



# Missouri S&T

Linda & Bipin Doshi Department of Chemical  
and Biochemical Engineering

## Graduate Student Handbook

2023-2024

# TABLE OF CONTENTS

I.	Department Overview	1
	Vision, Mission, and Student Learning Outcomes .....	1
	Faculty Directory.....	2
	Staff Directory.....	3
II.	Student Milestones and Electronic Workflow	4
III.	Required Coursework	5
	Core Graduate Courses and Lecture Series.....	5
	Bridge Courses.....	6
	Ph.D. Coursework .....	6
	M.S. Coursework.....	8
	Course Transferability .....	10
	Graduate Certificate Coursework .....	10
	GPA and Grade Requirements for Graduate Students .....	11
IV.	Good Standing	11
V.	Doctoral Forms	13
	Form 4: Report on Qualifying Examination .....	13
	Form 5/5A: Plan of Study.....	15
	Form 6: Report on Doctoral Comprehensive Examination .....	16
	Final Defense Notification Form .....	17
	Form 7: Report on Final Examination and Dissertation Approval.....	17
	ChBE Departmental PhD Dissertation Award Application.....	18
VI.	Master Forms	19
	Form 1/1A: Plan of Study.....	19
	Form 2: Report on Final Examination and Dissertation Approval.....	20
	Request for Waiver of Enrollment Requirements .....	20
VII.	Graduate Certificate Forms	20
	Substitution for Required Certificate Course From .....	21
	Certificate Program Courses Form .....	21
VIII.	Additional Information	21
	Appendix A: Example of PhD Course Plan without prior MS degree	
	Appendix B: Example of PhD Course Plan with prior MS degree	
	Appendix C: Example of Thesis MS Course Plan	
	Appendix D: Example of Non-Thesis MS Course Plan	
	Appendix E: SLO Assessment Rubric Forms	

# I. DEPARTMENT OVERVIEW

## 1. Department Vision Statement

A top Chemical Engineering department recognized for sustained excellence in research, discovery, and education with strong global engagement

## 2. Department Mission Statement

- Prepare chemical engineers for successful careers as leaders and innovators in chemical engineering and related fields
- Expand the knowledge base of chemical engineering through its scholarly pursuits
- Develop technology to serve societal needs
- Benefit the public welfare through service to the chemical engineering and related professions

## 3. Graduate Program Student Learning Outcomes (SLOs)

Upon graduation, our PhD, MS, and Graduate Certificate students will exhibit the following within their field of study at their respective mastery, proficiency, and competency levels:

- **Knowledge:** an ability to comprehend and apply the contemporary state of knowledge
- **Communication:** an ability to communicate effectively in the standards of professional work
- **Integrity and Ethics:** an ability to conform to high standards of professional behavior, integrity, and ethical conduct
- **Scholarship Independence:** an ability to identify, explain, evaluate, and develop scholarship
- **Critical Thinking:** an ability to identify hypothesis, evaluate arguments, assess assumptions, and synthesize knowledge

## 4. Faculty and Staff

**Department Chair:** Dr. Hu Yang  
[huyang@mst.edu](mailto:huyang@mst.edu)  
(573) 341-4854  
110E Bertelsmeyer Hall

The Chair of the ChBE department coordinates and monitors the efforts of the ChBE faculty and enforces graduation requirements that are specific to the department. Most questions and forms are handled by the associate chairs. You should, however, contact the department chair directly when you have concerns, complaints, or even compliments regarding a member of the faculty.

**Associate Chair for Academic Affairs:** Dr. Christi Luks  
[luksc@mst.edu](mailto:luksc@mst.edu)  
 (573) 341-7641  
 210N and 110C Bertelsmeyer Hall

The Associate Chair for Undergraduate Studies of the ChBE department handles admission to the undergraduate program. She has the authority to sign for the chairman on all enrollment and undergraduate forms. The Associate Chair can also sign other documents in the ChBE department chair's absence.

**Associate Chair for Research:** Dr. Jee-Ching Wang  
[icwang@mst.edu](mailto:icwang@mst.edu)  
 (573) 341-6705  
 210H Bertelsmeyer Hall

The Associate Chair for Research is also the Graduate Coordinator of the ChBE department who coordinates all aspects of the department's graduate studies including graduate recruitment and admission; selection of chancellor's fellows, graduate teaching assistants (GTAs) and graduate research assistants (GRAs); managing graduate curricula; and developing new graduate programs. He has the authority to sign for the chairman on various graduate forms included below. Undergraduate students interested in the Grad Track Pathway should contact the Associate Chair for further information.

**Faculty:**

<b>Full-time Faculty</b>			
Muthanna <b>Al-Dahhan</b>	210K Bertelsmeyer Hall	573-341-7518	aldahhanm@mst.edu
Hany <b>El-Azab</b>	210G Bertelsmeyer Hall	573-341-4416	hany.elazab@mst.edu
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Douglas K. <b>Ludlow</b>	210M Bertelsmeyer Hall	573-341-4457	dludlow@mst.edu
Christi Patton- <b>Luks</b>	210N Bertelsmeyer Hall	573-341-7641	luksc@mst.edu
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Joseph D. <b>Smith</b>	210C Bertelsmeyer Hall	573-341-4294	smithjose@mst.edu
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Jee-Ching <b>Wang</b>	210H Bertelsmeyer Hall	573-341-6705	jcwang@mst.edu
Hu <b>Yang</b> (Department Chair)	110E Bertelsmeyer Hall	573-341-4854	huyang@mst.edu
<b>Adjunct Faculty</b>			
Baojun <b>Bai</b>	303 McNutt Hall	573-341-4016	baib@mst.edu
Anthony <b>Convertine</b>	225 McNutt Hall	573-341-4458	convertinea@mst.edu
Chang-Soo <b>Kim</b>	218 Emerson Hall	573-341-4529	ckim@mst.edu
David <b>Westenberg</b>	202 Schrenk Hall	573-341-4798	djwesten@mst.edu
Jiandong <b>Wu</b>	210L Bertelsmeyer Hall	573-341-6225	jiandong.wu@mst.edu

**Staff:**

**Office Support Specialist:** Theresa Brown  
[theresabrown@mst.edu](mailto:theresabrown@mst.edu)  
(573) 341-4421  
110B Bertelsmeyer Hall

Theresa works closely with the Chair and Associate Chairs to manage the office and meeting rooms; assist in processing graduate student forms and meetings; coordinate miscellaneous department events; assign graduate advisors and office space; process graduate student employment ePAFs, waivers; and maintain personal files.

**Office Support Specialist:** Tonya Lane  
[tonya.lane@mst.edu](mailto:tonya.lane@mst.edu)  
(573) 341-4415  
110C Bertelsmeyer Hall

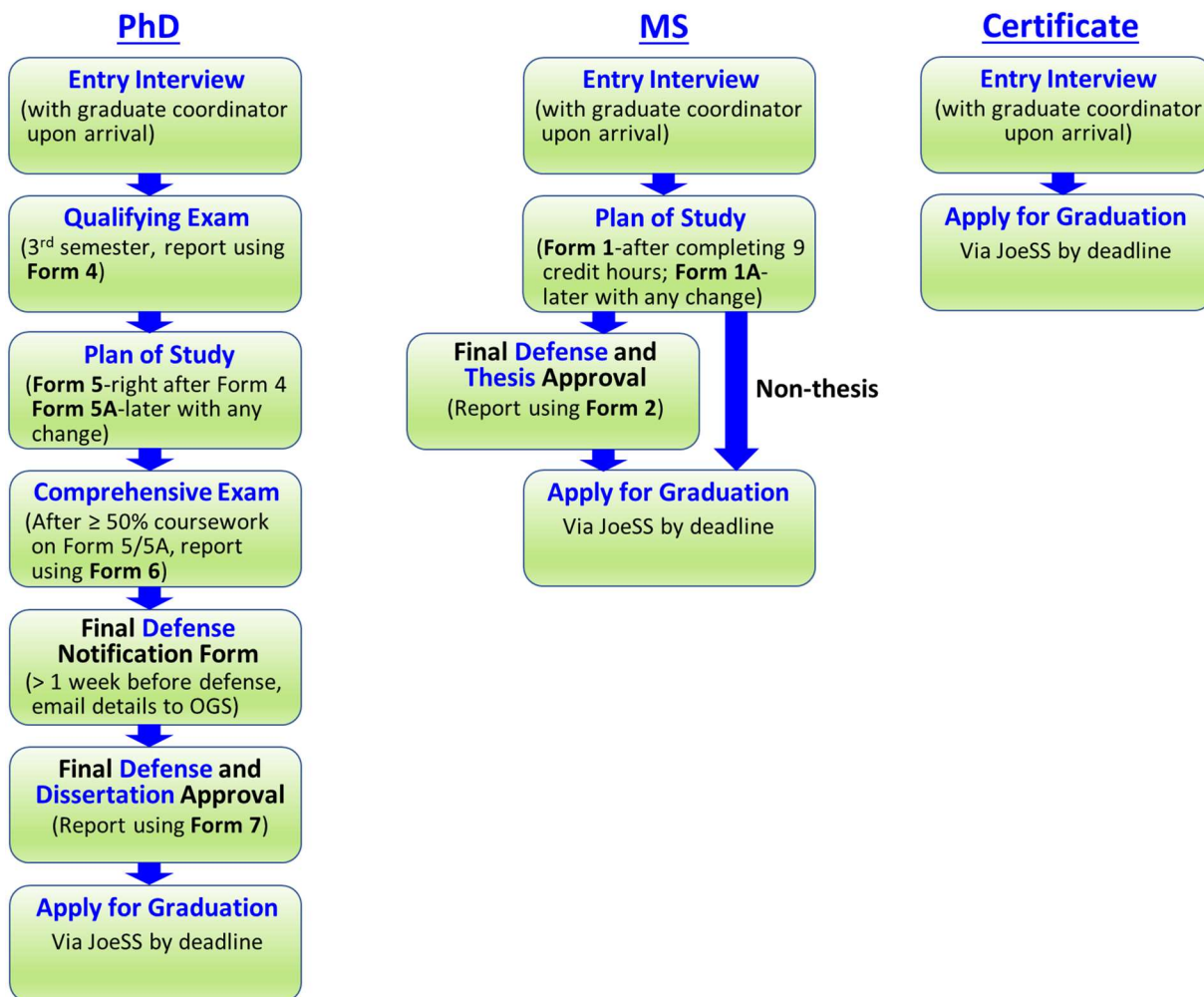
Tonya works closely with the Chair and Associate Chairs to manage the office; assist in processing undergraduate student forms and meetings; handle purchasing of the department equipment, shipping, and receiving; process undergraduate student employment ePAFs; and assist with ABET, IAC, and departmental scholarships.

**Senior Technician:** Micheal Murphy  
[murphyml@mst.edu](mailto:murphyml@mst.edu)  
(573) 341-4108  
B16 Bertelsmeyer Hall

The technician works with our research and teaching laboratories to keep our equipment operating and to update our facilities. If you notice anything in the building that is broken or needs repair, please report it to the main office.

## II. STUDENT MILESTONES (STEPS TO COMPLETE DEGREE)

The campus policies and rules concerning ALL graduate programs can be found in the graduate catalog: <https://catalog.mst.edu/graduate/>. The departmental policies and rules concerning chemical engineering PhD, MS, Graduate Certificate Programs summarized in this handbook are in faculty meeting minutes and required to be compliant with the campus's.



**Electronic Workflow: ALL graduate students are required to submit ALL graduate forms electronically** online: <https://grad.mst.edu/currentstudents/forms/>, where you can also find additional graduate information including various **deadline dates**. The graduate forms were created by the Office of Graduate Education using Google forms and use email addresses of the student, advisor, committee members, graduate coordinator, and the Office of Graduate Education for contact and approval. For more details about various forms, please visit the website and/or Sections V-VII of this Handbook.

To submit a graduate form, you need to log into a computer using your mst campus/Google account and click to open the form. You will be prompted to change account if the active user is not you on the computer. Usually on the first page of a form is your name, email address, student number, degree information, and your advisor's name and email address. Click the "Next" button at the bottom to proceed to the next page.

After submitting a form, you (requestor) will receive an email from "S&T Graduate Forms Workflow" to

- (i) confirm the request been sent to the first recipient,
- (ii) show a summary of the responses that you entered to the Google form (found in the body of the email and the pdf attached), and
- (iii) provide a Request #X link at top that can be used to check the status of the workflow (who has signed or yet to sign) at any time.
- (iv) includes a link for re-uploading corrected files.

Once the form has been processed and approved by the Office of Graduate Education, a notification email will be sent to you, your advisor, and program coordinator and staff. It is important to keep this email and all its attached forms and files for future reference.

### III. REQUIRED COURSEWORK

#### 1. Departmental Core Graduate Courses

The Department has established the following set of **core courses** for chemical engineering graduate program at Missouri S&T.

- **Chem Eng 5100 Intermediate Transport Phenomena**  
The similarities of flow of momentum, heat and mass transfer and the applications of these underlying principles are stressed. Course is primarily for seniors and beginning graduate students. Prerequisite: Chem Eng 3101 or graduate standing.
- **Chem Eng 5110 Intermediate Chemical Reactor Design**  
A study of homogeneous and heterogeneous catalyzed and noncatalyzed reaction kinetics for flow and batch chemical reactors. Application to reactor design is stressed. Prerequisite: Chem Eng 3150 or graduate standing.
- **Chem Eng 5220 Intermediate Engineering Thermodynamics**  
Review thermodynamic principles for pure fluids and mixtures. Emphasis on applications for the chemical industry and use of fundamental relations and equations of state. Prerequisite: Senior or graduate standing.

#### 2. Chem Eng 6015 Lecture Series (built around Graduate Seminars)

- 1) PhD students need to register for 1.0 credit hour of Chem Eng 6015 whenever registering for Chem Eng 6099 (taking one less hour of Chem Eng 6090) except for those in their first semester or in their last semester.
- 2) Thesis MS students need to register 1.0 credit hour of Chem Eng 6015 in three semesters.
- 3) Three (or more) credit hours of Chem Eng 6015 can be used as equivalent to a 3-credit-hour 6000-level lecture course in a graduate student's Form 1 or Form 5.
- 4) Letter grades will be assigned to students enrolled in ChE 6015 by the faculty member in charge based on the students' attendance and final report.
- 5) To demonstrate attendance, enrolled students need to get a copy of seminar flyer, write on its back their names and two relevant questions that they may ask if given opportunity, and give the flyer back to the faculty in charge. Missing two seminars in a semester is enough to be downgraded to B, three to C, and any more would lead to an F. Students are allowed to make up missed seminars by attending related seminars in other departments. For this purpose, students need to get an approval in advance from the ChE 6015 instructor, have the flyer of the substitute seminar signed by the seminar host, and afterwards give the seminar flyer back to the ChE 6015 instructor.
- 6) After all seminars are completed, students enrolled in ChE 6015 need to choose one of them and write a short report about it. This report is supposed to be 3-4 pages in length and due by a specific date designated by the ChE 6015 instructor.

### **3. Bridge courses:**

Chemical engineering "bridge" courses have been established by the faculty and intended to help students from non-ChE backgrounds to get properly prepared first before taking the required core graduate and PhD courses. The bridge courses are associated with chemical engineering core areas and required undergraduate courses, namely Chem Eng 3101 (Fundamentals of Transport in Chemical and Biochemical Engineering), Chem Eng 2110 or 3120 (Chemical Engineering Thermodynamics), and Chem Eng 3150 (Chemical Engineering Reactor Design). It is possible for additional bridge courses to be needed such as Calculus and Chem Eng 210 (Material and Energy Balances). The decision of bridge courses should be part of entry interview, based on previous courses/background, and stated clearly in the resultant memorandum for future reference.

Note that bridge courses may be excluded from a graduate student's GPA. In this regard, courses numbered below 3000 will automatically be excluded and those numbered from 3000-4999 can be identified as undergraduate credit by filling out the **Graduate Student Taking Undergraduate Credit Form** available on the Registrar's website (<https://registrar.mst.edu/forms/>).

### **4. Ph.D. Coursework (Form 5/5A, Course Plan see Appendices A and B)**

In addition to ChE 5100, ChE 5110, and ChE 5220, Doctor of Philosophy (Ph.D.)

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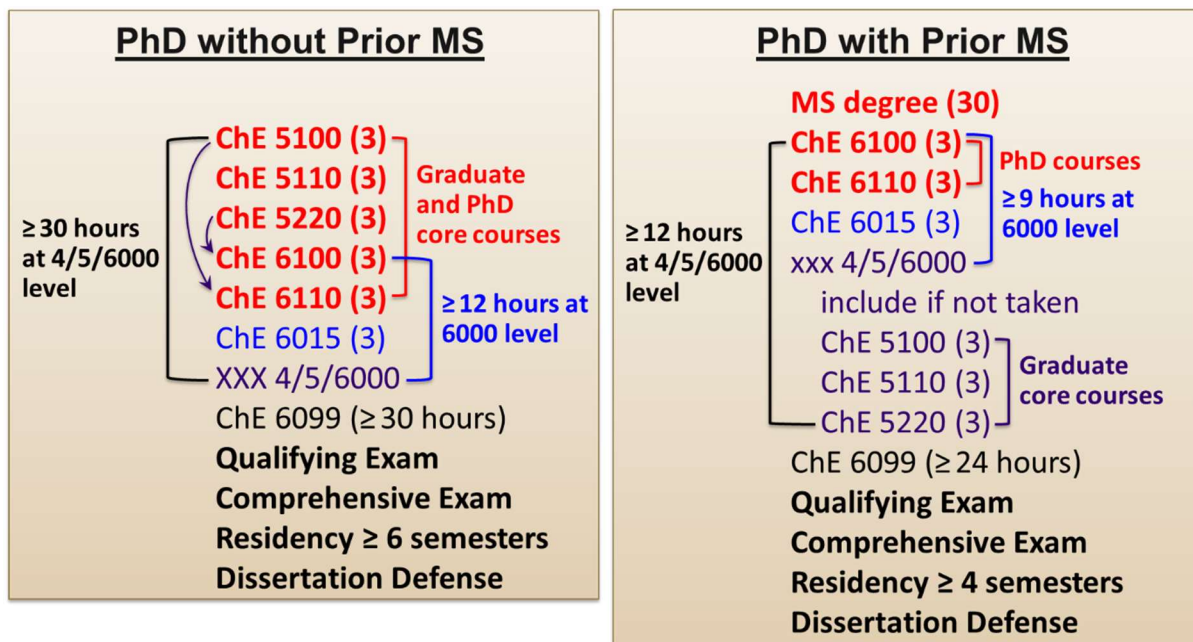
students are further required to take the following PhD-level courses:

- **Chem Eng 6100 Advanced Chemical Engineering Thermodynamics**
- **Chem Eng 6110 Advanced Transport Phenomena**

PhD students who do not hold a master's degree will be required to complete a minimum of seventy-two hours of graduate credit. The plan of study (Form 5/5-A) must include a minimum of thirty credit hours of 4000-, 5000-, and 6000-level lecture courses that satisfy the requirement of five PhD core courses listed above and contain at least twelve 6000-level lecture credit hours in or out of the department. Additionally, a minimum of thirty credit hours of ChE 6099 Research and a minimum of 3 years (6 semesters) of residency are required. Residency at Missouri S&T is defined as sustained intellectual interactions among the student and the academic community. The candidate for a doctoral degree receives one semester (0.5 year) of residency for each Spring or Fall semester enrolled as an on-campus student at Missouri S&T.

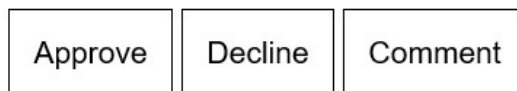
PhD students who hold a master's degree will be required to complete a minimum of forty-two hours of graduate credit. The plan of study (Form 5/5-A) must include a minimum of twelve credit hours of 4000-, 5000-, and 6000-level lecture courses that satisfy the requirement of five PhD core courses listed above and contain at least nine 6000-level lecture credit hours in or out of the department. Additionally, a minimum of twenty-four credit hours of ChE 6099 Research and a minimum of 3 years (6 semesters) of residency are required. If accepted by our graduate program, the prior master's degree is credited with a block of thirty lecture credit hours and one year (two semesters) of residency on Form 5/5-A.

The graphs below summarize the required PhD coursework under different circumstances.



Per campus policy, **Form 5 (Plan of Study)** must be submitted by the **end of the semester when a PhD student passes Qualifying Exam**. Please visit: <https://grad.mst.edu/currentstudents/forms/doctoraldegreeforms/> to start the submission via electronic workflow introduced in Section II. It requires (i) the **names and email addresses of all dissertation committee members** who should be selected in consultation with research advisor and (ii) **course plan**, which is a spreadsheet downloadable from the website to be filled with courses completed or planned to be taken to meet the campus and departmental minimum requirements. The same form needs to be submitted again as **Form 5A** whenever a change is made to the last approved one. Please make sure to select the right version, depending on your **catalog year before or after 2000**, and keep a copy for yourself to expedite future preparation and submission.

For **change of PhD project, advisor, or any committee member, approvals from all committee members including those being replaced are required**. For **change of courses, the updated course plan needs to be uploaded but only the research advisor's approval is required**. For this purpose, the research advisor and dissertation committee members will receive an email from "S&T Graduate Forms Workflow" where they will see three options as shown below,

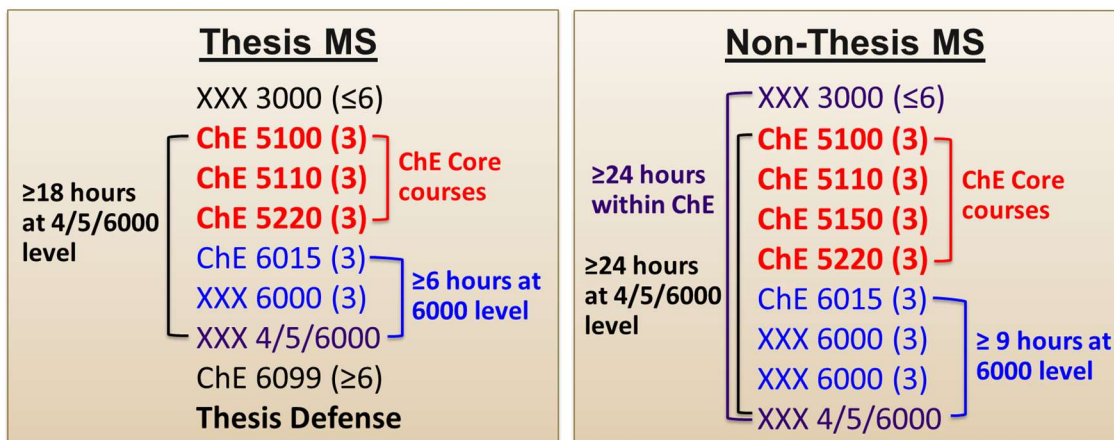


**The campus strongly recommends to not cancel a submission and to avoid rejections** as they may cause unnecessary complications and confusion. For additional information or change needed, the "Comment" option may be used to return the request back to the student. The corrected course plan can then be uploaded to the original form by clicking on the Updated Course Plan "File Upload" link in the email and it will be attached as "File Upload 2". For overall efficiency, **please fill out your course plan and send a physical or electronic (email) copy to graduate coordinator for compliance review first BEFORE Form 5 submission**.

#### 5. M.S. Coursework (Form 1/1A, Course Plan see Appendices C and D)

**Thesis option:** a minimum of 30 semester hours that must include (i) a minimum of **18 credit hours of 4000-, 5000-, and 6000-level lecture courses** that satisfy the core graduate course requirement detailed in III.1, (ii) a minimum of **6 credit hours of 6000-level lecture courses**, and (iii) a minimum of **6 credit hours of Chem Eng 6099** to carry out research, write thesis, and defend MS thesis.

**Non-thesis option:** a minimum of 30 semester hours that must include (i) a minimum of **24 credit hours of 4000-, 5000-, and 6000-level lecture courses**, (ii) a minimum of **9 credit hours from 6000-level lecture courses**, and (iii) a minimum of **24 credit hours of ChBE courses that include Chem Eng 5100, Chem Eng 5150, Chem Eng 5220, and Chem Eng 5015**. No credit hours of ChE 6099 Research can be counted for non-thesis MS degree even for those switching from thesis to non-thesis option. The graphs below summarize the required MS coursework for easier reference.



Per campus policy, **Form 1 (Plan of Study)** must be submitted during the semester when a MS student is to complete the ninth graduate credit hour. Please visit: <https://grad.mst.edu/currentstudents/forms/mastersdegreeforms/> to start the submission via electronic workflow introduced in Section II. While thesis MS students need to provide the **names and email addresses of all thesis committee members**, all MS students need to upload **course plan**, which is a spreadsheet downloadable from the website to be filled with courses completed or planned to be taken to meet the campus and departmental minimum requirements. The same form needs to be submitted again as **Form 1A** whenever a change is made to the last approved one. For this reason, please make sure to keep a copy of your course plan to expedite future preparation and submission.

For **change of MS project, advisor, or any committee member, approvals from all committee members including those being replaced are required.** For **change of courses, the updated course plan needs to be uploaded but only the research advisor's approval is required.** For this purpose, the research advisor and thesis committee members will receive an email from "S&T Graduate Forms Workflow" where they will see three options as shown below,

Approve	Decline	Comment
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**The campus strongly recommends to not cancel a submission and to avoid rejections** as they may cause unnecessary complications and confusion. For additional information or change needed, the "Comment" option may be used to return the request back to the student. The corrected course plan can then be uploaded to the original form by clicking on the Updated Course Plan "File Upload" link in the email and it will be attached as "File Upload 2". For overall efficiency, **please fill out your course plan and send a physical or electronic (email) copy to graduate coordinator for compliance review first BEFORE Form 5 submission.**

**Second M.S. Degree:** A student who had earned a master's degree at Missouri S&T or elsewhere in one major can earn a second MS degree in another area at Missouri S&T. The second MS degree requires a minimum of twenty-four additional hours of

graduate credit, including a minimum of eighteen credit hours of 4000-, 5000-, and 6000-level lecture courses and a minimum of six credit hours from 6000-level lecture courses. Additionally, for a second/subsequent master's degree with a thesis, a minimum of six credit hours of graduate research is required.

## 6. Course Transferability (Form 1 and Form 5 instructions)

In general, academia has a long tradition of “**no double dipping**” rule, that is, one course for one degree and cannot be counted again for another. As a result, courses completed during BS degree study cannot be used for graduate certificate or graduate degree unless special actions were taken or some particular rules become applicable.

Courses taken by students completing BS degree at Missouri S&T may be counted for graduate credits if (i) they were designated, up to 6 credit hours, by MS students admitted through Graduate Track Pathways (GTP) or (ii) they were separated out of the BS degree by filling out a form during senior year.

Graduate courses may be transferred from another university **as long as they have not been used to earn another degree (“no double dipping” except for MS&T degrees) and were registered as graduate credits when they were taken.** Students must have earned **at least a B grade or equivalent for such courses to be considered transferrable.** The university rules concerning transfer courses only specify the maximum numbers of credit hours for different degrees as summarized below, but whether the courses/credit hours are qualified for transfer and for what courses, required or elective, 5000 or 6000 level, should be part of entry interview and determined by the department.

- **PhD students without a master’s degree** may transfer a maximum of 18 credit hours
- **PhD students with a master’s degree** may transfer a maximum of 9 credit hours.
- **MS students** may transfer a maximum of 9 credit hours.
- The ChBE Graduate Certificate programs accept no transfer credit.

**Transfer of qualified graduate courses is done by listing them individually on Form 1 or Form 5 (Plan of Study) with the MST equivalent courses (course number and title) written in parenthesis within the same box.** It is important to note that **a student cannot take the same course again for a new degree even if the course has multiple course numbers.** If a required core course can be transferred or has been taken before, the student should take another course with the approval of the Graduate Coordinator based on educational objectives, research needs, and number of credit hours. Consult the Graduate Coordinator and/or graduate advisor in the Office of Graduate Education (<https://grad.mst.edu/>) for additional questions.

## 7. Graduate Certificate Coursework

The department currently has two graduate certificate programs which are briefly summarized below. For more information, please refer to the graduate catalog or

graduate coordinator. When planned properly, MS or PhD courses can also be used to earn graduate certificate BEFORE completing the degree.

**Chemical Process Engineering:** This certificate requires two core courses selected from Chem Eng 5100, Chem Eng 5110, Chem Eng 5150, Chem Eng 5220, and two elective 3-credit hour Chem Eng courses at 5000 or 6000 level.

**Carbon Management Engineering:** This certificate requires three core courses: Chem Eng 5325 Carbon Capture Process Engineering, Mech Eng 5539 Carbon Conversion and Utilization, Petro Eng 5050 Carbon Storage, and one elective 3-credit hour course from a list of approved Chem Eng, Mech Eng, and Petro Eng courses.

## 8. GPA and Grade Requirements for Graduate Students

- In order to earn a graduate degree a student must achieve both a cumulative GPA of 3.0 or higher for all graduate courses listed on the plan of study (Form 1 or Form 5) and cumulative GPA of 3.0 or higher in all coursework taken at Missouri S&T. No substitution may be made on the Plan of Study for courses in which the student has earned less than a B grade.
- In order to earn a graduate certificate, a student must achieve a cumulative GPA of 3.0 or higher in the courses approved for the certificate. If a graduate certificate student applies and gets admitted to MS program, only the courses receiving A or B grades can be counted toward the subsequent MS degree.
- If a semester graduate GPA falls below 3.0, the student will be placed on probation for the following semester. If the graduate GPA is not 3.0 or above in the following semester that coursework is taken, the student shall no longer be a candidate for a graduate degree or certificate from Missouri S&T.
- In cases where a graduate student repeats a course, both the original and repeat grades will be used in calculating the student's GPA, and both will appear on the student's transcript.

In addition, the ChBE department maintains an additional GPA requirement for PhD students, which is  $\leq 9$  credit hours of C grades over the course of PhD study.

## IV. GOOD STANDING

1. **University rules and regulations concerning graduate studies** are inflexible but can be updated on an annual basis. They are stated in the Missouri S&T graduate catalog (<http://catalog.mst.edu/graduate/>) which is updated and published by the Office of Graduate Education (<https://grad.mst.edu>). The applicability of the rules, regulations, and their changes is determined by the student's catalog year based on the date of admission to the degree program. Students may request to **change to a future catalog year** via electronic workflow. If a student changes their catalog year, they are responsible for fulfilling all of the graduation requirements in the newly chosen catalog and are not permitted to use a combination of catalogs to satisfy degree requirement.

2. Once admitted to a degree program, on campus graduate students must remain continuously enrolled in each fall and spring semester while summer enrollment is not required except when campus resources are used. A graduate student will be given a specified amount of time (three years for certificate, six years for master's, eight years for doctoral) to complete the program. A student may take a leave of absence, up to one year only, which will not count toward the specified time limit. For this purpose, **Request for Leave of Absence Form** must be submitted via electronic workflow by the student in a timely manner.
3. Graduate students can visit <https://registrar.mst.edu/psinfo/degreeaudit/index.html> any time to check on their **degree audit**, catalog year, and academic progress towards their degree, including required graduate forms that have been submitted or not. All categories of requirements will have to show 'OK' for graduation.
4. **Academic probation:** "if a semester graduate GPA falls below 3.0, the student will be placed on probation for the following semester. If the graduate GPA is not 3.0 or above in the following semester that coursework is taken, the student shall no longer be a candidate for a graduate degree or certificate from Missouri S&T." A formal notice/letter will be emailed to the student and the department from the Office of Graduate Education.
5. **Full-time enrollment:  $\geq 9$  credit hours in fall or spring semester and  $\geq 3$  credit hours in summer session.** Note that **full-time enrollment is usually required for tuition waiver for sponsored students.** Graduate teaching and research assistants (GTA/GRA), graduate instructors, and graduate fellow are required to be enrolled full time in each semester and summer session when they receive the assistantship except (i) MS students in their exit/last semester and (ii) PhD students completing comprehensive examination and all coursework. The eligible MS and PhD students must submit **Reduced Enrollment Request Form** via electronic workflow to be approved by the campus to maintain full time status with less than full time load.
6. **International students**, with or without assistantship, are required to enroll in a minimum of 9 credit hours in each fall and spring semester. Summer enrollment is optional but a minimum of 3 hours becomes required when a graduate student receives summer assistantship. International students are further subject to US government rules and regulations, including I-20, student visa, OPT, and CPT, which are handled by the Office of International Affairs (<https://international.mst.edu/>) and the Office of Graduate Education (<https://grad.mst.edu/>). Please consult with the advisors in these offices for more information and possible changes/extensions/exceptions in these regards.
7. There are protocols established by the department and implemented by the graduate committee, including selecting/getting a research advisor. They have to be followed and relevant forms have to be filled out with all signatures.
8. Those who have been admitted conditionally without satisfactory English proficiency must meet the campus minimum standard within the first year of their graduate study: TOEFL  $\geq 79$ , IELTS  $\geq 6.5$ , Duolingo  $\geq 105$ , or PTE  $\geq 53$ .

- There will be no financial support from the department without good standing. “Good standing” indicates conforming to relevant rules, regulations, and ethical standards, as well as showing satisfactory progress towards the degree on a regular basis in terms of coursework and research. In this respect, the dissertation/thesis advisor plays pivotal roles as the advisor controls advising hold, runs funded projects (funding source for GTA), approves various graduate forms, and chairs the dissertation/thesis committee. The advisor’s endorsement is an important foundation for the confirmation of good standing.

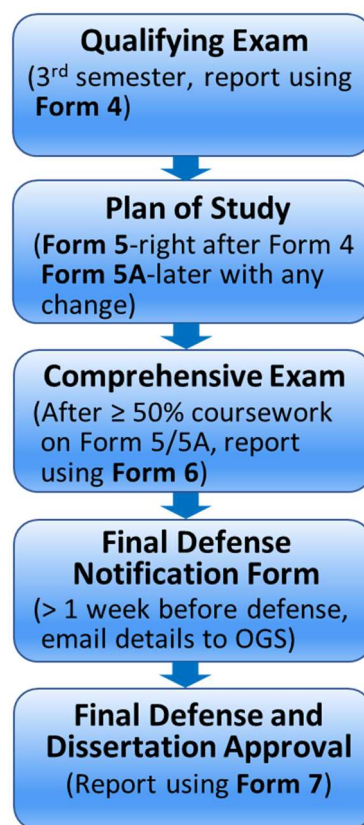
## V. DOCTORAL FORMS

Several graduate forms are required or may be needed for PhD students during their study. They are summarized below and must be submitted via electronic workflow (<https://grad.mst.edu/currentstudents/forms/>).

### 1. Form 4 and Qualifying Examination (3<sup>rd</sup> semester)

The goal of the qualifying exam is to examine the critical thinking and analysis capabilities of new PhD students. **PhD students are required by our department to take it during their 3rd semester** and given two chances to pass the qualifying exam. The outcome of each attempt will be reported by the Graduate Coordinator to the Office of Graduate Education using Form 4. **If the student fails both times, the university rule disqualifies the student to continue their PhD study in the department.** Those who enter the PhD program in the Summer will be considered together with those entering in the Fall semester. Other details of the exam include:

- A qualifying exam committee, of at least three faculty members, will be formed for each academic year by the department chair in consultation with the graduate committee. To avoid conflict of interest, the advisor of the student taking the exam should not be part of the qualifying exam committee or participate during the oral presentation or exam. Instead, the advisor should be replaced by another faculty member for the student’s qualifying exam.
- Between the qualifying exam committee, graduate committee, and research advisor, a pool of papers will be given to the student who should select one and report the selection back within a week to the Graduate Secretary in the department office to pass it to the exam committee. The Graduate Secretary will then schedule a qualifying exam time for the student.
- The student will be required to critically review the literature and prepare a review manuscript which is centered around the selected paper and may provide



foundational background for the student's dissertation research topic. This should be the student's work so the advisor should not help nor provide feedback to the student on this task.

- 4) The review manuscript should be at least 7 pages long but not more than 10 pages in length including written narrative, tables and figures (12 point, Times New Roman, single spaced with 1" margins) with sufficient references to indicate familiarity with the research topic (reference list and title page not included in the page limit). The manuscript should reflect the student's critical analysis and understanding of the literature related to the chosen research topic. **It is strongly recommended to organize your analysis and manuscript according to the following suggestion:**
  - A. **Introduction:** general perspectives of the scope and importance of the research area (e.g., CO<sub>2</sub> management, battery, bioengineering, etc.)
  - B. **Background and motivation** of the work discussed in the manuscript: description and discussion of the purposes, methods, results, and findings of your key references, plus their limitations either reported or identified by yourself, that point out directions for ongoing or future research (e.g., what have been done to reduce CO<sub>2</sub> emission, capture and storage CO<sub>2</sub>, or utilize/convert CO<sub>2</sub>)
  - C. **The current state of art** in the selected research area: summary of key research accomplishments to date and known remaining challenges and of desired research outcomes to meet future needs (e.g., latest reactions and processes for CO<sub>2</sub> conversion).
  - D. **Areas for future work** in the research area: there should be several worthy of pursuit based on based on sections B and C, including your PhD project (e.g., new reactions or catalysts for CO<sub>2</sub> conversion).
  - E. **A proposed theoretical and/or experimental plan** to address a topic from the future work: your PhD project, needed to be explained why it is important and even necessary to work on.
  - F. A summary and outlook of the selected research topic: the potential contributions of and the likely future situation affected by your PhD project.
  - G. Potential learning and benefits that address the following questions:
    - a) What the candidate learned from the literature that might be helpful towards his/her own research thesis work?
    - b) What the candidate might use from their review towards his/her own research thesis topic?
    - c) What literature the candidate might apply to their own research, and
    - d) Ideas generated during the literature review that might advance the candidate's own research thesis work and/or might be suitable for a future funded proposal.
  - H. Tables and Figures (with reference if taken from the literature)
  - I. List of References (ACS journal format)
- 5) The student will provide a copy of their written manuscript to the department Graduate Secretary no less than two (2) weeks prior to the scheduled examination



date. The writing should be the student's own work and the department will check for plagiarism using related software. Plagiarism of one's own or other's work is an ethical violation and will be grounds for disqualification from taking the qualifying exam. An important way to avoid such mistakes is to cite references properly in the manuscript and presentation file.

- 6) The student will be required to submit a power point presentation of no more than 30 slides to the Graduate Secretary at least two (2) weeks prior to the scheduled exam who will provide it to the examining committee. The advisor must not help the student prepare these slides. The presentation time allowed during the exam will be limited to 30 minutes, followed by a closed portion for examination questions by the committee. The presentation should reflect what is presented in the written manuscript.
- 7) During the closed portion of the exam, the committee may ask general questions related to reaction engineering, transport phenomena, and thermodynamics that are considered relevant to the selected research topic. The student will be required to address them orally to the exam committee.
- 8) If the student does not pass the first time, retaking the exam will require he/she to repeat the entire procedure described above. The committee will work with the student to schedule a proper time for re-examination which allows sufficient time for the student to prepare for and retake the qualifying exam. The second attempt should be completed before the end of the same semester when the student took the qualifying exam for the first time.
- 9) Shortcomings identified by the committee from the qualifying exam will be provided in writing and/or verbal explanation to the student and the advisor. The committee may suggest remedial actions that the student can work on independently or together with advisor to address the identified shortcomings.

## 2. Form 5/5A: Plan of Study

When a PhD student passes the qualifying examination, they need to submit **Form 5 for the first time within the same semester**, or a registration hold will be placed on the student's account by the Office of Graduate Education until Form 5 is received and approved by them. The first part of Form 5 is PhD project, advisor, and **advisory committee comprising a minimum of five members, including advisor and one member from outside the department**. Please consult with your advisor for committee selection and make sure all members are preapproved graduate faculty members (<https://catalog.mst.edu/graduate/generalinformation/graduatefaculty/>) and agree to participate. For those who have not been or are outside our campus, their detailed CVs need to be uploaded together with course plan to Form 5 submission. The second part of Form 5 is course plan as explained in Section III (Appendices A and B) and residency requirement. Residency at Missouri S&T is defined as "sustained intellectual interactions among the student and the academic community". In practice, every in-person enrolled Spring or Fall semester earns 0.5 year of

residency. Summer terms do not count toward residency regardless of summer enrollment.

Form 5 is a plan not a contract, so changes can be made as many times as needed. After the first submission, the same form, now called Form 5A, and same electronic workflow can be used again to report any change to the campus for approval. Note that for change of PhD project, advisor, or any committee member, approvals from all committee members including those being replaced are required. For change of courses, the updated course plan needs to be uploaded but only the research advisor's approval is required. It is important to keep a copy of your latest course plan for your own future reference.

### 3. Form 6: Report on Doctoral Comprehensive Examination

After a PhD candidate has **completed at least 50% of the coursework required** for the doctoral degree that were listed on their approved Form 5/5A, the candidate should consult their research advisor and committee members to arrange for comprehensive examination. The purpose of the comprehensive exam is to ensure that the student is knowledgeable enough with his or her area of research to make an original contribution and to determine whether the student should be permitted to "advance to candidacy"—that is, to go on and write a PhD dissertation. It is also an opportunity to assess graduate student learning outcomes for the department and for the university. For this reason and purpose, **the student/advisor should (i) inform the graduate coordinator or secretary when and where is the comprehensive exam, (ii) bring the assessment rubric forms attached in the appendix to the exam to be used by every dissertation committee member** to assess various learning outcomes of the student's PhD study, and **(iii) report the exam outcome and give the rubric forms back to the department/graduate coordinator**. To report the outcome of the comprehensive exam, **Form 6** should be submitted via electronic workflow to get email recommendations/approvals from advisor, committee members, graduate coordinator, and then the Office of Graduate Studies.

The current format of PhD comprehensive examination comprises a written report and oral presentation of a research proposal. Details of the exam will include the following:

- 1) An advisory committee with at least five committee members, including at least three members from ChBE faculty and at least one member from other department(s), should be formed. The student advisor should be the committee chair (Form 5/5A) and should approve the written report and oral presentation of the comprehensive exam first.
- 2) According to campus policy II-20, the student must be enrolled on the date of the comprehensive exam. Failure to do so may invalidate the exam. If the comprehensive exam occurs during the intersession, then an examination-only fee is appropriate by enrolling in one credit hour of Oral Examination (ChE 6040).
- 3) The student will submit the required written report to the advisory committee at least one week before the comprehensive exam presentation.

- 4) The written report should provide an overview of the research project, important results accomplished, and remaining tasks. It should be at least 10 pages long but not more than 15 pages in length including written narrative, tables and figures (12 point, Times New Roman, single spaced with 1" margins) with sufficient references to indicate familiarity with the research topic (reference list and title page not included in the page limit). The report should reflect the student's critical analysis and understanding of his/her research to make an original contribution in the area. The report should include the following sections:
- A. Title page
  - B. Abstract
  - C. Introduction (concise overview with brief introduction of methodology and highlights of key points)
  - D. Background and motivation of the work (literature review and objectives)
  - E. Research description/Path to achieve research objectives (tasks, deliverables, and impacts)
  - F. Research progress to date
  - G. Estimated budget
  - H. Research plan to complete dissertation study (timeline and schedule to complete remaining tasks, deliverables, and dissertation)
  - I. List of references (ACS journal format)
- 5) Plagiarism of one's own or other's work is an ethical violation and will be grounds for disqualification from taking the qualifying exam. An important way to avoid such mistakes is to cite references properly in the manuscript and presentation file.
- 6) The oral presentation should reflect what is presented in the written report. Any change after submitting the written report should be justified to and approved by the advisory committee. The presentation should be limited to 50 minutes.

**1 credit hour per semester reduced enrollment:** After passing the comprehensive examination and completing the minimum lecture credit, research hour, and residency requirements, the student can submit **Request for Continuous Registration Form** (<https://grad.mst.edu/currentstudents/forms/doctoraldegreeforms/>) via electronic workflow to get approval to take one credit hour of special problems (Chem Eng 6000) or graduate research (Chem Eng 6099) as full-time enrollment each semester/session until the degree is completed.

#### 4. Final Defense Notification Template (≥1 week prior to defense)

Please note that there must be at least 12 weeks between passing the comprehensive examination and holding the defense. A PhD candidate should submit this form via electronic workflow **no later than 1 week prior to the defense date**. Prior to or around submission of this form, the PhD candidate should also distribute a copy of PhD dissertation to each advisory committee member. Failure to do so may result in an invalid defense.

When writing your PhD dissertation, you want to ensure your document is presented in the most professional manner possible. For this purpose, the following website:

<https://grad.mst.edu/currentstudents/thesisdissertationinformation/formatting/> provides many useful resources on formatting your document properly (traditional format or publication option), binding your work professionally, and more. You are strongly recommended to visit this website from the beginning to the final stages of writing your dissertation. If you need additional help for writing dissertation, there is also a free program called Thesis & Dissertation Writing Camp: <https://grad.mst.edu/currentstudents/thesisanddissertationwritingcamp/> you can participate. All these online resources are provided and maintained by the Office of Graduate Studies.

## 5. Form 7: Report on Final Examination (Defense) and Dissertation Approval

Similar to comprehensive exam and Form 6, **the student/advisor should (i) inform the graduate coordinator or secretary when and where is the PhD defense, (ii) bring the assessment rubric forms attached in the appendix to the defense to be used by every dissertation committee member to assess student learning outcomes, and (iii) report the defense outcome and give the rubric forms back to the department/graduate coordinator.** A candidate will be considered to have passed the defense if all, or all but one, of the advisory committee members vote that the candidate passed. Regardless of the outcome, **Form 7 must be submitted by the student via electronic workflow to the campus.** Once this form has been approved by the dissertation committee and the Office of Graduate Studies, no other content changes can be made except for changes to the format outlined by the Thesis/Dissertation Specifications.

## 6. ChBE Departmental PhD Dissertation Award

The department created a PhD dissertation award to recognize and honor PhD students who have accomplished excellent PhD dissertations, and to also encourage all PhD students to actively write or participate in writing papers for their research projects. The departmental Graduate Committee has been given charge and thus established the following instructions to handle this award rigorously and consistently. For those who are interested, please consider

- 1) **Eligibility:** PhD students in their last semester who have successfully defended their PhD dissertations and produced a minimum of three qualified publications. Since summer has no commencement, PhD students graduating in summer can apply to be considered in the preceding Spring semester.
- 2) **Qualified publications:** published archival papers, accepted/in-press manuscripts, and filed nonprovisional utility patents, which must also be
  - peer-reviewed,
  - with the PhD applicant being the first author, and
  - included in the student's PhD dissertation.

Delayed publications due to confidentiality reasons may also qualify with advisor's certification.

- 3) **Application:** Because the Graduate Committee has no or limited access to the needed information, interested and qualified PhD students should apply by submitting digital(pdf) versions of their dissertations and publications as well as a completed **application form** to the Graduate Coordinator on behalf of the Graduate Committee at least one week prior to the commencement.
- 4) **Awardee:** every applicant who has met the above qualifications, completed their application in time, and received a majority vote from the Graduate Committee will be awarded.

## 7. Application to Conduct Off-Campus Research

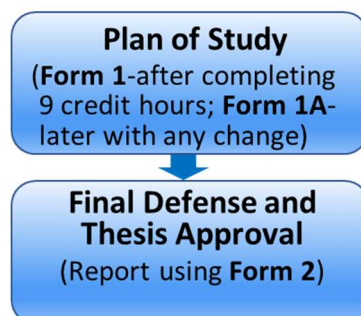
This form must be submitted to request prior approval to conduct off-campus research to ensure that such an endeavor will result in educational experiences which are equivalent, or superior, to those that a student might expect to have at Missouri S&T.

## VI. MASTER FORMS

The following are graduate forms required or potentially needed for MS students to complete their MS study. They must be submitted via electronic workflow (<https://grad.mst.edu/currentstudents/forms/>).

### 1. Form 1/1A: (Revised) Plan of Study

A MS student must submit Form 1 during the semester when completing the ninth graduate credit hour. A registration hold will be placed on the student's account by the Office of Graduate Studies until Form 1 is approved by them. Thesis MS students must consult with research advisor to form thesis committee with a minimum of three members, of whom two must be MST graduate faculty. MS students must download and fill out a course plan spreadsheet (Appendix C for thesis and D for non-thesis MS) and fill in out with courses to satisfy the required coursework explained in Section II. This course plan must be uploaded as part of Form 1 submission but please get it reviewed first by the graduate coordinator to avoid confusion or complication.



Form 1 is a plan not a contract, so changes can be made as many times as needed. After the first submission, the same form, now called Form 1A, can be used again to report any change to the campus for approval. Note that for change of MS project, advisor, or any committee member, approvals from all committee members including those being replaced are required. For change of courses, the updated course plan needs to be uploaded but only the research advisor's approval is required. It is important to keep a copy of your latest course plan for your own future reference.

**Switching between thesis and non-thesis MS** study is also done using Form 1/1A and to be approved by advisor, graduate coordinator, and then Office of Graduate Education.

## **2. Form 2: Report on Final Examination (Defense) and Thesis Approval**

When ready, a thesis MS student can consult with advisor and thesis committee members to arrange a date for defense. The candidate should distribute a copy of MS thesis to each committee member **at least seven days prior to the defense date. The student/advisor should (i) inform the graduate coordinator or secretary when and where is the MS defense, (ii) bring the assessment rubric forms attached in the appendix to the defense to be used by every dissertation committee member to assess student learning outcomes, and (iii) report the defense outcome and give the rubric forms back to the department/graduate coordinator.**

A candidate will be considered to have **passed the MS defense if all, or all but one, of the advisory committee members** vote that the candidate passed. Regardless of the outcome, **Form 2 must be submitted by the student via electronic workflow to the campus.** Once this form has been approved by the dissertation committee and the Office of Graduate Studies, no other content changes can be made except for changes to the format outlined by the Thesis/Dissertation Specifications.

When writing your MS thesis, you want to ensure your document is presented in the most professional manner possible. For this purpose, the following website: <https://grad.mst.edu/currentstudents/thesisdissertationinformation/formatting/> provides many useful resources on formatting your document properly (traditional format or publication option), binding your work professionally, and more. You are strongly recommended to visit this website from the beginning to the final stages of writing your thesis. If you need additional help for writing dissertation, there is also a free program called Thesis & Dissertation Writing Camp: <https://grad.mst.edu/currentstudents/thesisanddissertationwritingcamp/> you can participate. All these online resources are provided and maintained by the Office of Graduate Studies.

## **3. Request for Waiver of Enrollment Requirements**

Although graduate teaching and research assistants (GTA/GRA), graduate instructors, and graduate fellows are required to be enrolled full time each semester when they receive the assistantship, a one-time-only exit semester of reduced enrollment may be allowed, by submitting this form for MS students receiving assistantship.

## **VII. GRADUATE CERTIFICATE FORMS**

Graduate Certificates are open to existing graduate students who can apply for admission to a certificate program during their graduate degree study. The graduate courses taken at Missouri S&T by a graduate student pursuing this opportunity can be counted for both the certificate and the graduate degree. However, the student

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must complete the certificate program before their graduate degree is awarded, otherwise those courses become “locked in” to that degree and cannot be used toward the certificate.

Once a student is active in a certificate program, the relevant courses completed by the student will automatically be pulled into the appropriate sections of their degree audit. The student will only need to apply for completion/graduation via Joe'SS when finishing the last course and no additional form will be needed.

There are two special circumstances where clarification is needed by filling out the following forms.

### **1. Substitution for Required Certificate Course(s) Form**

When a required course for a graduate certificate is no longer available or has been taken for a previous degree, this form can be submitted to substitute the required certificate course with an acceptable alternate course.

### **2. Certificate Program Courses Form**

When a certificate student is active in more than one certificate program, this form is required to designate courses for each certificate. Courses taken for a specific certificate cannot be counted toward an additional certificate (no “double-dipping”). This form must be submitted before a second and/or subsequent certificate(s) can be awarded.

## **VIII. ADDITIONAL INFORMATION**

1. It is beneficial to visit the websites of the Office of Graduate Studies occasionally to get familiar with all the relevant rules and regulations, available resources, ongoing events, and new opportunities. They are also a good starting point when you face special situations and need certain help.

- <https://grad.mst.edu/>
- <https://grad.mst.edu/currentstudents/> .

2. **Joe'SS** (pronounced “Joe’s”) is short for Joe Miner’s Self-Service (<https://joess.mst.edu/>), a web portal that is accessible anywhere and allows students access to their academic and financial information such as course enrollment, payment options and history, billing statements, financial aid information, transcripts, and degree audit. To access financial information and aid communication with the Cashiers and Student Financial Assistance Offices, students need to agree to e-Consent. For more information about Joe'SS, visit <https://registrar.mst.edu/psinfo/>.

Degree audit can also be directly accessed via <https://mydegree.mst.edu>. The following is an example in 2UP format (option under UM in the upper right corner)

```

12/2018 ANLY 0003 17 00 00      12/2018 NQUA 0168 94 00 00
12/2018 NVER 0142 17 00 00
-----
-----> AT LEAST ONE REQUIREMENT HAS NOT BEEN SATISFIED <-----
-----
A GRADUATE FORM 5 MUST BE SUBMITTED BY THE END OF THE
SEMESTER IN WHICH THE STUDENT PASSES THE QUALIFYING EXAM
OK 1
  EARNED:   0.0 HOURS                1 SUB-GROUP
-----
OK 2 CUMULATIVE GRADUATE GPA - MUST HAVE A 3.0 OR HIGHER
  IP EARNED: 72.0 HOURS                1 SUB-GROUP      3.500 GPA
-----
NO 3 GRADUATE DEGREE WITH MASTERS
      (42 CREDIT HOURS MINIMUM)
      EARNED: 72.0 HOURS                1 SUB-GROUP      3.500 GPA
--> NEEDS:
  2 SUB-GROUPS
+ 1) 3000 LEVEL NON-LECTURE COURSES
      3.0 HOURS ADDED      3 COURSES TAKEN
  SP20 MS&E 5000 1.0 S >R Special Problems
  SP21 MS&E 5000 1.0 S >R Special Problems
  FS21 MS&E 5010 1.0 S Seminar
      SELECT FROM: FORM 5 MS&E 5000(X)
- 2) 4000,5000,6000 LEVEL LECTURE - 12 CREDIT HOUR MINIMUM
      24.0 HOURS ADDED      8 COURSES TAKEN      3.500 GPA
  SP19 MS&E 6120 3.0 B      SP19 MS&E 6130 3.0 A
  FS19 ENGLISH 5571 3.0 B      FS19 MS&E 6060 3.0 A
  FS19 MS&E 6110 3.0 B      FS20 MS&E 5220 3.0 B
  SP21 FINANCE 5260 3.0 A      FS21 BUS 6927 3.0 A
      NEEDS: 3.0 HOURS
-> NOT FROM: *****5099,6099,4000,5000,5040,6000,6010,
*****6040,6050,4085,5085,6085
      SELECT FROM: FORM 5 CER ENG 5310(X)
- 3) GRADUATE RESEARCH - 24 CREDIT HOUR MINIMUM
      45.0 HOURS ADDED      9 COURSES TAKEN
  SP19 MS&E 6099 3.0 S >R Research
  SS19 MS&E 6099 3.0 S >R Research
  SP20 MS&E 6099 8.0 S >R Research
  SS20 MS&E 6099 3.0 S >R Research
  FS20 MS&E 6099 6.0 S >R Research
  SP21 MS&E 6099 5.0 S >R Research
  SS21 MS&E 6099 3.0 S >R Research
  FS21 MS&E 6099 5.0 S >R Research
  SP22 MS&E 6099 9.0 IP >R Research
      NEEDS: 7.0 HOURS
      SELECT FROM: FORM 5 MS&E 5099(X),6099(X)
-----
OK 4 COURSES NOT USED TOWARD GRADUATE DEGREE
  EARNED:   0.0 HOURS                1 SUB-GROUP
-----
null

```

The usual rule of thumb for completing a degree is to get OK for every block, each a sub- requirement, signified by dashed lines. When **NO** is given instead, the degree audit usually provides brief explanation and recommendation. Please consult your advisor or graduate coordinator for further questions.

3. **Student code of conduct:** Student Honor Code can be found at this link: <http://stuco.mst.edu/honor-code/>. Conduct of students subject to sanctions can be found here: <https://registrar.mst.edu/academicregs/conductofstudents/>, and falls into the following categories:

- 1) Academic dishonesty, such as *cheating*, *plagiarism*, or *sabotage*.
- 2) Forgery, alteration, or misuse of University documents, records or identification, or knowingly furnishing false information to the University.
- 3) Obstruction or disruption of teaching, *research*, administration, conduct proceedings, or other University activities, including its public service functions on or off campus.



- 4) Physical abuse or other conduct which threatens or endangers the health or safety of any person.
- 5) Stalking another by following or engaging in a course of conduct with no legitimate purpose.
- 6) Academic dishonesty, such as cheating, plagiarism, or sabotage.
- 7) Forgery, alteration, or misuse of University documents, records or identification, or knowingly furnishing false information to the University.
- 8) Obstruction or disruption of teaching, research, administration, conduct proceedings, or other University activities, including its public service functions on or off campus.
- 9) Physical abuse or other conduct which threatens or endangers the health or safety of any person.
- 10) Stalking another by following or engaging in a course of conduct with no legitimate purpose.
- 11) Academic dishonesty, such as cheating, plagiarism, or sabotage.
- 12) Forgery, alteration, or misuse of University documents, records or identification, or knowingly furnishing false information to the University.
- 13) Obstruction or disruption of teaching, research, administration, conduct proceedings, or other University activities, including its public service functions on or off campus.
- 14) Physical abuse or other conduct which threatens or endangers the health or safety of any person.
- 15) Stalking another by following or engaging in a course of conduct with no legitimate purpose.
- 16) Hazing, participation or cooperation by the person(s) being hazed does not excuse the violation. Failing to intervene to prevent (and/or) failing to discourage (and/or) failing to report those acts may also violate this policy.
- 17) Misuse of computing resources in accordance with University policy.
  - a. Actual or attempted theft or other abuse.
  - b. Unauthorized entry into a file to use, read, or change the contents, or for any other purpose.
  - c. Unauthorized transfer of a file.
  - d. Unauthorized use of another individual's identification and password.
  - e. Use of computing facilities to interfere with the work of another student, faculty member, or University official.
  - f. Use of computing facilities to interfere with normal operation of the University computing system.
  - g. Knowingly causing a computer virus to become installed in a computer system or file

**4. Research Integrity and Ethics** is an important graduate learning outcome. To provide additional insights and guidelines, and to address potential issues, a special seminar will be presented annually to the graduate students. The presentation slides and relevant materials will be made available to the students via email and department websites.

- 5. Title IX:** Missouri University of Science and Technology is committed to the safety and well-being of all members of its community. US Federal Law Title IX states that no member of the university community shall, on the basis of sex, be excluded from participation in, or be denied benefits of, or be subjected to discrimination under any education program or activity. Furthermore, in accordance with Title IX guidelines from the US Office of Civil Rights, Missouri S&T requires that all faculty and staff members report, to the Missouri S&T Title IX Coordinator, any notice of sexual harassment, abuse, and/or violence (including personal relational abuse, relational/domestic violence, and stalking) disclosed through communication including but not limited to direct conversation, email, social media, classroom papers and homework exercises. Contact Missouri S&T's Title IX Coordinator (203 Centennial Hall; 573-341-6038) to report Title IX violations. To learn more about Title IX resources and reporting options (confidential and non-confidential) available to Missouri S&T students, staff, and faculty, please visit <http://titleix.mst.edu>.
- 6. Disability Support:** If special accommodations are needed for research and classes due to certain documented and approved disability, please consult the Disability Services staff at 204 Norwood Hall, Tel: 341-4211, email: [dss@mst.edu](mailto:dss@mst.edu), web: <http://dss.mst.edu>, your advisor and course instructors.
- 7. Well-Being and UCARE** (<https://go.mst.edu/ucare-report>)  
Any of us may experience strained relationships, increased anxiety, feeling down, alcohol/drug misuse, decreased motivation, challenges with housing and food insecurity, etc. When your mental well-being is negatively impacted, you may struggle academically and personally. If you feel overwhelmed or need support, please make use of S&T's confidential mental health services at no charge. If you are concerned about a friend or would like to consult with a Care Manager, please make a UCARE referral for support and assistance.



Appendix A-without revision

**Doctoral Degree Course Plan**

Name and ID: Joe Miner 12345678				Level/Credit Hours and Residency			
Add/ Delete (Form 5A ONLY)	Sem/Yr	Course Prefix/ Course Number	Course Title	3000- level & non-lec	4000/ 5000/6000- level lec	Research	Residency
	FS21	ChemE 5100	Intermediate Transport Phenomena		3.0		0.5
	FS21	ChemE 5220	Intermediate Engineering Thermodynamics		3.0		
	FS21	ChemE 6099	Research			3.0	
	SP22	ChemE 5110	Intermediate Reactor Design		3.0		0.5
	SP22	ChemE 6110	Advanced Chemical Engineering Thermodynamics		3.0		
	SP22	ChemE 6015	Lecture Series		1.0		
	SP22	ChemE 6099	Research			2.0	
	SS22	ChemE 6099	Research			3.0	
	FS22	ChemE 5001	Renewable Energy Processes		1.0		0.5
	FS22	ChemE 5001	Intro to Process Intensification		1.0		
	FS22	ChemE 5200	Biomaterials I		3.0		
	FS22	ChemE 6015	Lecture Series		1.0		
	FS22	ChemE 6099	Research			3.0	
	SP23	ChemE 6110	Advanced Transport Phenomena		3.0		0.5
	SP23	Chem 5810	Introduction to Polymeric Materials		3.0		
	SP23	ChemE 6015	Lecture Series		1.0		
	SP23	ChemE 6099	Research			2.0	
	SS23	ChemE 6099	Research			3.0	
	FS23	ChemE 6015	Lecture Series		1.0		0.5
	FS23	ChemE 6180	Advanced Applications of Computational Fluid Dynamics		3.0		
	FS23	ChemE 6099	Research			5.0	
	SP24	ChemE 6099	Research			9.0	0.5
	SS24	ChemE 6099	Research			3.0	
	FS24	ChemE 6099	Research			9.0	0.5
	SP25	ChemE 6099	Research			1.0	0.5

<b>3000-level lecture and non-lecture</b>						<b>0.0</b>
<b>4000/5000/6000-level lecture</b>						<b>30.0</b>
<b>Research</b>						<b>43.0</b>
<b>Total credit hours</b>						<b>73.0</b>
<b>Total residency</b>						<b>4.0</b>

Appendix A-with various revisions

Doctoral Degree Course Plan							
Name and ID:		Joe Miner 12345678					
Add/ Delete (Form 5A ONLY)	Sem/Yr	Course Prefix/ Course Number	Course Title	Level/Credit Hours and Residency			
				3000- level & non-lec	4000/ 5000/6000- level lec	Research	Residency
	FS/2020	ChemE/5220	Intermediate Engineering Thermodynamics		3.0		0.5
	FS/2020	ChemE/5810	Introduction to Polymeric Materials		3.0		
	FS/2020	ChemE/5001	Catalysis and Reaction Kinetic		3.0		
	SP/2021	ChemE/5110	Intermediate Chemical Reactor Design		3.0		0.5
	SP/2021	ChemE/6110	Advanced Chemical Engineering Thermodynamics		3.0		
	SP/2021	MetE/5525	Scanning Electron Microscopy Lab		1.0		
	SP/2021	ChemE/6099	Research			2.0	
	SS/2021	ChemE/6099	Research			3.0	
	D	FS/2021	ChemE/5200	Biomaterials I	3.0		0.5
	A	FS/2021	ChemE/5100	Intermediate Transport Phenomena	3.0		
		FS/2021	ChemE/6099	Research		6.0	
	D	SP/2022	ChemE/6100	Advanced Transport Phenomena	3.0		0.5
	D	SP/2022	ChemE/5150	Intermediate Process Computing	3.0		
	D	SP/2022	ChemE/5010	Seminar	1.0		
	A	SP/2022	ChemE/6015	Lecture Series	1.0		
	D	SP/2022	ChemE/6099	Research		2.0	
	A	SP/2022	ChemE/6099	Research		5.0	
		SS/2022	ChemE/6099	Research		3.0	
		FS/2022	ChemE/6241	Intermediate Chemical Process Safety	3.0		0.5
		FS/2022	ChemE/6015	Lecture Series	1.0		
		FS/2022	ChemE/6099	Research		5.0	
	D	SP/2023	ChemE/6120	Applied Mathematics in Chemical Engineering	3.0		0.5
		SP/2023	ChemE/6015	Lecture Series	1.0		
	D	SP/2023	ChemE/6099	Research		5.0	
	A	SP/2023	ChemE/6099	Research		8.0	
	D	SS/2023	ChemE/6099	Research		6.0	
	A	SS/2023	ChemE/6099	Research		3.0	
	A	FS/2023	MSE/6110	Bonding, Crystallography, and structure-property Relationship	3.0		0.5
	D	FS/2023	ChemE/6015	Lecture Series	1.0		
	D	FS/2023	ChemE/6099	Research		8.0	
	A	FS/2023	ChemE/6099	Research		6.0	
	D	SP/2024	ChemE/6015	Lecture Series	1.0		0.5
	D	SP/2024	ChemE/6099	Research		8.0	
	A	SP/2024	ChemE/6099	Research		1.0	
				<b>3000-level lecture and non-lecture</b>			<b>0.0</b>
				<b>4000/5000/6000-level lecture</b>			<b>31.0</b>
				<b>Research</b>			<b>42.0</b>
				<b>Total credit hours</b>			<b>73.0</b>
				<b>Total residency</b>			<b>4.0</b>

0.5 for each Spring & Fall

Take a different course than previously planned

Did not take the course, so add 3 hours to 6099

wrong course replaced by the right course

Not offered

3 hours to ChE 6099

Correcting previous mistake

No need or interest

Adjusting to make 9 total credit hours

After comprehensive exam and last semester do not need to 9 hours

Double check the numbers here as the various revisions may make the automatically calculated sums not correct. Add completed hours only, excluding those labeled with "D"

Appendix B

Doctoral Degree Course Plan

Name and ID: Joe Miner 12345678

Add/ Delete (Form 5A ONLY)	Sem/Yr	Course Prefix/ Course Number	Course Title	Level/Credit Hours and Residency			
				3000- level & non-lec	4000/ 5000/6000- level lec	Research	Residency
	XXXX		MS		30.0		1.0
	FS22	ChemE 5100	Intermediate Transport Phenomena		3.0		0.5
	FS22	ChemE 5220	Intermediate Engineering Thermodynamics		3.0		
	FS22	ChemE 6099	Research			3.0	
	SP23	ChemE 6100	Advanced Chemical Engineering Thermodynamics		3.0		0.5
	SP23	ChemE 5110	Intermediate Reactor Design		3.0		
	SP23	ChemE 6099	Research			3.0	
	SS23	ChemE 6099	Research			3.0	
	FS23	ChemE 6015	Lecture Series		1.0		0.5
	FS23	ChemE 6099	Research			8.0	
	SP24	ChemE 6110	Advanced Transport Phenomena		3.0		0.5
	SP24	ChemE 6015	Lecture Series		1.0		
	SP24	ChemE 6099	Research			5.0	
	SS24	ChemE 6099	Research			3.0	
	FS24	ChemE 6015	Lecture Series		1.0		0.5
	FS24	ChemE 6099	Research			8.0	
	SP25	ChemE 6099	Research			1.0	0.5
	SS25	ChemE 6099	Research			1.0	
	FS25	ChemE 6099	Research			1.0	0.5

				<b>3000-level lecture and non-lecture</b>	<b>0.0</b>		
				<b>4000/5000/6000-level lecture</b>	<b>48.0</b>		
				<b>Research</b>	<b>36.0</b>		
				<b>Total credit hours</b>	<b>84.0</b>		
				<b>Total residency</b>	<b>4.5</b>		

Appendix C

Master's Degree Course Plan								
Name and ID:		Joe Miner 12345678						
Add/Delete (Form 1A ONLY)	Sem/Yr	Course Prefix/ Course Number	Course Title	Level/Credit Hours				
				Transfer	3000- level & non-lec	4000/ 5000- level lec	6000-level lec	Research
	FS22	CHEM ENG 5100	Intermediate Transport Phenomena			3.0		
	FS22	CHEM ENG 5220	Intermediate Engineering Thermodynamics			3.0		
	FS22	CHEM ENG 5810	Introduction to Polymeric Materials			3.0		
	SP23	CHEM ENG 6100	Advanced Chemical Engineering Thermodynamics				3.0	
	SP23	MS&E 6060	Chemistry of construction materials				3.0	
	SP23	CHEM ENG 6099	Research					3.0
	FS23	CHEM ENG 5150	Intermediate Chemical Reactor Design			3.0		
	FS23	CHEM ENG 5161	Intermediate Molecular Engineering			3.0		
	FS23	CHEM ENG 6099	Research					3.0
	SP24	CHEM ENG 6099	Research					3.0
<b>Total credit hours:</b>								<b>30.0</b>

## Appendix D

<b>Master's Degree Course Plan</b>								
<b>Name and ID:</b>		<b>Joe Miner 12345678</b>						
Add/Delete (Form 1A ONLY)	Sem/Yr	Course Prefix/ Course Number	Course Title	Level/Credit Hours				
				Transfer	3000- level & non-lec	4000/ 5000- level lec	6000-level lec	Research
	FS22	CHEM ENG 5100	Intermediate Transport Phenomena			3.0		
	FS22	CHEM ENG 5220	Intermediate Engineering Thermodynamics			3.0		
	FS22	CHEM ENG 5810	Introduction to Polymeric Materials			3.0		
	SP23	CHEM ENG 5001	Introduction to colloid checmistry and interfacial enginerring			3.0		
	SP23	MS&E 6060	Chemistry of construction materails				3.0	
	SP23	CHEM ENG 6110	Advanced Transport Phenomena				3.0	
	FS23	CHEM ENG 5150	Intermediate Process Computing			3.0		
	FS23	CHEM ENG 5161	Intermediate Molecular Engineering			3.0		
	FS23	CHEM ENG 6180	Advanced Applications of Computational Fluid Dynamics				3.0	
	SP24	CHEM ENG 5110	Intermediate Chemical Reactor Design			3.0		
<b>Total credit hours:</b>								<b>30.0</b>



# Graduate Learning Outcome (GLO) Standard Rubric

Evaluation Rubrics for (select one of the following research-based levels):

MS  ME  PhD  DE

Candidate Name: \_\_\_\_\_

Student ID: \_\_\_\_\_

Department: Chemical and Biochemical Engineering

Program: Chemical Engineering

Semester & Year of Defense: \_\_\_\_\_ Committee member: \_\_\_\_\_

Milestone: Comprehensive Exam / Defense

\*Guidance for assessing candidate suggested on page 2

Graduate Learning Outcome (Scale of 1-5)	Unsubstantiated (1)	Developing (2)	Acceptable (3)	Proficient (4)	Exceptional (5)
<b>1. Knowledge:</b> Candidate has the ability to apply the contemporary state of knowledge within their discipline.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>2. Communication:</b> Candidate has the ability to communicate in the standards of professional work in their discipline.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>3. Integrity and Ethics:</b> Candidate has the ability to adhere to the highest standards of professional behavior, integrity, and ethical conduct.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>4. Scholarship Independence:</b> Candidate has the ability to identify, explain, and develop scholarship.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>5. Critical Thinking:</b> Candidate has the ability to evaluate arguments, assess assumptions about information and data, and synthesize knowledge.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Student Name: \_\_\_\_\_

Date: \_\_\_\_\_

<u>Graduate Learning Outcome</u>	<u>Unsubstantiated/Developing (1-2)</u>	<u>Acceptable (3)</u>	<u>Proficient/Exceptional (4-5)</u>
<b>Knowledge:</b> an ability to apply the contemporary state of knowledge within their discipline	Does not reflect understanding of subject matter and associated literature	Reflects understanding of subject matter and associated literature	Reflects mastery of the understanding of subject matter and associated literature
	Demonstrates little understanding of relevant fundamental concepts	Demonstrates understanding of relevant fundamental concepts	Demonstrates superior understanding of relevant fundamental concepts
	Limited evidence of comprehension	Some evidence of comprehension	Significant evidence of comprehension
<b>Communication:</b> an ability to communicate in the standards of professional work	Presents reasonings incorrectly, incoherently, or faultily	Presents reasonings coherently and clearly	Presents reasonings in a superior manner
	Organization is poor	Organization is logical	Organization is excellent
	Contains numerous grammatical and spelling errors	Contains some grammatical and spelling errors	Contains no grammatical and spelling errors
<b>Integrity &amp; Ethics:</b> an ability to adhere to the highest standards of professional behavior, integrity, and ethical conduct	Possesses inadequate awareness/training of ethical and responsible research	Possesses suitable awareness/training of ethical and responsible research	Possesses substantial awareness/training of ethical and responsible research
	Does not cite references from which work was obtained and used	Cites references partially from which work was obtained and used	Cites references thoroughly from which work was obtained and used
<b>Scholarship Independence:</b> an ability to identify, explain, and develop scholarship	Shows limited expansion upon previous research	Builds upon previous research	Greatly extends previous research
	Provides weak justification for the choice of research method	Provides reasonable justification for the choice of research method	Provides strong justification for the choice of research method
	Presents limited publication potential	Presents reasonable publication potential	Presents significant publication potential
<b>Critical Thinking:</b> an ability to evaluate arguments, assess assumptions about information and data, and synthesize knowledge	Demonstrates rudimentary problem solving skills and the solutions have major flaws	Demonstrates average problem solving skills but the solutions have minor flaws	Demonstrates mature problem-solving skills and the solutions have no flaws
	Defines objectives and assumptions poorly	Defines objectives and assumptions clearly	Defines objectives and assumptions thoroughly
	Displays limited creativity and insight	Displays creativity and insight	Displays significant creativity and insight

Comments: