer the teach material to the local instructor for any future use in form of the power point presentation.

Professional Service

Invited Speaker Laufer Energy Symposium — 2023
Senior Member – Mines & Metallurgy Academy — 2022
Foreign Faculty – International Nathiagali Summer College on Physics — 2007
Secretary – NPIC & HMIT — 2006

Departmental Service

Member ———— Several Faculty Search Committee — 2005-present
Faculty Advisor – ANS Student Chapter at S&T — August 2004 – August 2006
Faculty Advisor – Alpha Nu Sigma Student Chapter at S&T — August 2006 – 2016
Mentorship —— Several junior faculty members — 2010-present

College Service

Member – Faculty Senate representing nuclear engineering program — 2010-present
Member – Tenure and Promotion Committee (for both CEC and Campus) — 2012-present
Member – Tenure Policy Committee (Campus) — 2012-present
Member – Missouri S&T Radiation Safety Committee — 2014-present

Consulting

Capgemini Cincinnati, OH — **1999-2002**
Data Modeling, system architecture and cyber-security for Internet/Intranet ecommerce applications development
Procter & Gamble, Johnson & Johnson and The Coca-Cola Company

Reference

Provided upon request

Keke Wu ("Coco")

Professor, College of Business
Central Washington University, Ellensburg, WA 98926 [redacted]

Academic Qualification

Professor of Management, Central Washington University (SA), Fall 2022 - present
Associate Professor of Management, Central Washington University (SA), Fall 2017
Assistant Professor of Management, Central Washington University (SA), Winter 2011
Ph.D. in Management, The University of Alabama, Tuscaloosa AL, Spring 2010
MBA and MSc, Jacksonville State University, Jacksonville AL, Summer 2005
BS - International Business, Guangdong University of Foreign Studies, China, Summer 2000

Administrative Experience

Associate Dean, CWU College of Business (CB), December 2018 – December 2023

Strategic Management and Accreditation Maintenance

- Shaped the process of strategic planning and the maintenance of AACSB and NWCCU accreditation.
- Implemented the CB strategic plan for AY18-20, with a focus on curricular assessment, academic advising, enrollment management, and cocurricular engagement.
- Led the CB Executive Committee on the development and implementation of the strategic plan for AY21-25, including:
  - Revised CB Vision, Mission, Values.
  - Identified AY21-25 Strategic Goals.
  - Established timetables for the each of the strategic goals.
  - Developed the assessment process for the strategic plan.
  - Ensured the alignment of the CB strategic plan to the CWU strategic plan and priorities.
- Engaged students in the strategic management process for both CB and CWU, including:
  - Engaged CB Dean's Council (CB student organization leaders) on the revision of CB Vision-Mission-Values-Goals.
  - Ensured student participation in the CWU strategic planning processes.
  - Incorporated student input in the strategic plans in the college as well as the university.
- Rebuilt and engaged CB Leadership Board (i.e., industry advisory board) in strategic planning and implementation.
- Maintained currency with accreditation standards of specialized and regional accreditors.
- Interpreted, applied, and implemented accreditation standards in college operation.
- Ensured faculty sufficiency in CB academic programs by working with chairs and faculty on teaching and research workloads.
- Prepared the college for accreditation visits and produced accreditation reports.

Operational Budget and Enrollment Management

- Managed the college operational budget, currently at about $ 10 million (not including CWU Foundation funding).
- Optimized the processes for instructional budget planning and academic scheduling (for 7 degree-programs with 50 FTE on faculty, 70% T/TT).
- Analyzed enrollment trends to project course demands, faculty workload, and staffing needs.
- Monitored faculty workload to ensure compliance with the CWU Faculty Collective Bargaining Agreement.
- Monitored faculty sufficiency on academic schedules to ensure compliance with the AACSB and NWCCU accreditation standards.
- Advised the departments on instructional budget and academic scheduling.
- Advised the departments on scheduling options to ensure efficiency and effectiveness of program delivery.
- Coordinated Summer School by managing the summer budget and schedule, in collaboration with other colleges and the Provost's Office.
- Coordinated General Education academic schedules with the Provost's Office.
- Advised the dean on college budget decisions, related to both instructional and non-instructional activities and needs.
- Maintained a balanced budget through institutional budget model changes and the COVID pandemic, which involved the implementation of 2 budget model changes, and various cuts in operational budget.

Curricular Program Oversight and Curricular Assessment

- Oversaw curriculum development of 7 degree-programs (1 graduate, 6 undergraduate, with 11 specializations, 11 minors, 5 certificates, on the main campus, at 6 instructional sites, and online).
- Spearheaded the development of new academic programs:
  - Launched 3 Agribusiness certificate programs (Ag-Biz, Ag-Tech, Ag-Innovation, interdisciplinary), which are to become part of the 1st stackable degree program in the state of Washington – 2021, 2022, 2023
  - Launched the Graduate Managerial Accounting Certificate – 2022
  - Launched the Graduate Professional Tax Certificate – 2021
  - Redesigned and re-launched the Master of Professional Accountancy program - 2020
  - Launched the Graduate HRM Certificate – 2020
  - Launched the BS Entrepreneurship program - 2019
  - Strengthened the BS Personal Financial Planning program with donor support - 2019, which still is the only CFP Board certified program in the state of Washington
- Provided policy/procedure/design guidance for the CB Curriculum Committee in the curriculum development and review process.
- Provided quality control and enforcement of university and college academic policies and procedures.
- Ensured that CB programs meet curriculum standards for both specialized and regional accreditors.
- Directed the CB Assurance of Learning (AOL) committee in the establishment and implementation of a robust and sustainable AOL system/process.
- Analyzed CB assessment data and produce CB assessment reports in collaboration with CB AOL Committee and CB faculty.

- Engaged faculty to ensure the continuous improvement of CB curricular design, delivery, and assessment.
- Facilitated the implementation of curriculum changes to address assessment results.
- Developed and refined CB assessment strategies and monitored its progress to ensure CB programs meet specialized accreditation standards for programmatic assessment.
- Collaborated with the CWU Assessment Council to ensure that CB programs and courses meet regional accreditation needs.

Academic Advising and Engagement Program Oversight, and Co-Curricular Assessment

- Oversaw and support CB advising operations and assessment.
- Oversaw CB enrollment management and academic scheduling, serving about 1,200 undergraduate and 30 graduate students.
- Drove the development and assessment of the CB co-curricular program EDGE (explore → develop → grow → excel), designed for the purpose of student engagement with a focus on the CB program learning goal Career Readiness.
- Adopted and managed the Suitable platform for EDGE.
- Collaborated with faculty and staff on the development – refinement – assessment of EDGE.
- Connected with industries to ensure currency and relevance of the co-curriculum program.
- Initiated industry sponsored co-curricular programs (e.g., a KPMG badge on EDGE)
- Directed CB engagement plans and events, including regional conferences, community events, and student events.
- Spearheaded the institutional effort on gathering placement data via the First Destination Survey by collaborating with CWU Alumni Relations and Career Service in survey design, delivery and providing support for analytics.

Marketing Communications and Public Relations

- Developed the marketing and communication strategies for both curricular and co-curricular programs and oversee their implementation, across all instructional locations and online.
- Supervised the development and distribution of marketing information and materials, including rebranding CB social media and the CB undergraduate magazine LAUNCH, rebranded, redesigned from "CB Looks" in 2019).
- Established the college marketing communication network and oversaw its development and maintenance.
- Collaborated with university centers (remote instruction cites) as well as university admissions office in marketing, recruitment, orientation, and retention efforts.
- Serve on the CWU Brand Council and advise the council on the re-brand and its implementation.
- Collaborated with CWU University Relations in developing web design and contents for the new CWU website.
- Directed the CB communication plan for branding and website redesign.

Alumni and Donor Relations

- Managed the CB Emergency Fund, supported by BECU, to provide emergency financial aid to students in need.
- Coordinated with CWU Alumni Relations to engage alumni in various capacities.

- Engaged CB leadership board members in the development of the co-curricular program.
- Spearheaded the First Destination Survey project in collaboration with CWU Alumni Relations and Career Services.
- Collaborated with CWU Alumni Relations and Public Affairs in the rebranding and development of the CB alumni magazine VOYAGE (rebranded, redesigned from "Beacon" in 2019).
- Supported fund raising activities such as Day of Giving at CWU.
- Supported alumni engagement events such as the annual Find Your Voice conference, hosted by the CWU Women in Business club and sponsored by CB.

Diversity, Equity, and Inclusion

- Highlighted DEI in the co-curricular program EDGE, by:
  - promoting events/activities related to DEI, such as a cultural awareness workshop.
  - incentivizing student participation with opportunities for higher visibility.
  - engaging industry partners in creating equitable access to professional development opportunities for all students.
  - creating corporate/industry sponsored co-curricular credentials/badges (e.g., the KPMG badge as part of the Reaching New Heights Program).
- Supported faculty work on various diversity initiatives, such as:
  - CB diversity climate survey.
  - CB emotional intelligence training for faculty, staff, and students.
  - Incorporation of DEI contents in CWU curriculum.
- Supported student work and organizations that serve minority and underrepresented groups.
- Supported the recruitment and retention of students, faculty, and staff, from diverse backgrounds.
  - 55% of CB student population is of minority ethnicity.
  - CB faculty has been the most diverse group of faculty at CWU across all ranks.
- Served as CB liaison to the Office of International Studies and Programs (OISP).
  - Perform curriculum review with partner institutions overseas.
  - Support OISP in establishing and maintaining exchange relationships with partner institutions.
  - Support OISP in its student advising and engagement efforts.
  - Support OISP in its recruitment activities.

Labor Relations and Personnel Management

- Oversaw college operation that involves collaboration with three unions at CWU: faculty, civil service, and facilities.
- Maintained currency with collective bargaining processes and policies.
- Ensured compliance of college operations with all three collective bargaining agreements.
- Supervised the CB Student Engagement Coordinator position, which leads a team of student ambassadors in performing the positions key responsibilities, including co-curricular program development and implementation, as well as program marketing and communication.
- Recruited, coached, and mentored advising and engagement staff.
- Recruited, trained, and supervised student employees at times of need.

- Chaired Faculty 180 Council (while on faculty) and worked with Faculty Relations office in providing guidance and training for faculty in the performance/tenure review process.
- Coached/mentored both tenure track and non-tenure track faculty in the faculty review process (both as faculty, as Faculty 180 Council chair, and as associate dean).
- Chaired and served on various search committees for administrative, staff, and faculty positions.
- Co-chaired the department personnel committee (when on faculty, before assuming the position of the Associate Dean).

Assurance of Learning (AOL) Director, CWU College of Business, Fall 2015 – Summer 2018

- Initiated changes to curricular assessment to address the concerns and recommendations from the AACSB peer review team (CIR2015).
- Led faculty discussions on changes to assessment strategy, process, and instruments.
- Redefined the college's assessment strategy to provide systematic guidance to using assessment as a mechanism for continuous improvement.
- Established a robust and sustainable assessment process that supports assessment data collection, analysis, and reporting.
- Worked with faculty in the College of Business (CB) and across campus in related disciplines to rebuild assessment instruments, including test banks and grading rubrics, for all CB major and specialization programs.
- With faculty support, experimented various assessment schedules and instruments within the core curriculum between Fall 2015 and Fall 2018.
- Created and implemented an end-of-program assessment course (BUS489) to capture assessment data from graduating seniors, where pre-graduation assessment instruments are implemented.

Chair, CWU Faculty 180 Council, Fall 2016 – Summer 2018

- Chaired the CWU Faculty 180 Council, a council consisting of CWU administrators, CWU faculty union representative, and CWU faculty, in the development and implementation of Faculty 180 as the platform to house faculty personnel review data and process.
- Developed training materials to help faculty navigate the personnel review process on this plat form, ensuring compliance with faculty standards across all colleges on campus.
- In conjunction with the provost's office, delivered training workshops before each faculty personnel review cycle starts.
- In partnership with the dean's office, provided technical support for CB faculty during their personnel review process.

Professional Development *(key items, not exhaustive list)*

- AACSB Lessons for Aspiring Deans 2022
- Diversity Advocate Training 2022
- AACSB Global Diversity and Inclusion Conference 2021
- AACSU Academic Affairs Summer Meeting 2021
- AACSB Associate Deans Conference 2020
- AACSB Associate Deans Conference 2019
- Professional Fund Raising for Deans and Academic Leaders 2019

- AACSB Online Teaching Effectiveness Seminar 2018
- AACSB AOL Seminar II 2017
- AACSB AOL Seminar I 2016

Professional Service *(key items, not exhaustive list)*

Key Service Items	Role	Primary Tasks
University		
CWU ASL Leadership	Member	CWU Academic and Student Life
CWU Academic Technology Advisory Council	Chair	CWU academic technology review
CWU Assessment Council	Member	CWU assessment
CWU Brand Council	Member	CWU branding work group
CWU Employee of Color Equity Council	Member	CWU diversity and equity initiatives
CWU Exempt Employee Association	Member	CWU Exempt Pay Committee
CWU ETA+ and MAPs	Member	Transfer marketing/recruitment
CWU Faculty Senate Curriculum Committee	Member	CWU curriculum policy and review
CWU Faculty 180 Council	Chair	Faculty personnel file management system
CWU First Destination Workgroup	Member	Lead on college implementation
CWU Library Associate Dean Search	Chair	Administrative Service
CWU Orientation/Onboarding/Transition	Member	Multiple teams: admissions to retention
CWU Strategic Operation Team	Member	CWU strategic planning in academic units
CWU Summer Session Committee	Member	Budget - Summer budget planning
CWU Transfer Experience Team (TET)	Member	Retention - Transfer experience
College of Business		
CB Executive Committee	Member	CB leadership
CB Assurance of Learning Committee (AOL)	Chair	CB program assessment
Department of Management		
CB MANA Department Personnel Committee	Co-chair	Department personnel review
Professional		
Journal of Leadership & Organizational Studies	Ed Board	Review journal article submissions
Journal of Behavioral and Applied Management	Reviewer	Review journal article submissions
Journal of Business Ethics	Reviewer	Review journal article submissions
Women in Business Education (WiBE)	Member	Professional development
AACSB Women Administrators in Business Education (WABE)	Member	Professional development

Faculty Experience

Fall 2022 – Present	Full Professor of Management
Fall 2017 – Summer 2022	Associate Professor of Management
Winter 2011 – Summer 2017	Assistant Professor of Management

Honors/Awards at CWU

- Nominated by CWU Career Services for the Wildcat Way Spotlight Award 2023

- Best Branding at Suitable for EDGE 2022
- Most Engaged Partner for Suitable 2022
- Visiting Scholar Invitation at the Business School in Shantou University during the 2018-2019 academic year (I did not accept the offer as I moved into the role of the Associate Dean.)
- CB Advisory Board Award for Faculty Excellence in Service AY16-17
- CB Advisory Board Award for Faculty Excellence in Research AY14-15
- Nominated by staff for CB Advisory Board Award for Faculty Excellence in Advising AY14-15
- Nominated by students for CB Advisory Board Award for Faculty Excellence in Teaching AY13-14

Research at CWU

Title	Outlet	Year
Journal Publications		
How and when abusive supervision influences knowledge hiding behavior: Evidence from India	Journal of Knowledge Management	2022
Procedural justice and voice: A group engagement model	Journal of Managerial Psychology	2019
The impact of leader trustworthiness on employee voice and performance in China	Journal of Leadership & Organizational Studies	2019
Perceived outcome interdependence and voice behavior in working teams: Results from the U.S. and China	Journal of Organizational Behavior	2018
The impact of balance-focused attitudes on job stress: Gender differences evidenced in American and Chinese samples	International Journal of Psychology	2018
Egocentric reciprocity and the role of friendship and anger	Journal of Social Psychology	2017
Going against the grain works: An attributional perspective of perceived ethical leadership	Journal of Business Ethics	2017
Investigation of motive between transformational leadership and pro-social voice: An empirical study in China	International Journal of Leadership Studies	2015
The influence of abusive supervision and job embeddedness on citizenship and deviance	Journal of Business Ethics	2015
Moral leadership and psychological empowerment in China	Journal of Managerial Psychology	2012
Role of self-esteem in the relationship between stress and ingratiation	Psychological Reports	2011
Book Chapter		
A New Voice in China	Voice and whistleblowing in organizations: Overcoming fear, fostering courage, and unleashing candor	2013
Conference Presentation/Proceedings (in/post 2017)		
Creative and innovative leadership during the Covid-19 pandemic	Western Academy of Management	2022
A value chain analysis approach to designing a regional medical cluster: A case study in China	Eastern Academy of Management	2017

The voice of a leader: An examination of leader trustworthiness, voice, and performance in China	Academy of Management	2013
Trapped with a mad man: The impact of abusive supervision and job embeddedness on citizenship and deviance	Southern Management Association	2012
Growth-need and impression management in the out-group	Southern Management Association	2011
Balance-focused attitude and job stress in a moderated mediation model	Southern Management Association	2011
Perceived motives of paternalistic leadership and turnover intent	Southern Management Association	2011
Growth-need and work-related outcomes of out-group members	Society for Industrial and Organizational Psychology	2011

Teaching at CWU

BUS 489 – AACSB Assessment (senior capstone, end of program assessment)
MGT 489 – Strategic Management (senior capstone, experiential learning with simulations)
MGT 483 – Organizational Change
MGT 395 – Leadership in Business Organizations
MGT 385 – Organizational Theories
MGT 383 – Contemporary Managerial Practices
MGT 382 – Principles of Management (intro capstone)

Agenda Item Summary

7.1

Date: September 25, 2025

Agenda Item: Master Plan Amendment

☐ **Review** ☒ **Action** ☐ **No action required**

PRESENTER: Dr. Claire Stinson, Sr. Vice President for Planning & Finance

PURPOSE & KEY POINTS: Tennessee Tech University proposes Master Plan Amendment #5 which includes the acquisition of 505 East 15th Street. The property, located three blocks from the northeast corner of campus, features a soon-to-be-completed office building. This acquisition provides an immediate opportunity to relocate the administrative offices of the Facilities Services Complex, which is currently situated on the west side of campus.

BAUER ASKEW
architecture . pllc

615
T726.0047
F726.4891
615

1615
sixteenth
avenue south

nashville
tennessee
37212

25 June 2025

Tennessee Tech University Master Plan
SBC #364/000-02-2019

Master Plan Amendment #5
505 East 15th Street Property Acquisition

Executive Summary

A unique opportunity has arisen that the University would like to take advantage to help facilitate the vision of relocating the Facilities Services Complex. The intent of Master Plan is to relocate the complex currently located on the west side of campus to the northeast corner of the campus. The existing multi-building complex includes an administrative building as well as maintenance operations with a shop building, warehouse, and garage. Additionally, it includes a service yard and parking for the university vehicles. The relocation of the complex is listed as Item A of the Disclosed Projects in the Master Plan.

An improved property with a soon to be completed office building has become available three blocks from the northeast corner of campus. The property represents an opportunity to relocate the administrative offices in the very near future and alleviate the pressure to accommodate all the Facilities Services Complex programmatic needs on the area at the northeast of the Foundation Hall property.

Since this opportunity came to fruition after the completion of the Master Plan, it was not included in the master plan. The attached documents are proposed to be submitted as an amendment to the Master Plan.

As this project will be funded by university funds as the initial part of the Facilities Services Complex Disclosed Project, we recommend that the Master Plan be amended to allow to this to be implemented.

BAUER ASKEW
architecture . pllc

615
T726.0047
F726.4891
615

1615
sixteenth
avenue south

nashville
tennessee
37212

25 June 2025

Mr. Jim Cobb
Tennessee Technological University
220 W. Tenth Street, Room 115
Cookeville, Tennessee 38505

RE: TTU Master Plan
SBC #364/000-02-2019
Subject: Master Plan Amendment #5
505 East 15th Street Property Acquisition

Jim,

A unique opportunity has arisen that the University would like to take advantage to help facilitate the vision of relocating the Facilities Services Complex. The intent of Master Plan is to relocate the complex currently located on the west side of campus to the northeast corner of the campus. The existing multi-building complex includes an administrative building as well as maintenance operations with a shop building, warehouse, and garage. Additionally, it includes a service yard and parking for the university vehicles. The relocation of the complex is listed as Item A of the Disclosed Projects in the Master Plan.

An improved property with a soon to be completed office building has become available three blocks from the northeast corner of campus. The property represents an opportunity to relocate the administrative offices in the very near future and alleviate the pressure to accommodate all the Facilities Services Complex programmatic needs on the area at the northeast of the Foundation Hall property.

Since this opportunity came to fruition after the completion of the Master Plan, it was not included in the master plan. Therefore, we are providing the attached documents to submit as an amendment to the Master Plan.

As this project will be funded by university funds as the initial part of the Facilities Services Complex Disclosed Project, we recommend that the Master Plan be amended to allow to this to be implemented.

Please don't hesitate to call with any questions and comments.

Respectfully,

J. Garry Askew, AIA
Architect

cc: Christine Daniels, TTU
Attachments: Revised Master Plan Pages 29, 30 and 229, Executive Summary

LAND ACQUISITION

Since its founding in 1915, Tennessee Technological University has continued to expand its presence in Cookeville to accommodate its growing population. The 2014 Acquisition Plan outlined a significant number of properties to acquire. The four blocks of property at the corner of Willow and Seventh are now owned by the University and have been developed into the new Recreation and Fitness Center. Other properties that have been added to the main campus include several properties at N. Franklin Avenue and 11th Street.

The current Acquisition Plan outlines multiple properties that the University should consider for acquisition. These properties are identified in two categories: high priority and long range. The high priority sites represent properties that could be utilized in the near future. They are located along the south border of Tech Village, the block between Dixie and Mahler Avenue, and the remaining properties that fill up the corner of Twelfth and North Washington Avenue. The long range areas include properties that should be considered, if available, and will likely require accumulation over time. The long range sites lie within the residential neighborhood blocks adjacent to the main campus to the north, west, and east, as well as the two blocks to the south directly west of the Bell Hall site. Likewise, land that becomes available near or adjacent to other currently owned property should also be considered, such as an expansion of the Shipley Farm property.

Away from the main campus, the property acquired by the TTU Foundation on Fourth Street in downtown Crossville should be considered the Crossville Campus of TTU.

Off-Campus Acquisition
Property owned by the university outside the realm of the main campus includes a golf course, four farms, and the new Campus in downtown Crossville. Within an urban context, the Crossville Campus presents unique restraints associated with expansion and parking. Therefore, opportunities presented by adjacent properties for the advantage of the campus should be considered.

Likewise, properties within two to three blocks from the campus which provide strategic functionality for the university, such as the E. 15th Street property outlined on the Acquisition Map, should be considered for acquisition.

Figure 2.15 Mahler Avenue, north of West 7th Street

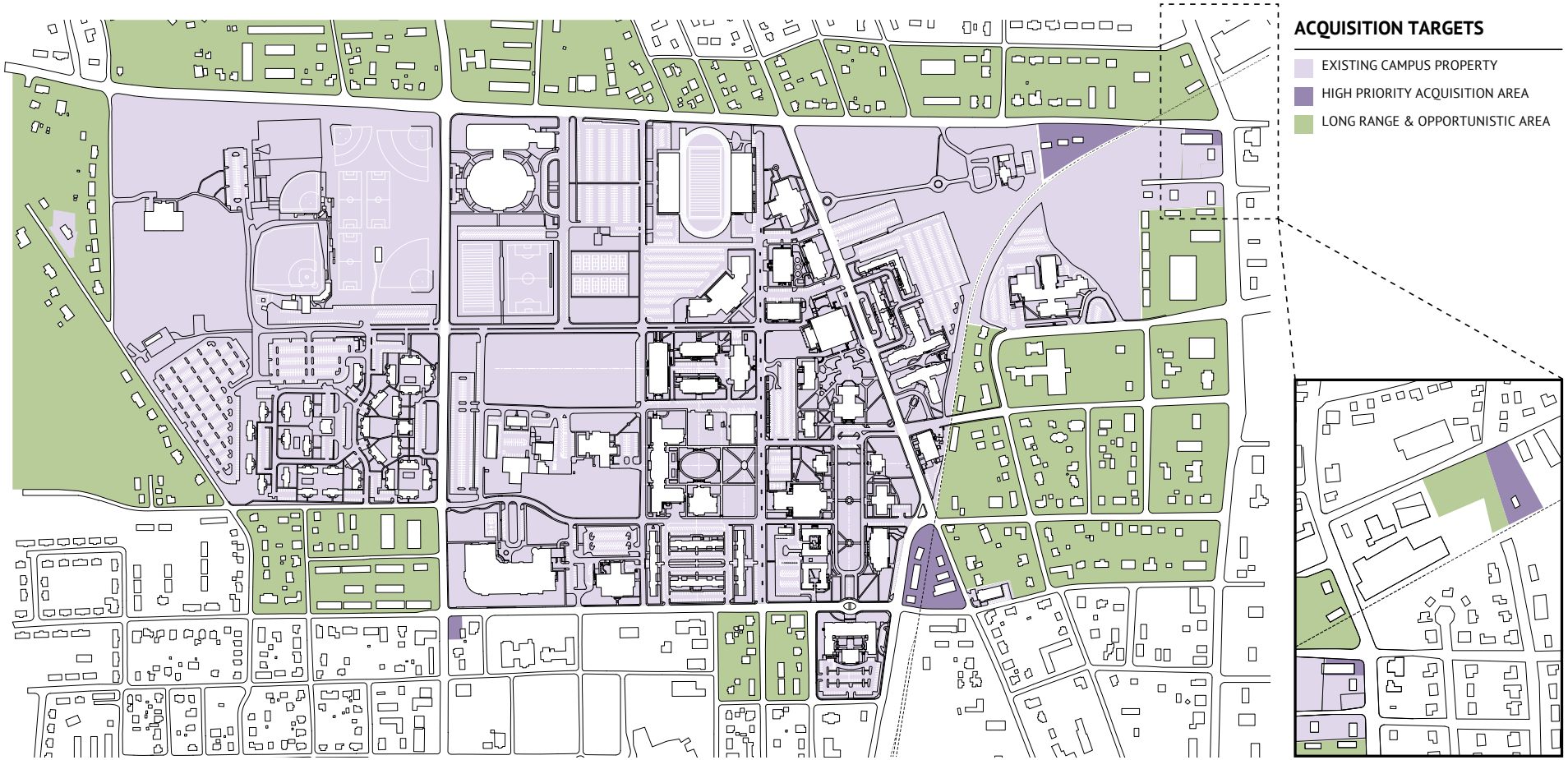


Figure 2.16 2022 Acquisition Map

2022 ACQUISITION MAP

LAND ACQUISITION

INDEX OF AMENDMENTS

1. ACADEMIC CLASSROOM BUILDING

Page 07	Clarify renovation goal
Page 11	Revised list to show Crawford to be demolished
Page 13	Updated footprint for new Academic Classroom Building
Page 14	Updated footprint for new Academic Classroom Building
Page 35	Crawford rating revised to be <60 and to be demolished
Page 75	Updated narrative for Academic Classroom Building
Page 77	Updated Capital Improvement list and footprint of Academic Classroom Building
Page 81	Updated footprint for new Academic Classroom Building
Page 97	Updated Implementation table
Page 98	Updated footprint for new Academic Classroom Building
Page 99	Updated footprint for new Academic Classroom Building

2. CROSSVILLE CAMPUS

Page 26	Updated narrative and University Property chart
Page 28	Added the Crossville Campus to the map
Page 29	Updated narrative
Page 78A	Added page to show Crossville Campus property and proximity map

3. UNIVERSITY CENTER

Page 80	Revised University Center Expansion to include a detatched Event Center at the south end of Tucker Stadium in association with the Volpe Library in lieu of a western addition to the existing University Center. The existing University Center will still be renovated.
Page 81	Added footprint of Event Center, reduced footprint of expansion of Roaden University Center
Page 89	Refined Parking to eliminate parking lot behind Volpe Library
Page 90	Refined Parking to eliminate parking lot behind Volpe Library
Page 91	Added greenspace at parking area behind Library as part of University Event Center
Page 98	Updated plan to include University Center related projects
Page 99	Updated plan to include University Center related projects

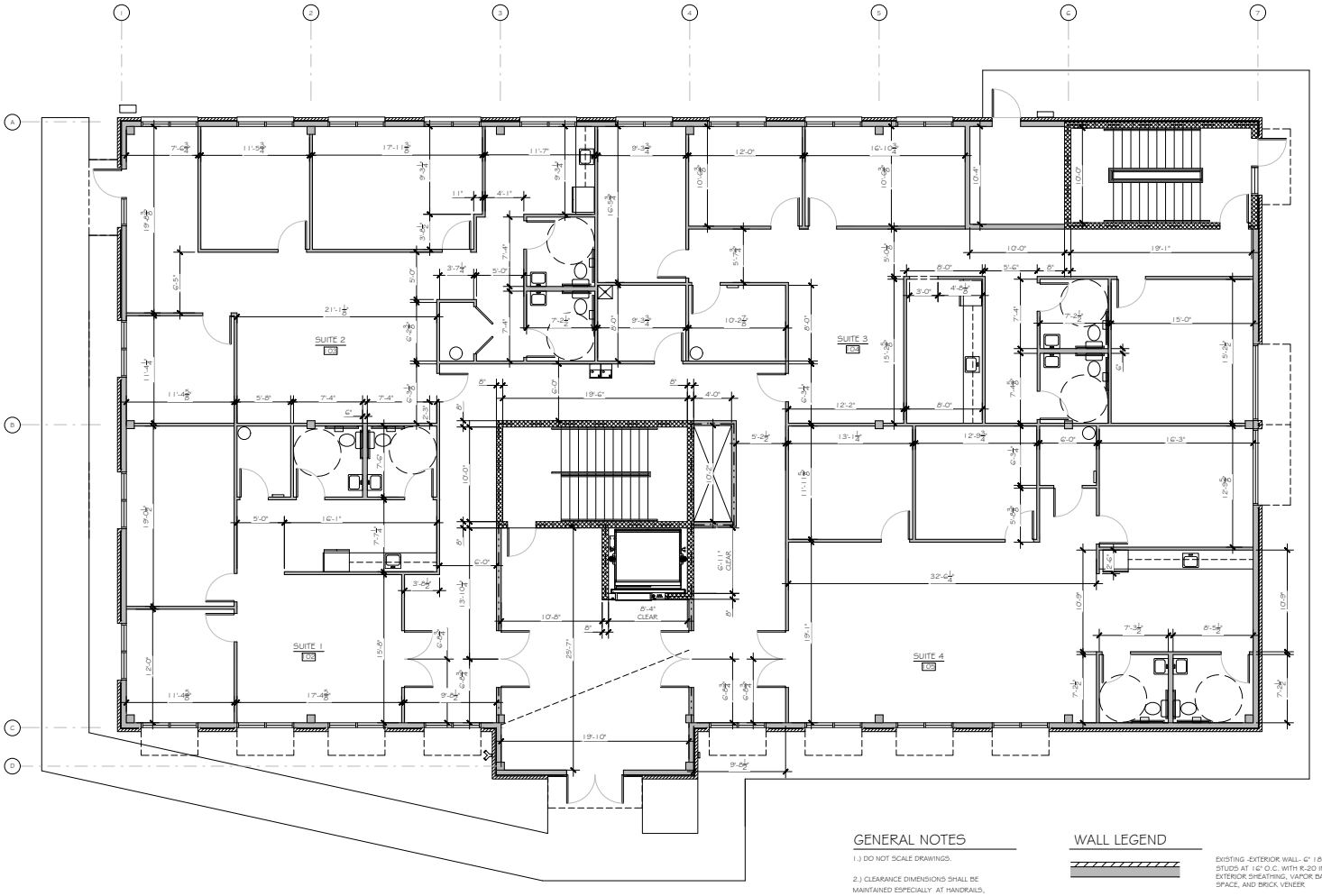
4. CROSSVILLE CAMPUS EXPANSION

Page 11	Added Derryberry Hall Renovation and Updated building names
Page 29	Updated narrative
Page 75	Updated building names and graphic alteration
Page 76	Updated building names and added Derryberry Hall Renovation
Page 77	Updated building names and added Derryberry Hall Renovation
Page 78A	Updated narrative and added expansion parcels to Crossville Campus Property map
Page 97	Added Derryberry Hall Renovation and Updated building names
Page 98	Added Derryberry Hall Renovation and Updated building names

INDEX OF AMENDMENTS

5. E. 15TH STREET LAND ACQUISITION


E 15th St
E 14th St
Bradley Dr
Recycling Cent
Recycle Place
W 12th St
E 12th St
Tucker Stadium
Tennessee Tech Univ
Sherlock Park
Laboratory Science Commons
Rice Thai Bistro
Collegeside Church of Christ
Spankies
House of Thai
Crepe & Creme
Irrationale kitchen+taps
Sundown Window Tinting
Subway
IGA
E 10th St
W 10th St
W 8th St
E 8th St
E 7th St
Loweland Rd
Timber Ln
Walton Ln
N Maple Ave
N Jefferson Ave
Allen Ave
N Dixie Ave
Madison Ave
Woodland Ave
Mississippi Ave
Virginia Ave
Autumn Ave
N Willow Ave
B St
A St



DIMENSIONED FIRST FLOOR PLAN
SCALE: 3/16" = 1'-0"

GENERAL NOTES

1.) DO NOT SCALE DRAWINGS.

2.) CLEARANCE DIMENSIONS SHALL BE MAINTAINED ESPECIALLY AT HANDRAILS, GRAB BARS & PLUMBING FIXTURES.

3.) THE CONTRACTOR SHALL FIELD MEASURE BEFORE STARTING CONSTRUCTION & SHOP DRAWINGS.

4.) NOTIFY THE DESIGNER OF ANY VARIATION REQUIRED IN THE DIMENSIONS, WHETHER NOTED FOR VERIFICATION, FOR THE INSTALLATION OF EQUIPMENT OR OTHERWISE BEFORE CONTINUING WITH THE WORK.

5.) IN THE EVENT CLARIFICATION IS NEEDED, NOTIFY THE DESIGNER BEFORE CONTINUING WITH THE WORK IN QUESTION.

6.) PROVIDE SOUND INSULATION AND MOISTURE RESISTANT GYP. BD. IN BATH ROOM WALLS

7.) DOOR JAMBS TO HAVE A MIN. OF 4" RETURN

WALL LEGEND

EXISTING -EXTERIOR WALL- 6" 18 GA. METAL STUDS AT 16" O.C. WITH R-20 INSULATION, ½" EXTERIOR SHEATHING, VAPOR BARRIER, 1" AIR SPACE, AND BRICK VENEER

EXISTING - EXTERIOR WALL- 6" 18 GA. METAL STUDS AT 16" O.C. WITH R-20 INSULATION, ½" EXTERIOR SHEATHING, VAPOR BARRIER, AND ARCHITECTURAL METAL WALL PANELS

INTERIOR WALL -3-5/8" 20 GA. METAL STUDS AT 16" O.C. WITH ½" GYP. BD. EACH SIDE

INTERIOR WALL -6" 20 GA. METAL STUDS AT 16" O.C. WITH ½" GYP. BD. EACH SIDE

INTERIOR WALL -6" 20 GA. METAL STUDS AT 16" O.C. WITH ½" GYP. BD. EACH SIDE

EXISTING ONE HOUR FIRE RATED WALL- 8" CMU UL DESIGN U904-REFER TO SHEET UL-1

EXISTING 1 HOUR FIRE RATED INTERIOR WALL-6" METAL STUDS UL DESIGN U465-REFER TO SHEET UL-1

SDG
Architecture + Planning
Stamps Design Group
7705 Village Drive
Knoxville, TN 37919
Phone: 931-252-2400

jGroves design company

7.1

Eagle Crossing Business Center
First Floor Build Out
505 East 15th Street
Cookeville, TN

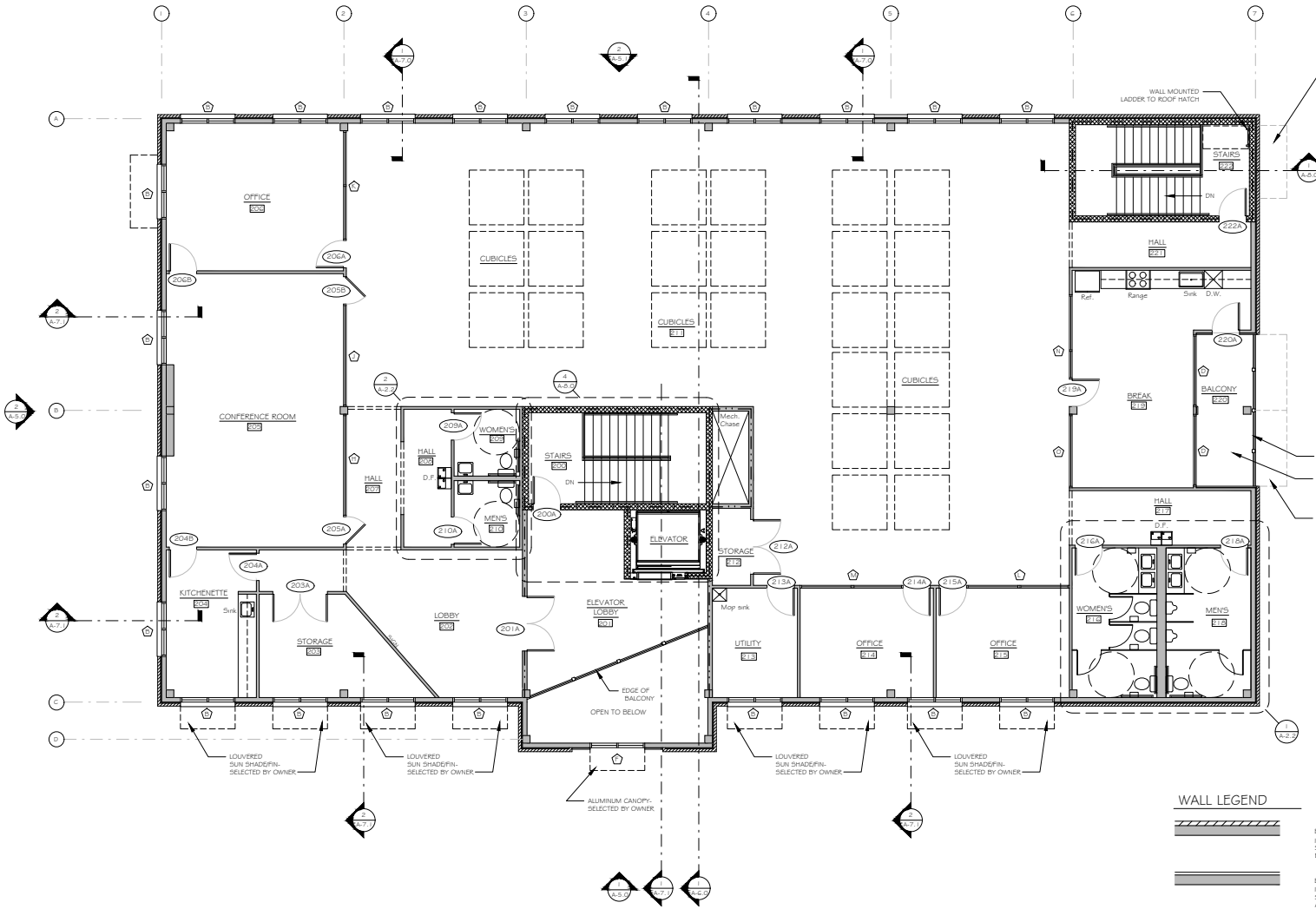
JAMES GREGORY STAMPS II REGISTERED ARCHITECT 102358 STATE OF TENNESSEE

REVISIONS
1.
2.
3.
4.
5.

SIGNATURES:

JOB NO:	07_23049
DWN BY:	JJG
DATE:	1.23.24
THIS SHEET:	DIM FIRST FLOOR PLAN
SCALE:	AS NOTED

SHEET: A-1.1



GENERAL NOTES

1.) DO NOT SCALE DRAWINGS.

2.) CLEARANCE DIMENSIONS SHALL BE MAINTAINED ESPECIALLY AT HANDRAILS, GRAB BARS & PLUMBING FIXTURES.

3.) THE CONTRACTOR SHALL FIELD MEASURE BEFORE STARTING CONSTRUCTION & SHOP DRAWINGS.

4.) NOTIFY THE DESIGNER OF ANY VARIATION REQUIRED IN THE DIMENSIONS, WHETHER NOTED FOR VERIFICATION, FOR THE INSTALLATION OF EQUIPMENT OR OTHERWISE BEFORE CONTINUING WITH THE WORK.

5.) IN THE EVENT CLARIFICATION IS NEEDED, NOTIFY THE DESIGNER BEFORE CONTINUING WITH THE WORK IN QUESTION.

6.) PROVIDE SOUND INSULATION AND MOISTURE RESISTANT GYP. BD. IN BATH ROOM WALLS

7.) DOOR JAMBS TO HAVE A MIN. OF 4" RETURN

WALL LEGEND

EXTERIOR WALL- 6" 18 GA. METAL STUDS AT 16" O.C. WITH R-20 INSULATION, ½" EXTERIOR SHEATHING, VAPOR BARRIER, 1" AIR SPACE, AND BRICK VENEER

EXTERIOR WALL- 6" 18 GA. METAL STUDS AT 16" O.C. WITH R-20 INSULATION, ½" EXTERIOR SHEATHING, VAPOR BARRIER, AND ARCHITECTURAL METAL WALL PANELS

INTERIOR WALL -3-5/8" 20 GA. METAL STUDS AT 16" O.C. WITH ½" GYP. BD. EACH SIDE

INTERIOR WALL -6" 20 GA. METAL STUDS AT 16" O.C. WITH ½" GYP. BD. EACH SIDE

INTERIOR WALL -6" 20 GA. METAL STUDS AT 16" O.C. WITH ½" GYP. BD. EACH SIDE

ONE HOUR FIRE RATED WALL- 8" CMU UL DESIGN U904-REFER TO SHEET UL-1

1 HOUR FIRE RATED INTERIOR WALL-6" METAL STUDS UL DESIGN U465-REFER TO SHEET UL-1

1 A-1.2 NOTED SECOND FLOOR PLAN
SCALE: 3/16" = 1'-0"

SDG
Architecture + Planning
Stamps Design Group
7705 Village Drive
Knoxville, TN 37919
Phone: 931-252-2400

jGroves design company

7.1

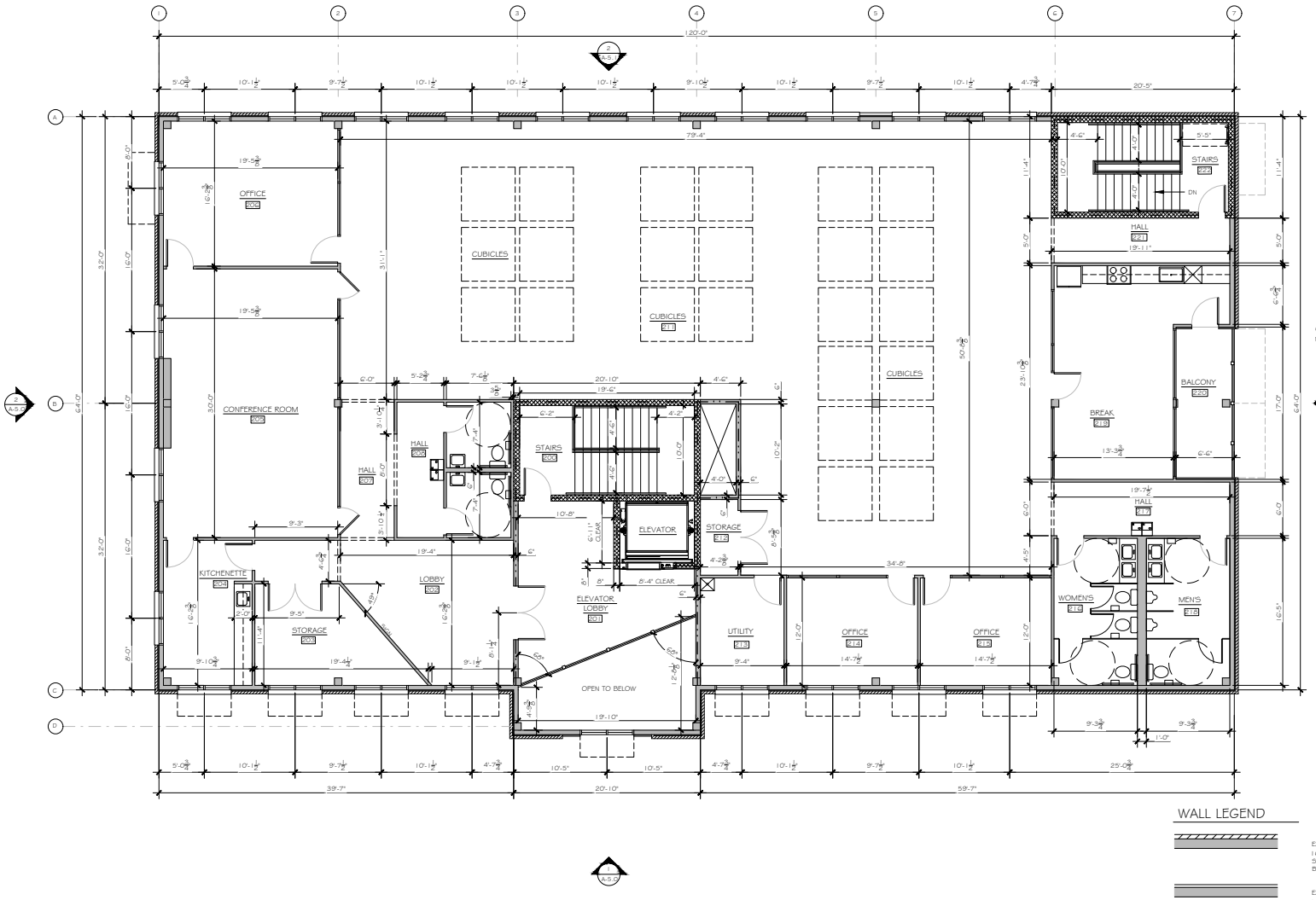
Eagle Crossing Business Center
505 East 15th Street
Cookeville, TN

6.30.23

REVISIONS
1.
2.
3.
4.
5.

SIGNATURES:

JOB NO: 08_220C1
DWN BY: JJG
DATE: 6.30.23
THIS SHEET: NOTED SECOND FLOOR PLAN
SCALE: AS NOTED
SHEET: A-1.2



DIMENSIONED SECOND FLOOR PLAN
A-1.3
SCALE: 3/16" = 1'-0"

GENERAL NOTES

1.) DO NOT SCALE DRAWINGS.

2.) CLEARANCE DIMENSIONS SHALL BE MAINTAINED ESPECIALLY AT HANDRAILS, GRAB BARS & PLUMBING FIXTURES.

3.) THE CONTRACTOR SHALL FIELD MEASURE BEFORE STARTING CONSTRUCTION & SHOP DRAWINGS.

4.) NOTIFY THE DESIGNER OF ANY VARIATION REQUIRED IN THE DIMENSIONS, WHETHER NOTED FOR VERIFICATION, FOR THE INSTALLATION OF EQUIPMENT OR OTHERWISE BEFORE CONTINUING WITH THE WORK.

5.) IN THE EVENT CLARIFICATION IS NEEDED, NOTIFY THE DESIGNER BEFORE CONTINUING WITH THE WORK IN QUESTION.

6.) PROVIDE SOUND INSULATION AND MOISTURE RESISTANT GYP. BD. IN BATH ROOM WALLS

7.) DOOR JAMBS TO HAVE A MIN. OF 4" RETURN

WALL LEGEND

EXTERIOR WALL- 6" 18 GA. METAL STUDS AT 16" O.C. WITH R-20 INSULATION, ½" EXTERIOR SHEATHING, VAPOR BARRIER, 1" AIR SPACE, AND BRICK VENEER

EXTERIOR WALL- 6" 18 GA. METAL STUDS AT 16" O.C. WITH R-20 INSULATION, ½" EXTERIOR SHEATHING, VAPOR BARRIER, AND ARCHITECTURAL METAL WALL PANELS

INTERIOR WALL -3-5/8" 20 GA. METAL STUDS AT 16" O.C. WITH ½" GYP. BD. EACH SIDE

INTERIOR WALL -6" 20 GA. METAL STUDS AT 16" O.C. WITH ½" GYP. BD. EACH SIDE

INTERIOR WALL -6" 20 GA. METAL STUDS AT 16" O.C. WITH ½" GYP. BD. EACH SIDE

ONE HOUR FIRE RATED WALL- 8" CMU
UL DESIGN U904-REFER TO SHEET UL-1

1 HOUR FIRE RATED INTERIOR WALL-6" METAL STUDS
UL DESIGN U465-REFER TO SHEET UL-1

SDG
Architecture + Planning
Stamps Design Group
7705 Village Drive
Knoxville, TN 37919
Phone: 931-252-2400

jGroves design company

7.1

Eagle Crossing Business Center
505 East 15th Street
Cookeville, TN

6.30.23

REVISIONS
1.
2.
3.
4.
5.

SIGNATURES:

JOB NO: 08_220c1
DWN BY: JJG
DATE: 6.30.23
THIS SHEET: 2ND FLOOR PLAN DIMENSIONED
SCALE: AS NOTED
SHEET: A-1.3

Agenda Item Summary

Date: September 25, 2025

Agenda Item: Organizational Chart Change

☐ **Review** ☒ **Action** ☐ **No action required**

PRESENTERS: Dr. Claire Stinson, Sr. Vice President for Planning & Finance

PURPOSE & KEY POINTS: Recommend Approval

Overview of the crosswalk of organizational changes with a proposed implementation date of October 1, 2025.

Office of the President

TENNESSEE TECH

August 30, 2025

Submitting on behalf of Tennessee Tech University (TTU) a crosswalk of organizational changes/updates with a proposed implementation date of October 1, 2025, as follows:

Enrollment & Communication:

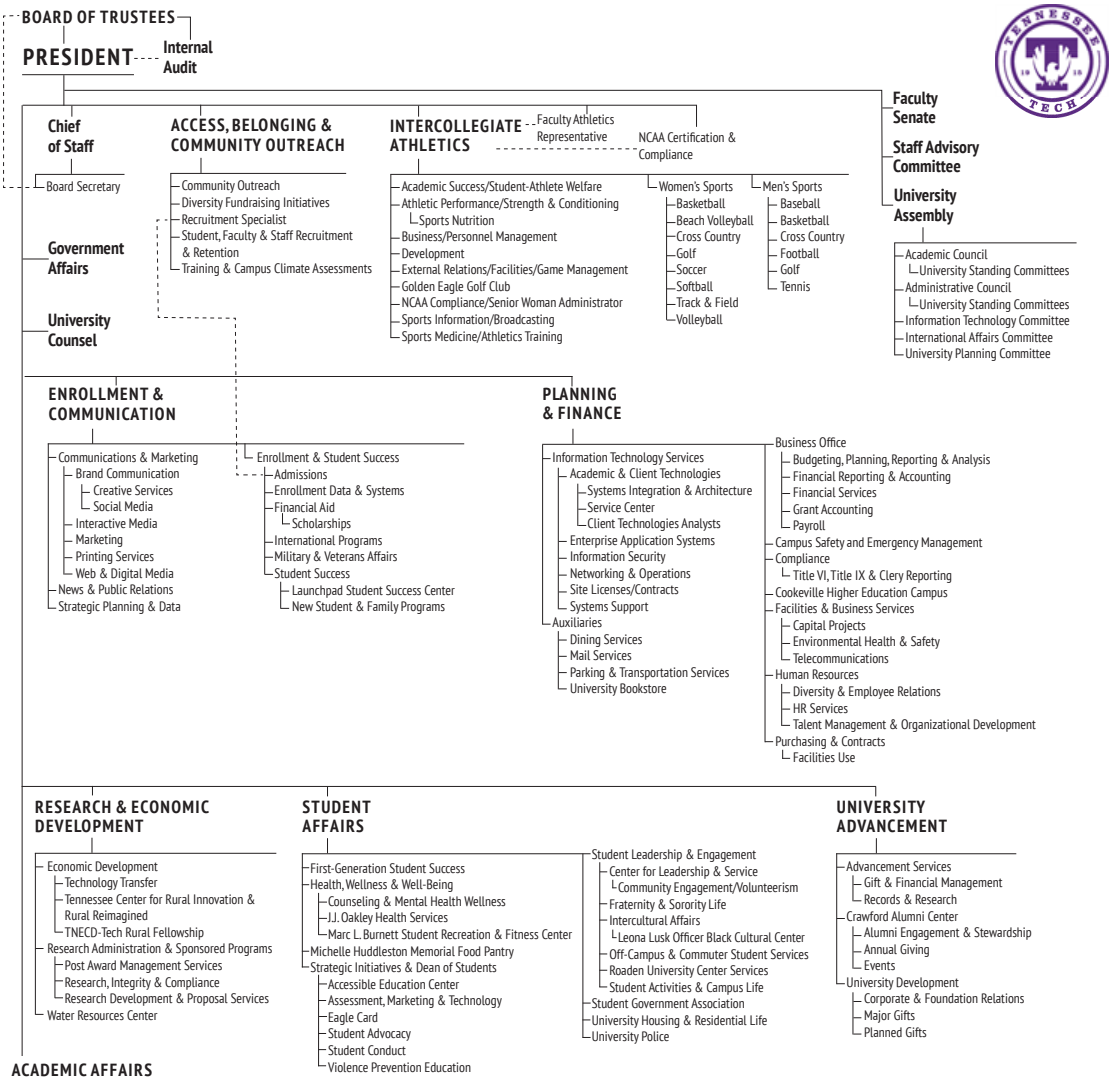
- Remove Career Development under Student Success

Academic Affairs:

- Add Career Development under Academic Support
- Rename the Women's Center to The Gretta Stanger Center

Dr. Philip B. Oldham, President

Tennessee Tech / Campus Box 5007 / Cookeville, TN 38505 / P. 931-372-3241 / F. 931-372-6332 / **tntech.edu/president**


BOARD OF TRUSTEES
PRESIDENT
Internal Audit
Chief of Staff
Board Secretary
Government Affairs
University Counsel
ACCESS, BELONGING & COMMUNITY OUTREACH
Community Outreach
Diversity Fundraising Initiatives
Recruitment Specialist
Student, Faculty & Staff Recruitment & Retention
Training & Campus Climate Assessments
INTERCOLLEGIATE ATHLETICS
Faculty Athletics Representative
NCAA Certification & Compliance
Academic Success/Student-Athlete Welfare
Athletic Performance/Strength & Conditioning
Sports Nutrition
Business/Personnel Management
Development
External Relations/Facilities/Game Management
Golden Eagle Golf Club
NCAA Compliance/Senior Woman Administrator
Sports Information/Broadcasting
Sports Medicine/Athletics Training
Women's Sports
Basketball
Beach Volleyball
Cross Country
Golf
Soccer
Softball
Track & Field
Volleyball
Men's Sports
Baseball
Basketball
Cross Country
Football
Golf
Tennis
Faculty Senate
Staff Advisory Committee
University Assembly
Academic Council
University Standing Committees
Administrative Council
University Standing Committees
Information Technology Committee
International Affairs Committee
University Planning Committee
ENROLLMENT & COMMUNICATION
Communications & Marketing
Brand Communication
Creative Services
Social Media
Interactive Media
Marketing
Printing Services
Web & Digital Media
News & Public Relations
Strategic Planning & Data
Enrollment & Student Success
Admissions
Enrollment Data & Systems
Financial Aid
Scholarships
International Programs
Military & Veterans Affairs
Student Success
Launchpad Student Success Center
New Student & Family Programs
PLANNING & FINANCE
Information Technology Services
Academic & Client Technologies
Systems Integration & Architecture
Service Center
Client Technologies Analysts
Enterprise Application Systems
Information Security
Networking & Operations
Site Licenses/Contracts
Systems Support
Auxiliaries
Dining Services
Mail Services
Parking & Transportation Services
University Bookstore
Business Office
Budgeting, Planning, Reporting & Analysis
Financial Reporting & Accounting
Financial Services
Grant Accounting
Payroll
Campus Safety and Emergency Management
Compliance
Title VI, Title IX & Clery Reporting
Cookeville Higher Education Campus
Facilities & Business Services
Capital Projects
Environmental Health & Safety
Telecommunications
Human Resources
Diversity & Employee Relations
HR Services
Talent Management & Organizational Development
Purchasing & Contracts
Facilities Use
RESEARCH & ECONOMIC DEVELOPMENT
Economic Development
Technology Transfer
Tennessee Center for Rural Innovation & Rural Reimagined
TNECD-Tech Rural Fellowship
Research Administration & Sponsored Programs
Post Award Management Services
Research, Integrity & Compliance
Research Development & Proposal Services
Water Resources Center
STUDENT AFFAIRS
First-Generation Student Success
Health, Wellness & Well-Being
Counseling & Mental Health Wellness
J.J. Oakley Health Services
Marc L. Burnett Student Recreation & Fitness Center
Michelle Huddleston Memorial Food Pantry
Strategic Initiatives & Dean of Students
Accessible Education Center
Assessment, Marketing & Technology
Eagle Card
Student Advocacy
Student Conduct
Violence Prevention Education
Student Leadership & Engagement
Center for Leadership & Service
Community Engagement/Volunteerism
Fraternity & Sorority Life
Intercultural Affairs
Leona Lusk Officer Black Cultural Center
Off-Campus & Commuter Student Services
Roaden University Center Services
Student Activities & Campus Life
Student Government Association
University Housing & Residential Life
University Police
UNIVERSITY ADVANCEMENT
Advancement Services
Gift & Financial Management
Records & Research
Crawford Alumni Center
Alumni Engagement & Stewardship
Annual Giving
Events
University Development
Corporate & Foundation Relations
Major Gifts
Planned Gifts
ACADEMIC AFFAIRS
Academics & Operations
Academic Integrity
Center for Global Experiences
Honors Program
Military Science
Space Utilization
Student Success
Academic Support
Accreditation
Career Development
Institutional Assessment, Research & Effectiveness
Quality Assurance Funding
Quality Enhancement Program
Undergraduate Education
General Education
The Gretta Stanger Center
Online Education & Faculty Development
Center for Advancing Faculty Excellence
Center for Innovation in Teaching & Learning
Faculty Development & Awards
Online Education
TN eCampus
Angelo & Jennette Volpe Library
Registrar
Graduation
Records
Registration
College of Agriculture & Human Ecology
School of Agriculture
School of Human Ecology
Student Success Center
College of Arts & Sciences
Biology
Co-op Fisheries Unit
Chemistry
Earth Sciences
English
Foreign Languages
History
Mathematics
Physics
Sociology & Political Science
Student Success Center
College of Business
Accounting
Decision Sciences & Management
Economics, Finance & Marketing
Graduate Office
iCube
Student Success Center
College of Education & Human Sciences
Child Development Lab
Counseling & Psychology
Curriculum & Instruction
Exercise Science
Millard Oakley STEM Center
Student Success Center
Teacher Education
College of Engineering
Center for Cybersecurity Education, Research and Outreach
Center for Energy Systems Research
Center for Machine Intelligence & Data Science
Center for Manufacturing Research
Chemical Engineering
Civil & Environmental Engineering
Computer Science
Electrical & Computer Engineering
General & Industrial Engineering
Hixson Student Success Center
Manufacturing & Engineering Technology
Mechanical & Nuclear Engineering
College of Fine Arts
Joe L. Evins Appalachian Center for Craft
Center Stage
School of Art, Craft & Design
School of Music
Student Success Center
College of Graduate Studies
College of Emerging & Integrative Studies
Communication & Media
Oracle/WTTU
Non-Credit Programs
Off-Campus Programs
School of Environmental Studies
School of Interdisciplinary Studies
School of Professional Studies
Student Success Center
Whitson-Hester School of Nursing
Student Success Center

Oct. 1, 2025

Agenda Item Summary

Date: September 25, 2025

Agenda Item: Meeting Dates

☐ **Review** ☐ **Action** ☒ **No action required**

PRESENTERS: Board Chair

PURPOSE & KEY POINTS: Announce the upcoming Board of Trustees' meeting dates:

Next Meeting: December 4, 2025

Calendar Year 2026:

March 12

June 25

September 24

December 3