Institutional Effectiveness
2024-2025

Program: Engineering PhD
College and Department: College of Engineering
Contact: Dr. William Eberle
Mission:

The PhD program is a research degree and aims to enhance research quality and external recognition. The program goal has evolved to provide increasing prospects for the students to focus on research in five concentration areas as well as opportunities to pursue interdisciplinary research involving one or more of these specializations.

Description of Program:
The College of Engineering (CoE) at Tennessee Tech University (TTU) first began offering a Doctor of Philosophy in Engineering (PhD-Engr) degree in 1971. The PhD-Engr is a single, college-wide degree for all departments. However, students pursuing this degree will do so in a concentration area, listed below, hosted by a CoE department. The college-wide program also allows students to develop an interdisciplinary research topic that cuts across one or more of these concentrations.

PhD Concentrations	Host Department
Chemical Engineering	Chemical Engineering Department(CHE)
Civil Engineering	Civil and Environmental Engr. Dept.(CEE)
Computer Science	Computer Science(CSC)
Electrical & Computer Engr.	Electrical & Computer Engineering(ECE)
Mechanical Engineering	Mechanical Engineering Department(ME)

Purpose of the PhD Program:
The purpose of the Ph.D. Program is to provide students with an opportunity for advanced studies and research in the field of engineering and computer science. As a research-based degree, the focus is on developing the independent learning skills of students in preparation for advanced-level, research-focused employment in industry or academia.

Attach Curriculum Map (Educational Programs Only):
Attached Files: See Appendix 1

PO1: Comprehensive, interdisciplinary, research-intensive training environment

Define Outcome:
Provide a comprehensive, interdisciplinary, research-intensive training environment for student development.

Assessment Methods:
Provide a map of the curriculum for each concentration, including their frequency, and titles of courses so that the diversity of course offerings can be analyzed.

Criteria for Success (Thresholds for Assessment Methods):
List of course offerings, including their frequency and titles. Number of course offerings will vary among the concentrations due to the wide range in the number of PhD students. Courses at the 5xxx/6xxx level should be offered at least once every 2 years, and courses at the 7xxx should be offered at least once every 3 years. This is so that a PhD student - which normally takes 3-5 years - will be able to take any course during their time in the program.

Link to 'Tech Tomorrow' Strategic Plan:
2.B Research, Scholar, Intellect, and Creativity

Results and Analysis:
Refer to the attached "Curriculum Map" and "Course Offerings and Frequence".

Attached Files: See Appendices 1 and 2

Use of Results to Improve Outcomes:
No actions were taken during the planning year designed to impact performance. This next year, we would like each of the departments to revisit their course offerings, as many of them are just Directed Independent Studies.

PO2: Increase Average Completion

Define Outcome:
Increase the average number of students completing the PhD program to 22 per year.

Assessment Methods:
A three-year moving average of number of students graduating per year is a better indicator of trends than year-to-year data, which may be subject to fluctuations.

Criteria for Success (Thresholds for Assessment Methods):
This number was chosen because it would represent a 10% increase over the previous 3-year moving average, which would represent healthy growth for the college.

Link to 'Tech Tomorrow' Strategic Plan:
2.B Research, Scholar, Intellect, and Creativity

Results and Analysis:
Table 1 shows the degrees conferred and the three-year moving average for the last **6** academic years. The three-year moving average for the program has almost doubled from **11.7** in 2019-2020 to **20** at the end of the 2024-2025 academic year. Unfortunately, the three-year moving average dipped slightly from **20.3** in 2023-2024 to **20.0** in 2024-2025, and we did not achieve our goal of averaging **22**.

Table 1. Degrees and Enrollment Statistics for Fall 2019-Spring 2025.

AY	Degrees Conferred	Three-Year Moving Average	Total Fall Enrollment
2019-2020	21	11.7	100
2020-2021	10	14.6	104
2021-2022	22	17.7	124
2022-2023	21	17.7	119
2023-2024	18	20.3	120
2024-2025	21	20.0	116

Use of Results to Improve Outcomes:

In order to improve the average time to completion, we will look at implementing a tool for tracking student progress. Adding automated notifications would provide the students and their faculty advisors with reminders of their progress. In addition, we will be looking at new ways to increase enrollment in the program, including:

- *ENGINE: roll out e-mails to prospective students in the October-November time frame (much earlier than the January time frame that happened this last year)*
- *Explore external agencies for marketing our program (e.g., EAB, Study College)*
- *Get a few/low-cost, comprehensive healthcare option approved. This last year we attempted to to come up with a free/low-cost healthcare option for PhD students who are funded on assistantships, however we struggled getting good financial numbers from the healthcare companies. Our plan is to reach out to other providers to get the cost manageable, allowing us to provide this attractive option to PhD students.*

PO3: Increase the percentage of graduates taking positions in academia.

Define Outcome:
Increase the percentage of graduates taking positions in academia.

Assessment Methods:
Provide a percentage of students taking jobs in academia based upon exit surveys.

Criteria for Success (Thresholds for Assessment Methods):
The reason for this metric is that by putting more students into academia, we can (1) improve the visibility of our program, and (2) help with the national shortage of Ph.D. graduates in academia. Using the results from exit surveys, we hope to achieve a 30% matriculation into academia.

Link to 'Tech Tomorrow' Strategic Plan:
2.B Research, Scholar, Intellect, and Creativity,4.C Network of Scholars

Results and Analysis:

	2022-2023	**2023-2024**	**2024-2025**
# Ph.D. Graduates	**21**	**18**	**20**
# Taking Jobs in Academia	**5 ****	**6**	**6**
% Taking Jobs in Academia	**24%**	**33%**	**30%**

*** Only started collecting job information in Spring 2023*

Starting in Spring 2023, surveys were sent to all students who defended their dissertations. In the survey, the student provides their post-graduation plans, including where they will be working, what type of organization (academia or industry), their title, etc. We originally set a goal of 10% for last year (2023-2024) as the data was incomplete for the previous year (2022-2023). We easily met that and decided to up it to 30% as the goal based upon a 3-year moving average, which we now have a partial moving average of 29. It should also be noted that while the number of “Ph.D. Graduates” is accurate, the number taking jobs in academia is dependent upon the students responding to the survey.

Use of Results to Improve Outcomes:

We hope to continue increasing the number of graduates going into academia by encouraging this career direction and increasing the visibility of our program (including ranking), which makes our PhD students attractive to other institutions.

SLO1 - 4: Academic Competencies

Define Outcome:

SLO1: Demonstrate Depth of Knowledge

The student should demonstrate depth of knowledge in the specific area of his/her research topic.

SLO2: Independent Academic Research

The student should gain experience in doing independent academic work and research.

SLO3: Ability to Identify and Define Topic

The student should demonstrate his/her ability to identify and define the research topic.

SLO4: Contribute to Existing Knowledge in the Engineering Field

The student's research work should contribute to the existing knowledge in the engineering field.

Assessment Methods:

SLO1: Every PhD student **must complete a Program of Study** (PoS). The PoS is developed under the guidance of the student's Advisory Committee (AC). The courses specified in the PoS ensure the depth of knowledge needed for the research topic.

SLO2: The ability to conduct independent academic research must be demonstrated through the **comprehensive examination** process.

SLO3: The ability to define an appropriate research topic for a dissertation must be demonstrated through the comprehensive examination process. The comprehensive examination involves an examination of the depth of the specific knowledge in the field of study and a **written proposal** describing the research the student will conduct.

SLO4: Through the comprehensive examination process, students must establish their clear and unique contributions to their field of study through an **oral presentation** of their research topic.

The completion of the student's research culminates in a **written dissertation** that is examined by the AC and defended publicly through an oral examination (**SLO1-4**).

Criteria for Success (Thresholds for Assessment Methods):

SLO1: We aim for 100% of our students to have filed a **Program of Study**, as no student should be allowed to proceed without a plan early enough in their program (*depth*).

SLO2: We aim for 95% of students who take the **Comprehensive Exam** to pass on their first try (*independent work*).

SLO3: We aim for 95% of students who take the **Comprehensive Exam** to pass on their first try (*research*).

SLO4: We aim for 95% of students who take the **Comprehensive Exam** to pass on their first try (*contribution to the field*).

Link to 'Tech Tomorrow' Strategic Plan:
2.B Research, Scholar, Intellect, and Creativity

Results and Analysis:
In 2023-2024, 95% of students who graduated had filed a Program of Study before their final semester. This was the first year for capturing this metric. In **2024-2025**, only 90% of PhD graduates had filed a PoS before their final semester.

By requiring the students to complete a PoS, it allows the Department and the College to examine the courses that the student took or will be taking. The 2023-2024 academic year was the first year since the change to Degree Works by the College of Graduate Studies that the College required a PoS, which will allow us to better track the depth of knowledge (exposure) by the student. However, while Graduate Studies requires all students to file a PoS to graduate, many of the students (and advisors) are waiting until far too late in their program.

Comprehensive Exams

	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	**2024-25**
# Ph.D. Students **	15	35	23	15	17	14	20	**23**
# Pass on first attempt	93.3%	100%	100%	100%	100%	100%	95%	**97%**

** This is the number of PhD students who took a comprehensive exam, NOT the number who graduated

From 2018-19 to 2022-23, 100% of students who took the Comprehensive Exam passed on their first try. This is a difficult exam, but most students should be well prepared, with help from their Advisor, to pass on their first attempt. Each of the last two years, we have had one student not pass the comprehensive exam, which is still a high rate of success.

Written/Oral Dissertations

This is a new metric for this SLO, so we only started collecting this information with the Fall 2023 semester.

	2023-24	**2024-25**
# Ph.D. Students	**18**	**20**
# Pass on first attempt	**18**	**20**

To evaluate these 4 outcomes, the only two mechanisms currently being used are students' comprehensive exams and their written/oral dissertations. These appear to be the best sources of measuring SLO 1-4, as they involve the evaluation of a student on their depth of knowledge, their ability to do research, and whether or not they will be able to contribute to existing knowledge. Given that all students passed their Dissertation on their first attempt, that shows the quality of the students and the preparation provided by their Advisor.

Use of Results to Improve Outcomes:

To make sure that students are getting the depth of knowledge needed to be successful in their research, the College is going to work on a plan to require students to complete their PoS no later than the completion of 15 hours. We will look to implement a tracking system that notifies the student in the semester of taking 15 hours that they must complete their PoS or not be allowed to register for a subsequent semester.

Given the still highly successful rate of passing the comprehensive exam, no actions were taken during the planning year designed to impact performance, and none are planned for the next year.

Given the still highly successful rate of passing the dissertation exam, no actions were taken during the planning year designed to impact performance, and none are planned for the next year.

SLO5: Demonstrate Contribution to Society

Define Outcome:
The student should demonstrate the ability to contribute to the achievement of societally relevant outcomes.

Assessment Methods:
Many Ph.D. students are funded through research grants, of which there are many times broader/societal objectives. Working on these funded research projects will expose the student to the societal benefits of their work.

Attached Files: See Appendix 3

Criteria for Success (Thresholds for Assessment Methods):
In 2023-2024, we reached 65%, which was more than double the previous year's percentage, primarily due to a huge increase in external funding. For 2024-2025, we have set a goal of 70% of PhD students as we continue to strive to move up a Carnegie classification when it comes to funding, and, directly related to this SLO, expose more of our students to societally relevant research.

Link to 'Tech Tomorrow' Strategic Plan:
2.B Research, Scholar, Intellect, and Creativity

Results and Analysis:
This SLO metric was first collected in Spring 2023. The idea is that students actively involved in research are adding to societal outcomes.

	2022-23	2023-24	**2024-25**
# Ph.D. Students Funded on External Research Grants	38**	78****	**51**
# Ph.D. Students***	119	120	**116**
% Ph.D. supported on external research grants	32%	65%	**44%**

** These are Spring/Summer numbers only

*** These are Fall numbers as I do not have access to the total number of unique PhD students for an academic year (i.e., Fall/Spring/Summer). I would expect the total number to be a bit higher, as there are spring/summer entries that were probably more than fall graduates.

**** The mechanism for counting PhD students funded on external grants changed, and this number will be investigated further.

Our goal for **2024-25** was to fund **70**% of Ph.D. students on external research grants. Unfortunately, we did not meet our goal. However, the validity of the numbers for 2023-24 is questionable. If we do not take last year into account, we achieved ~**37**% increase from 2022-23, which is probably due to the increased number of grants and grant funding that was received in **2024-2025**.

Use of Results to Improve Outcomes:

We want to see a more accurate three-year rolling average. Starting in the summer of 2025, we will be revisiting the collection of these numbers to validate the actual growth.

Summative Evaluation:

The College of Engineering has in place a framework/process for the continual improvement of the Ph.D. in Engineering program to ensure its learning outcomes are met and that the outcomes are themselves updated as necessary to reflect any changes that may occur in vision, mission, or the needs of the educational and research community.

Assessment Plan Changes:

Increase Number of PhD Students in the Program (P02)

In order to help improve this metric (*Increase the rolling average number of students completing the PhD program to 22 per year*), we will be exploring 3 initiatives this year:

- In 2023-2024, we enrolled in the **ENGINE program**, which provides a database of students from around the country who are interested in graduate school. While most students are only interested in MS programs, a good number indicated in the database that they are also interested in PhD programs. In 2024-2025, we rolled out emails to thousands of prospective students. However, only one round of emails went out, and it went out too late (January). Our goal for 2025-2026 is to start sending emails in October, and every month or so after that for at least three times.
- In 2024-2025, we paid for an external agency (Study College) to market our graduate programs to certain areas of **India** using Facebook and Instagram. While we received millions of views and thousands of clicks, the yield (i.e., applications to our programs) was only a couple. In 2025-2026, we are going to explore another agency, EAB, which recently rolled out a program called Appily that targets **domestic**, graduate students.
- In 2023-2024, we proposed a comprehensive **healthcare** option for graduate students to the Administration. However, the cost was too prohibitive (over $600K per year). In 2024-2025, we attempted to come up with a free/low-cost healthcare option for just PhD students who are funded on assistantships. Unfortunately, the costs from the healthcare companies were too prohibitive. Our goal in 2025-2026 is to continue searching for healthcare companies that can handle the small volume of students that this would cover, but still be cost-effective, which would enable us to better recruit PhD students.

List of Appendices:

Appendix 1: Curriculum Map

Appendix 2: Course Offerings and Frequence

Appendix 3: College of Engineering PhD Program Oral Defense and Dissertation Assessment Form

Appendix 1: Curriculum Map

Engineering PhD

Coursework	Student Learning Objectives				
	Demonstrate Depth and Breadth of Knowledge	Gain Experience in Independent Academic Work and Research	Identify and Define the Research Topic	Contribute to Existing Knowledge	Communicate Effectively
6XXX and 7XXX Coursework*	X		X		
7980 Directed Study	X	X			
7990 Research and Dissertation	X	X	X	X	X

Appendix 2: Course Offerings and Frequence

Chemical Engineering

Course # Course Names	F19	S20	F20	S21	F21	S23	F23	S24	F24	S25
CHE 5050 Trans Sci III: Diff/Mass Trans									X	
CHE 5410 Process Design I							X		X	
CHE 5420 Process Design II										X
CHE 5510 Advanced Math for Engineers	X	X	X	X	X	X				
CHE 5661 Transport in Biochem/Biol Prc										X
CHE 6010 Advanced ChE Thermodynamics	X		X		X			X		X
CHE 6040 Intermediate Fluid Mechanics										
CHE 6100 Introduction to Food, Energy, Water							X		X	
CHE 6130 FEW Nexus Challenge								X		X
CHE 6140 Physics of Transport							X		X	
CHE 6150 Interdisc Integation/Techniq.									X	
CHE 6210 Advanced Kinetics		X				X		X		X
CHE 6810 Special Topics (**multiple offerings each year**)	X	X	X	X	X	X	X	X		X
CHE 6920 Chemical Engineering Graduate Seminar	X		X		X		X		X	
CHE 7970 Special Topics (**multiple offerings each year**)	X	X	X	X	X	X		X	X	
CHE 7240 Advances in Fuel Cell Electrocatalysis										
CHE 7980 Directed Study (**multiple offerings each year**)		X							X	X

Civil and Environmental Engineering

Course Number	Course Title	Semester											
		F19	S20	F20	S21	F21	S22	F22	S23	F23	S24	F24	S25
CEE 5130	Matrix and Finite Element Methods		✓		✓		✓		✓		✓		✓
CEE 5170	Intro to Mechanics of Composites								✓				
CEE 5190	Advanced Mechanics of Materials	✓		✓		✓		✓		✓		✓	
CEE 5350	Advanced Structural Design		✓		✓		✓		✓		✓		✓
CEE 5360	Advanced Topics in Structural Concrete Design	✓		✓		✓		✓		✓		✓	
CEE 5380	Bridge Design	✓		✓		✓		✓		✓		✓	
CEE 5410	Solid and Hazardous Waste Mmgt			✓				✓		✓			✓
CEE 5420	Engineering Hydrology	✓		✓		✓		✓		✓		✓	
CEE 5430	Water and Wastewater Engineering												✓
CEE 5440	Water Resources Engineering	✓			✓		✓		✓		✓		
CEE 5460	Geospatial Model/Analysis Engr										✓		✓
CEE 5610	Pavement Design					✓							
CEE 5630	Traffic Engineering		✓			✓		✓		✓		✓	
CEE 5640	Highway Engineering				✓		✓		✓		✓		✓
CEE 5660	Transportation Planning	✓		✓		✓		✓		✓		✓	✓
CEE 5700	Masonry Design		✓		✓		✓						
CEE 5810	Foundation Engineering		✓		✓		✓		✓		✓		
CEE 5820	Retaining Walls & Excavations												✓
CEE 5990	Special Problems (**multiple offerings each year**)	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
CEE/ENGR 6200	Statistical Inference for Engineers					✓		✓					
CEE 6300	Multiscale Analysis of Concrete	✓		✓				✓		✓		✓	
CEE 6350	Finite Element Analysis		✓		✓		✓		✓		✓		✓
CEE 6400	Traffic Simulation							✓				✓	
CEE 6410	Traffic Control Systems						✓				✓		✓
CEE 6470	Transportation Demand Analysis											✓	
CEE 6520	Open-Channel Hydraulics									✓			
CEE 6610	Applied Env Chemistry												✓
CEE 6720	Env Eng Unit Ops & Processes										✓		
CEE 6800	Advanced Soil Mechanics										✓		✓
CEE 6900	Special Problems (**multiple offerings each year**)	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
CEE 6910	Graduate Seminars	✓		✓		✓		✓		✓		✓	
CEE 6930	Theory of Elasticity									✓		✓	
CEE 6980	Graduate Geotech Lab												✓
CEE 7420	Public Transportation										✓		✓
CEE 7450	Adv Topics/Concrete Durability										✓		✓
CEE 7510	Theory of Plates & Shells										✓		
CEE 7620	Adv Finite Element Analysis									✓		✓	
CEE 7720	Fiber-Reinforced Comp Mtrl												✓
CEE 7810	Structural Dynamics										✓		✓

Computer Science

Course (Department, Number, Title)	F19	S20	F20	S21	F21	S22	F22	S23	F23	S24	F24	S25
CSC 5100 Operating Systems	x	x	x	x	x	x	x	x	x	x	x	
CSC 5200 Computer Networks	x	x	x	x	x	x	x	x	x	x	x	x
CSC 5220 Data Mining and ML		x		x		x		x		x		x
CSC 5240 Artificial Intelligence	x		x		x		x		x		x	
CSC 5260 Adv Data Science								x		x		x
CSC 5320 Computer Architecture	x	x	x	x	x	x	x	x		x		x
CSC 5400 Analysis of Algorithms												
CSC 5575 Cryptography		x		x		x		x		x		x
CSC 5580 Software Reverse Eng.										x		
CSC 5585 Software and Systems Security	x		x		x		x		x		x	
CSC 5760 Parallel Programming										x		x
CSC 5770 Distributed & Cloud Computing			x		x		x		x		x	
CSC 5903 Special Topics										x		x
CSC 6220 Data Mining		x				x				x		
CSC 6230 Machine Learning				x				x				x
CSC 6240 Mathematics and Theory of ML			x				x				x	
CSC 6260 Advanced Topics in Artificial Intelligence					x					x		
CSC 6400 Adv Analysis of Algorithms				x		x		x		x		x
CSC 6570 Cloud Security						x				x		x
CSC 6575 Internet Security	x		x		x		x		x		x	
CSC 6580 Advanced Reverse Engineering	x	x		x		x		x	x			
CSC 6590 Application Security										x		x
CSC 6585 Secure Software Development			x				x				x	
CSC 6730 Advanced Networking					x						x	
CSC 6740 Parallel and Distributed Algorithms		x				x			x			
CSC 6780 Distributed Computing			x				x			x		
CSC 6903 Special Topics (**multiple offerings each year**)			x		x		x		x	x	x	
CSC 6910 Graduate Seminar	x	x	x	x	x	x	x	x	x	x	x	x
CSC 7210 Anomaly and Intrusion Detection Sys			x						x			
CSC 7240 Intelligent Info System	x				x							
CSC 7560 Adv Network/Next Gen										x		
CSC 7570 A.I. Assisted Cyber					x				x		x	
CSC 7575 Security Topics in Cyber-		x		x				x				

Physical Systems												
CSC 7720 Distributed Operating Systems						x						x
CSC 7750 Topics in HPC				x						x		
CSC 7970 Special Topics (**multiple offerings each year**)											x	x

Electrical and Computer Engineering

Courses	F19	S20	F20	S21	F21	S22	F22	S23	F23	S24	F24	S25
ECE 5020: Digital Signal Processing		1		1		1		1		1		
ECE 5110: Digital Logic Design	1		1		1							
ECE 5120: Fundamentals/Comp Design		1		1		1		1		1		
ECE 5130: Intro to Digital VLSI	1		1		1		1				1	
ECE 5140: Embedded System Design		1		1		1		1			1	
ECE 5210: Control System Design I	1		1		1		1					
ECE 5370: Mechatronics/Intel Machine Eng				1		1		1				
ECE 5510: Electromagnetic Fields II	1		1		1		1		1		1	
ECE 5520: Optoelectronic Eng		1		1		1		1		1		1
ECE 5610: Power System Analysis	1		1		1		1				1	
ECE 5620: Power Sys Oper & Control		1		1		1		1				1
ECE 5630: Power Electronics	1		1		1		1					
ECE 5710: Principles/Telecomm	1				1				1		1	
ECE 6040: Signal Analysis								1				
ECE 6110: Microprocessors Systems ECE 6130: Computer Architecture			1				1	1	1			
ECE 6170: High Perf Embedded Sys	1									1		
ECE 6200: Linear Systems Analysis	1		1			1		1			1	
ECE 6230: Linear Multivariable Sys		1							1			
ECE 6250: Random Signals & Sys					1					1		
ECE 6280: Nonlinear Auto Control							1			1		
ECE 6510: Electromag Field Theory I		1		1		1			1			1
ECE 6580: Instr/Transducer Tech							1				1	
ECE 6600: Computer Meth/Pwr Sys			1							1		
ECE 6640: Rnwbl Energy/Distr Generation			1				1					
ECE 6650: Design-Control/Power El Sys					1							
ECE 6670: Pwr Flow Cntrl-Mdrn Pwr Sys		1										
ECE 6710: Communications Sys Theory						1					1	
ECE 6730 Info Theory & Reliable Comm												1
ECE 6750: Wireless Comm Sys							1					
ECE 6900: Special Problems			1	1		1			1		1	1
ECE 6910: Intro to Grad Research	1		1		1		1		1		1	
ECE 6980: Directed Study	1	1	1	1	1	1	1	1				
ECE 7110: Advanced Digital Design	1			1								
ECE 7620: Adjustable Speed Drives	1					1						
ECE 7640: Distributed Energy Sys				1				1				
ECE 7970: Special Topics									1			1

Mechanical Engineering

Course	Course Title	F19	S20	F20	S21	F21	S22	F22	S23	F23	S24	F24	S25
ME 5020	Applied Machine Design										X	X	
ME 5060	Machine Vibrations		X		X		X		X		X		X
ME 5120	Intermediate Dynamics				X		X		X				
ME 5140	Introduction to Robotics	X		X		X		X		X		X	
ME 5180	Finite Element Methods in ME			X		X		X		X		X	
ME 5190	Adv. Mechanics of Materials	X		X		X		X				X	
ME 5210	Refrigeration & AC	X		X		X		X			X		X
ME 5220	Air Conditioning Design				X		X		X				
ME 5260	Energy Cons. & Conversion	X		X		X		X		X		X	
ME 5310	Gas Dynamics					X				X		X	
ME 5370	Mechatronics		X		X		X		X		X		X
ME 5380	Data Acquisition and Signal Proc		X		X		X		X		X		X
ME 5450	Design for Manufacturability				X				X				
ME 5460	Mechanical Prop. Of Materials	X		X		X		X		X		X	
ME 5480	Microstructural Analysis		X		X		X		X				
ME 5510	Aerodynamics		X		X		X		X		X		X
ME 5610	Steam Power Plants		X		X		X		X		X		
ME 5620	Turbomachinery		X		X		X		X		X		X
ME 5630	Internal Combustion Engines	X		X		X		X		X			
ME 5640	Dynamics of Machinery II					X							
ME 5710	Propulsion										X		X
ME 5720	Thermal Design			X	X	X	X	X	X				
ME 5730	Numerical Heat Transfer	X		X		X		X		X			
ME 5810	Modern Controls		X		X		X		X		X		X
ME 5900	Selected Topics (**multiple offerings each year**)											X	
ME 5930	Noise Control			X		X		X		X		X	
ME 6010	Conduction Heat Transfer	X		X				X					
ME 6030	Radiation Heat Transfer					X							
ME 6040	Intermediate Fluid Mechanics			X		X		X		X		X	
ME 6050	Convection Heat Transfer		X		X		X		X				
ME 6210	Advanced Thermodynamics		X		X				X				
ME 6350	Finite Element Analysis		X		X		X		X		X		X
ME 6360	Introduction to Continuum Mechanics		X			X				X		X	
ME 6370	Vibrations of Continuous Media						X						X
ME 6620	Advanced Machine Design II										X		
ME 6640	Advanced Robotics					X				X			
ME 6710	Advanced Dynamics of Machinery						X						

ME 6760	Smart Materials and Structures			X								X	
ME 6810	Advanced Material Science I		X			X					X		
ME 6830	Advanced CAD					X							
ME 6910	Intro to Graduate Research	X		X		X		X		X			X
ME 6930	Theory of Elasticity	X		X		X		X		X			
ME 6970	Selected Topics	X	X	X	X	X	X	X	X	X	X		X
ME 7040	Mass Transfer												
ME 7060	Advanced Numerical Heat Transfer			X				X					
ME 7070	Fluid Mechanics of Suspensions						X						
ME 7080	Advanced Viscous Flow					X							
ME 7090	Computational Fluid Mechanics				X				X			X	
ME 7100	Turbulence	X				X				X			
ME 7510	Space Mechanisms				X				X				
ME 7600	Plates and Shells		X		X		X		X		X		
ME 7620	Finite Element Analysis II	X		X		X		X		X			
ME 7640	Theory of Inelastic Materials												
ME 7660	Fracture Mechanics						X						
ME 7670	Composite Materials												X
ME 7810	Advanced Material Science II				X				X				X
ME 7970	Selected Topics (**multiple offerings each year**)											X	

Appendix 3: College of Engineering PhD Program Oral Defense and Dissertation Assessment Form

College of Engineering PhD Program
Oral Defense and Dissertation Assessment Form

Candidate Name: Engineering discipline:

Committee Member Faculty Student (Please check one)

Date:

Evaluation of Oral Presentation

Oral Presentation Type (circle): Proposal Defense Dissertation Defense

Graduates of the PhD program must be able to communicate their ideas effectively with their technical peers and with others outside their discipline. Please assess this candidate's oral presentation and written work using the following scale:

Not Acceptable	Below Expectation	Meets Expectation	Above Expectation
1	2	3	4

1 2 3 4 **Content:** appropriate, complete, concise, and logically organized; problem, approach and results clear; appropriate use of time.

1 2 3 4 **Visual aids:** readable and clear, concise wording, effective use of graphics, appropriate amount of information

1 2 3 4 **Presenter:** appears well-prepared, vocabulary technically correct and audience- appropriate

1 2 3 4 **Presentation mechanics:** volume of voice is good, good enunciation, appropriate speed in delivery; free of hesitations, distracting mannerisms; good poise, eye contact

1 2 3 4 **Responses to questions and comments**: appropriate, direct, and complete

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Evaluation of Dissertation Document

1 2 3 4 **Quality of English**: good grammatical form, voice, tense, punctuation. Concise presentation

1 2 3 4 **Technical content**: clear description of problem, state-of-the-art, technical approach, and results; relevant and timely references

1 2 3 4 **Technical writing**: good organization; clear description of problem; clear figures and tables