George Mason University College of Education and Human Development Graduate School of Education: Elementary Education EDCI 553 Section A01 Science Methods for the Elementary Classroom (3 credits) Summer 2016 (May 16—June 23)

Thompson L003/2020 and Centreville/Centre Ridge Elementary School

*Course taught in conjunction with EDCI 545 – Assessment and Differentiation

Professor: Dr. Andrew Gilbert **Office Hours:** By appointment; including email/Skype or Facetime if desired. **Office Location:** Thompson 1404 **Office Phone:** (703)-993-3497 **Email:** agilbe14@gmu.edu

This course is only open to students in the Elementary Education program.

COURSE DESCRIPTION

A. Prerequisites/Corequisites

Admission to the Elementary Education program.

B. University Catalog Course Descriptions

Develops skills and abilities in science teaching methods, applications of technology, safety practices, and creation of integrated science curricula. Examines science teaching based on contemporary theory, practice, and standards. Prerequisite(s): Admission to elementary education licensure program.

Notes: Requires field experience in public schools.

C. Expanded Course Description

The primary goal of this course is to provide you with practical experience, theoretical background, and pedagogical skills that will allow you to be successful in your future career. To this end, there will be two main themes stressed over the duration of the course: 1) to facilitate the development of pedagogical approaches to inquiry-based teaching practice, and 2) to develop confidence and understanding for science and health content. With respect to content, the course will develop your background knowledge with the goal of successful teaching in an elementary science context, meaning that you will need to have a solid understanding of large-scale science topics beyond what is expected of elementary children. The course will also consider the intersection of science, self and society to investigate elements of health related content such as human body systems, nutrition, emotional health, as well as conceptions of gender and identity.

Most children come to school with a keen interest in the world around them, but often by the end of elementary school only a small percentage of students have retained this interest in science content. This is generally attributed to the ways in which "school science" often ignores the beauty and joy that can come from engaging with science and connecting scientific understanding to the everyday experiences of children. Consequently, we will conceptualize science as a verb where we are consider our *wonders, build new knowledge* and *discover* as opposed to the memorization of 'science facts.' For this reason, we will utilize constructivist approaches to learning and those approaches should help you scaffold science content that is too often presented as an exercise in the acquisition of vocabulary.

This course plans to provide opportunities for students to enjoy and embrace the ideas that make us wonder about the world and our role within it. In many respects, science can be intimidating to learn in the ways it is presented in schools, media and the general public. Our goal is to unpack those social constructions of science to present science in a more realistic light where scientists are presented as humans struggling to better understand the world (just like the rest of us) as opposed to omnipotent, infallible heroes that society and textbooks wish to portray. This class experience is merely a first step in your evolution toward becoming the kind of educator you wish to be. Lastly, you will be required to bring your curiosity to class for each session. Please make sure to nurture and feed it as we move through our work together.

LEARNER OUTCOMES

This course will enable students to:

- A. Build pedagogical content knowledge base in science and health through inquiry-based investigation
- B. Conceptualize core principles regarding the Nature of Science, ie. how wonder, creativity experimentation, and evidence frame scientific thinking
- C. Develop lesson plans demonstrating inquiry-based principles in science and health education including the incorporation of technology
- D. Demonstrate age-appropriate safety standards when designing hands-on classroom experiences
- E. Examine science and health curricula and methods with respect to "Science for All" and standards documents at local, state, and national levels
- F. Develop viable assessment tools for science and health contexts

KEY PROFESSIONAL STANDARDS ADDRESSED FOR PBA ASSESSMENTS

INTASC: Interstate Teacher Assessment and Support Consortium, Model Core Teaching Standards

#4. Content Knowledge. The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches and creates learning experiences that make the discipline accessible and meaningful for learners to assure mastery of the content.

#5. Application of Content. The teacher understands how to connect concepts and use differing perspectives to engage learners in critical thinking, creativity, and collaborative problem solving related to authentic local and global issues.

#6. Assessment. The teacher understands and uses multiple methods of assessment to engage learners in their own growth, to monitor learner progress, and to guide the teacher's and learner's decision making.

#7. Planning for Instruction. The teacher plans instruction that supports every student in meeting

rigorous learning goals by drawing upon knowledge of content areas, curriculum, cross-disciplinary skills, and pedagogy, as well as knowledge of learners and the community context.

#8. Instructional Strategies. The teacher understands and uses a variety of instructional strategies to

encourage learners to develop deep understanding of content areas and their connections, and to build skills to apply knowledge in meaningful ways.

ACEI: Association for Childhood Education International - Standards for elementary level teacher preparation:

1.0 Development, Learning, and Motivation--Candidates know, understand, and use the major concepts, principles, theories, and research related to development of children and young adolescents to construct learning opportunities that support individual students' development, acquisition of knowledge, and motivation.

2.2 Science— Candidates know and understand fundamental concepts of physical, life, and earth/space sciences as delineated in the National Science Education Standards. Candidates can design and implement age-appropriate inquiry lessons to teach science, to build student understanding of personal and social applications, and to convey the nature of science. (INTASC #1 Subject Matter Knowledge)

2.6 Health education— Candidates know, understand, and use the major concepts in the subject matter of health education to create opportunities for student development and practice of skills that contribute to good health. (INTASC #1 Subject Matter Knowledge)

3.1 Integrating and applying knowledge for instruction— Candidates plan and implement instruction based on knowledge of students, learning theory, connection across the curriculum, curricular goals, and community. (INTASC #7 Planning)

#4.0 Assessment for Instruction -- Candidates know, understand and use formal and informal assessment strategies to plan, evaluate and strengthen instruction that will promote continuous intellectual, social, emotional, and physical development of each elementary student.

Technology (ISTE NETS): International Society for Technology in Education / National Educational Technology Standards

Standard I. Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments.

COURSE DELIVERY

Face to face, field-based, with some on-line sessions

REQUIRED TEXTS & READINGS

All readings will be provided via electronic chapters via Blackboard.

Board of Education, Commonwealth of Virginia. (2010). *Standards of learning for Virginia Public Schools: Science* Available online:

http://www.doe.virginia.gov/testing/sol/standards_docs/science/complete/stds_sciencek-12.doc

Board of Education, Commonwealth of Virginia. (2008). *Standards of learning for Virginia Public Schools: Health.* Available online:

http://www.doe.virginia.gov/testing/sol/standards_docs/health/complete/stds_healthk-10.doc

Articles and other materials will be provided throughout the course.

Optional Texts:

Inquire with Dr. G, if you are interested in finding titles with ideas for teaching elementary science. You can consider any elementary science teaching text as a resource for lesson ideas and support for theoretical underpinning regarding your pedagogical approaches. Glad to provide guidance here.

COURSE ASSIGNMENTS AND EXAMINATIONS (all assignments count for each course EDCI 545 and 553):

1. Attendance and Participation

It is expected that you attend all scheduled classes and asynchronous online meetings outlined within the syllabus. Absence from class to observe a religious holiday, to serve jury duty, or to participate in required military service, and medical emergencies are exceptions to the above policy. If you anticipate being absent for any of these reasons, please make arrangements at least 48 hours in advance. In addition, you are expected to be on time to class each week unless 48 hours advance notice has been provided to the instructor. This is particularly important given our work with a school partner. This course operates with the assumption that knowledge is socially constructed and the most meaningful learning opportunities are those where you have the opportunity to offer and explore diverse perspectives with peers; therefore, you are expected to contribute to both class and online discussions and activities as well as genuinely listen to peers as they do the same. In addition, you are expected to be prepared for each class, which means having completed all assigned readings and tasks for that class. Cell phones are for emergency use only and it is expected that you will not use cell phones in class for purposes such as texting, social media, or phone calls.

2. Wonder Project

Think about the science that you see in the everyday. Ask yourself questions, feel the movements and forces while you drive, look at the sky, watch your pet, engage with another human, think about your place in this world, go for a long walk and just think...no phone, no worries, just get lost in your thoughts. Remember this is homework so you have an excuse. After you have engaged with some of these and spent some time with your thoughts, **craft a list of 25 things you wonder about in relation to science and include at least one image that can be shared with the class**. There are no real rules here. Your

10%

10%

be completed before the class period begins.
 be brief, yet thoughtful, and demonstrate genuine consideration of the text

3. be accessible during each class session.

3. Longitudinal Reading Logs

These will help in the construction and support of both your science unit and differentiation plan.

reading. Use the template provided in Bb. Your reflection should...

4. Differentiation and Assessment Plan for unit(PBA #1)20%

wonders are yours and unique to how you envision the world around you. "Dance like nobody is watching" while you build your list. Then reflect on the list and provide a $\frac{1}{2}$ to

a. You will analyze each reading in terms of the reading and its connection to your school site and your unit. Record these responses in your longitudinal reading log for each

lpage (max) discussion regarding aspects we will discuss on day two in class.

Using the template provided in class, you will work with your teams to outline a plan for a differentiated unit of instruction. You will design the differentiation and assessment plan to promote equity in learning opportunities for all students. This means that intentional decisions will need to be made to consider student readiness, interests, and learning profiles. You will need to consider how content, process, and/or products of the lesson will be different for different groups of students depending on their strengths. All of these decisions will be driven by your knowledge of students from your field placement and couched in the readings you have engaged in throughout the semester. Your outline will also include a plan for measuring student learning prior to and throughout the unit.

5. Impact on Student Learning Task:

After teaching apportion of your unit, you will analyze the student learning data you collected from any pre/formative/summative assessments you delivered within your instruction. You will be expected to examine it to such a level that you are able to identify areas of strengths and weaknesses for individual students while also identifying learning trends across the classroom. And finally, you will pose implications for further instruction, including differentiation, based on your analysis of student assessment data. You will go beyond merely attending to percentage correct/incorrect of the assignment and instead will "break the assessment down" to its skills and sub-skills. First, you will evaluate what the student demonstrated that he/she knew or did not know within each objective. Second, you will pose implications for further instruction based on your analysis.

6. Inquiry-Based Unit Project

The goal of this project is construct and teach (a small portion) an inquiry-based unit within your field site. We will design this work around the 5 E model of lesson planning. The unit will entail building a detailed and well-supported narrative description for the approach that will be employed. The five-lesson sequence will build science content understanding in engaging and dynamic ways for students within your field site and provide some key theoretical and research-based support for the content, approach and activities constructed. The unit will be comprised of the following components and

(PBA #3) 30%

 Fask:
 (PBA #2)

 ur unit
 you will analyze the student less

20%

10%

scored via the rubric provided later in the syllabus as part of the PBA for science.

GRADING POLICIES:

A=94-100; A-=90-93; B+=87-89; B=80-86; C=70-79; F=below 70 *Remember: A course grade less than B requires that you retake the course.

WORK TIMELINESS EXPECTATIONS:

It is expected that all class assignments will be submitted on time to the correct location; therefore, **late assignments will not receive full credit**. Assignments turned in late will receive an automatic deduction of one letter grade making the highest possible score equivalent to 80% (B). All assignments must be submitted by the beginning of class (Eastern standard time) on the due date stated within the syllabus (see below) and should only be submitted via **Blackboard**. If you are unable to complete an assignment due to an emergency or difficult circumstance, communication must be made with the instructor via email or in person. In situations that are deemed an emergency or a difficult circumstance, I will work with you to set a new submission date that will not be considered late.

OTHER EXPECTATIONS

All written papers are **expected to be double-spaced**, with 1" margins, and in 12-point font (Times New Roman, Calibri, or Arial). APA format is expected. If you do not have a 6th Edition APA manual, the OWL at Purdue is an excellent resource: <u>http://owl.english.purdue.edu/owl/resource/560/01/</u>

***Please Note:** The GMU Writing Center offers online support via email. They will provide feedback on your writing within one hour. Graduate and professional writing can be difficult; I encourage you to take advantage of this service. <u>http://writingcenter.gmu.edu/?page_id=177</u>

BLACKBOARD REQUIREMENTS

Every student registered for any Elementary Education course with a required performancebased assessment (designated as such in the syllabus) is required to submit this/these assessment(s) (EDCI 545: Impact on Student Learning Task; EDCI 553 – Science Unit) to Tk20 through Blackboard (regardless of whether a course is an elective, a onetime course or part of an undergraduate minor). Evaluation of the performance-based assessment by the course instructor will also be completed in Tk20 through Blackboard. Failure to submit the assessment to Tk20 (through Blackboard) will result in the course instructor reporting the course grade as Incomplete (IN). Unless this grade is changed upon completion of the required Tk20 submission, the IN will convert to an F nine weeks into the following semester.

GMU POLICIES AND RESOURCES FOR STUDENTS

- 1 Students must adhere to the guidelines of the George Mason University Honor Code (See <u>http://oai.gmu.edu/the-mason-honor-code/</u>).
- 2 Students must follow the university policy for Responsible Use of Computing (<u>http://universitypolicy.gmu.edu/policies/responsible-use-of-computing/</u>).

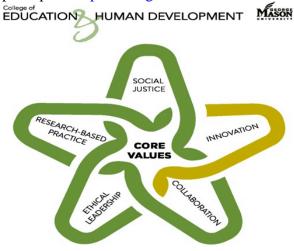
- 3 Students are responsible for the content of university communications sent to their George Mason University email account and are required to activate their account and check it regularly. All communication from the university, college, school, and program will be sent to students solely through their Mason email account.
- 4 The George Mason University Counseling and Psychological Services (CAPS) staff consists of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops and outreach programs) to enhance students' personal experience and academic performance [See http://caps.gmu.edu/].
- 5 Students with disabilities who seek accommodations in a course must be registered with the George Mason University Office of Disability Services (ODS) and inform their instructor, in writing, as soon as possible [See http://ods.gmu.edu/]. Approved accommodations will begin at the time the written letter from Disability Services is received by the instructor (See http://ods.gmu.edu/)
- 6 Students must follow the university policy stating that all sound emitting devices shall be turned off during class unless otherwise authorized by the instructor.
- 7 The George Mason University Writing Center staff provides a variety of resources and services (e.g., tutoring, workshops, writing guides, handbooks) intended to support students as they work to construct and share knowledge through writing (See http://writingcenter.gmu.edu/).

PROFESSIONAL DISPOSITIONS

Students are expected to exhibit professional behaviors and dispositions at all times (See Elementary Education Program Handbook).

CORE VALUES COMMITMENT

Core Values Commitment egenefCEducation & Human Development is committed to collaboration, ethical leadership, innovation, research-based practice, and social justice. Students are expected to adhere to these principles. http://cehd.gmu.edu/values/



Promoting Learning Development Across the Lifespan

For additional information on the College of Education and Human Development, Graduate School of Education, please visit our website [See <u>http://gse.gmu.edu/</u>].

Emergency Procedures

You are encouraged to sign up for emergency alerts by visiting the website https://alert.gmu.edu. There are emergency posters in each classroom explaining what to do in the event of crises. Further information about emergency procedures exists on <u>http://gmu.edu/service/cert</u>

IMPORTANT INFORMATION FOR LICENSURE COMPLETION

Beginning with Spring 2015 internships, all official and passing test scores must be submitted and in the Mason system (i.e. Banner/PatriotWeb) by the internship application deadline. Allow a minimum of six weeks for official test scores to arrive at Mason. Testing too close to the application deadline means scores will not arrive in time and the internship application will not be accepted. Required tests:

- Praxis Core Academic Skills for Educators Tests (or qualifying substitute)
- VCLA
- RVE
- Praxis II (Content Knowledge exam in your specific endorsement area) *For details, please check http://cehd.gmu.edu/teacher/test/*

Endorsements:

Please note that ALL endorsement coursework must be completed, with all transcripts submitted and approved by the CEHD Endorsement Office, prior to the internship application deadline. Since the internship application must be submitted in the semester prior to the actual internship, please make an appointment to meet with the Endorsement Specialist and plan the completion of your Endorsements accordingly.

CPR/AED/First Aid:

Beginning with spring 2015 internships, verification that the Emergency First Aid, CPR, and Use of AED Certification or Training requirement must be submitted and in the Mason system (i.e. Banner/PatriotWeb) by the application deadline. Students must submit one of the "acceptable evidence" documents listed at http://cehd.gmu.edu/teacher/emergency-first-aid to CEHD Student and Academic Affairs. In order to have the requirement reflected as met in the Mason system, documents can be scanned/e-mailed to CEHDacad@gmu.edu or dropped-off in Thompson Hall, Suite 2300.

Background Checks/Fingerprints:

All local school systems require students to complete a criminal background check through their human resources office (not through George Mason University) prior to beginning field hours and internship. Detailed instructions on the process will be sent to the student from either the school system or Mason. Students are strongly advised to disclose any/all legal incidents that may appear on their records. The consequence of failing to do so, whether or not such incidents resulted in conviction, is termination of the field hours or internship.

Please Note: Your G-Number must be clearly noted (visible and legible) on the face of the document(s) that you submit.

Application

The internship application can be downloaded at http://cehd.gmu.edu/teacher/internships-field-experience

Description and	Exceeds	Meets	Needs	Does Not Meet
standard addressed	Expectations, 4-5	Expectations, 2-3	Improvement,	Expectations –
	pts.	pts.	1 pt.	0
A. Lesson Framework (pedagogical process & procedure, narrative description) INTASC: # 8 ACEI: #1.0	Utilizes inquiry-based lesson model (5E's), clearly describes pedagogical process that embodies inquiry. Clearly described, highly usable and	Utilizes inquiry-based lesson model (5E's), clearly describes pedagogical process that embodies inquiry.	Difficult to use; does not have complete components; and/or is not self-explanatory.	0 No consistent format nor serious professional commitment to student needs.
	respected sources properly referenced within narrative descriptions.	narrative descriptions.		
B. Aligned Standards, Objectives, Activities & Resources	All are student- oriented objectives and stated in observable student learning outcomes;	All are student- oriented objectives and stated in observable student learning outcomes;	teacher-oriented objectives or not stated in terms of observable student learning	Missing
INTASC: # 7; ACEI: #3.1	spans all levels of student thinking; all are appropriate for the lesson. Standards, objectives and lesson activities all seamlessly align and support one another.	student thinking; most are clearly connected directly to lesson activities; there exists alignment between standards, objectives and activities.	student thinking; has way too little or many objectives; and/or some are inappropriate for lesson. Standards, objectives and activities not clearly aligned.	
C. Assessment INTASC: #6 ACEI #4	strategies clearly linked to objectives; demonstrates all stated objectives,	demonstrates nearly all stated objectives, copies of written assessments are attached. Will include	Assessment is not clearly linked to objectives; demonstrates some stated objectives, and/or copies of written assessments are not attached. Does not include all three types of assessment.	Missing

PBA #1 Three lesson inquiry unit

D. Science Content	Content utilized in	Content utilized in	Content utilized in	Missing
			lesson plan is	withoung
(Earth science, space	-	accurate, complete (as	1	
science, file science,			places, key content is	
	standards);		not addressed (as	
	· ·		defined by listed	
INTASC: #4			standards);	
ACEI #2.2			incorporates mostly	
		connect to students	scientifically accurate	
	11 /		approaches; little effort	
	are made to students		to connect to students	
	everyday lives and		everyday lives.	
	accessible.			
		Lesson supports	Lesson tries to support	Missing
and Safety	essential enactment of		enactment of science	-
INTASC Content #5	science processes	processes consistent	processes consistent	
ACEI #2.2	consistent with	with accepted notions	with accepted notions	
	accepted notions of	of NOS. These	of NOS, but misses on	
			key approaches or	
			those approaches are	
			absent. (including	
			wonder, evidence,	
			investigation, testing,	
	11		concluding based on	
		attention to issues that	findings, etc.)	
		could arise and clearly		
	There also exists keen		There is not enough	
	attention to issues that		attention paid to issues	
	could arise and clearly		that could arise and do	
	provides appropriate		not clearly provide	
	safety measures.		appropriate safety	
			measures.	
F. Technology Plan				Missing
		technology use that	technology lacks	
INTASC #5		connects subject	specifics and does not	
ISTE: #I	5		clearly offer ways to	
		0,	advance student	
	forms technology that		learning in creative,	
			innovative and	
			meaningful ways.	
	creative, and	creative, and		
	innovative ways.	innovative ways.		

Assessment Summary: The project is meant to facilitate your understanding for the design and teaching of an inquiry-based science unit. This will require research into both inquiry-based lesson planning and science content. The goal is bring powerful learning theory to life in classrooms and design science experiences that both excite and engage elementary children.

PBA	#2
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Part 1-Diagnostic Assessment				
Торіс	Distinguished (met) 4	Proficient (met) 3	Developing (not met) 2	Beginning (not met) 1
Diagnostic Tools	Discusses a wide variety (4+) of diagnostic pre- assessments and articulates myriad of reasons for choosing your approach.	Discusses a variety (2-3) of diagnostic pre-assessments and articulates myriad of reasons for choosing your approach.	Designed and used a limited number of diagnostic pre- assessments (2 or fewer) articulates a few reasons for choosing your approach.	Not included
Analysis of pre-assessment data	Analysis of data includes rich, thorough descriptions with detailed example cases	Analysis of data includes a general description with example cases, but missing some detail.	Analysis of data is generic in scope and limited in depth.	Not included
Implications of pre-assessment findings	A thorough description of implications for planning—with an emphasis on strategies for differentiating instruction	A description of implications for planning—with an some emphasis on strategies for differentiating instruction	Limited description of implications for planning—with little attention to strategies for differentiating instruction	
Writing Style	Well written with no errors in grammar, style or punctuation	Well written with few errors in grammar, style or punctuation	Some errors and/or stylistic issues	Numerous errors and/or stylistic issues

Part 2: Lesson Plans				
Торіс	Distinguished (met) 4	Proficient (met) 3	Developing (not met) 2	Beginning (not met) 1
Rationale ACEI 3.1 INTASC 2	Detailed rationale for instructional decisions. Specific connections to course content.	Somewhat detailed rationale for instructional decisions. General connections to course content.	General rationale for instructional decisions. Minimal connections to course content.	Limited rationale for instructional decisions. No connection to course content.

Standards and objectives ACEI 3.1 INTASC 7 Instructional procedures	Specific connections to standards; specific, clear objectives aligned to lesson procedures Specific, clear, description	Connections to standards; Objectives generally clear and connected to lesson procedures Somewhat specific description of	General connections to standards; broad objectives and/or not connected to lesson procedures General description of procedures	Limited connections to standards; minimal/poorly constructed objectives Limited description of procedures
ACEI 3.1 INTASC 7	including a scripting of the procedures	procedures with limited scripting		
Instructional approach and strategies ACEI 3.4, INTASC 5	Instructional approach is clearly identifiable and includes all components are used; highly engaging instructional strategies are used	Instructional approach is identifiable and most components are used, some engaging instructional strategies are used	Instructional approach is identifiable and generally followed; minimal inclusion of engaging instructional strategies	Instructional approach is unclear and/or missing components; no attention to engaging instructional strategies
Assessment ACEI 4.0 INTASC 6	Detailed, specific attention to formative and summative assessment strategies; assessments clearly connect to objectives and procedures.	Somewhat specific attention to formative and summative assessment strategies; assessments generally connect to objectives and procedures	General attention to formative and summative assessment strategies; minimal connections to objectives and procedures	Limited attention to formative and summative assessment strategies; no connection to objectives and procedures
Learner differences ACEI 3.2 INTASC 2	Detailed attention to learner differences via accommodations, modifications, differentiated strategies	Somewhat specific attention to learner differences via accommodations, modifications, differentiated strategies	General attention to learner differences via accommodations, modifications, differentiated strategies	Limited attention to learner differences via accommodations, modifications, differentiated strategies

Part 3-Analysis of Impact of Instruction on Student Learning				
Торіс	Distinguished (met) 4	Proficient (met) 3	Developing (not met) 2	Beginning (not met) 1
Analysis of Progress Towards Objectives	Thorough post lesson analysis of what the students did/did not know in relation to the objectives	Post lesson analysis of what the students did/did not know in relation to the objectives	General post lesson analysis of what the students did/did not know in relation to the objectives	
Analysis of Student Strengths/ Weaknesses	Rich description of areas of strength and areas of weakness for each student	Description of areas of strength and areas of weakness for each student	General description of areas of strength and areas of weakness for each student	
Implications	Thoroughly described implications for future instruction, including needed differentiation.	Description includes implications for future instruction, including needed differentiation.	General description of implications for future instruction	
Writing Style	Well written with no errors in grammar, style or punctuation	Well written with few errors in grammar, style or punctuation	Some errors and/or stylistic issues	Extensive errors and/or stylistic issues

Deadlines

Spring internship application:

• Traditional semester long internship: September 15

Fall internship application:

• Traditional semester long internship: February 15

• Year Long Internship: April 1 (All testing deadlines are August 1 immediately preceding the fall start; RVE deadline is December 1).