Grading Scheme for Junior and Senior Seminar
2012-2013

Evaluation Criteria

Students will be evaluated on the *content* of their projects, the *independence* they exhibit in completing their projects, the extent of their *participation* in the broader mathematical community, and the effectiveness of their *communication* in explaining their findings.

- **Content:** Projects will be classified as being *pure*, *applied*, *interdisciplinary*, or *other*. The meaning of "content" depends on which type of project is under consideration.
    - A *pure* project is one that involves mathematics without significant reference to applications or other disciplines.
    - An *applied* project is a study of how mathematical tools are used to solve problems outside of mathematics or an application of such tools by the student to solve a particular problem. When studying the use of mathematical tools, the project may be either narrow and deep or broad and cohesive.
    - An *interdisciplinary* project is one that combines tools from mathematics and another academic discipline in an attempt to solve a problem. Students working on this type of project will be strongly encouraged to have two advisors, one from mathematics and the other from the non-mathematical field.
    - A project that does not match one of these descriptions belongs to the category *other*. The student must work with the project supervisor to develop a content description with matching grade guidelines. This description must be submitted to the junior/senior seminar coordinator for his or her approval.
- **Independence:** A student will be judged as showing independence if they work autonomously from their supervisor(s) or if they show a high level of motivation.
- **Participation:** Students will be judged to be participating in the broader academic community if they attend and report on lectures, attend and report on conferences, present their work at academic meetings, and/or submit their work for publication.
- **Communication:** Students will be expected to effectively communicate their work, both orally and in writing, to an audience of students, faculty, and the broader mathematical community.

Scoring the Criteria

Students will receive a score between 0 and 4 points in each of the four criteria. These points will be summed, rounded off at the discretion of the instructor, and converted to a final grade according to the following table.

Score:	16 or 15	14	13	12	11	10	9	8	7	6	5 or 4	3 or less
Grade:	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F

In the Senior Spring, students are in addition **required** to hand in an approved final paper. Students who do not submit a final paper, or whose final paper is not approved, will not be given a passing grade in senior seminar regardless of their scores in other categories.

Content Scores

These will be awarded according to the type of project undertaken.

Pure Projects

- Grade 4: The student must demonstrate a high degree of proficiency with the material at a level judged by the faculty to be above that of a senior level course at Rhodes. The student must do original work in that area. The student must be able to precisely justify their work using the appropriate mathematical language or citing the appropriate constructions and results. The student knows when it is appropriate to claim ignorance or classify a fact/question as beyond the scope of their project.
- Grade 3: The student's work must demonstrate a moderate degree of proficiency with the material at a level judged by the faculty to be above that of a senior level course at Rhodes. The student must demonstrate a depth of exploration beyond that of routine/drill exercises. The student can often justify their work precisely using appropriate mathematical language, but may sometimes inappropriately claim ignorance or inappropriately classify a fact or question as beyond the scope of their project.
- Grade 2: The student's work must demonstrate some proficiency with the material at a level judged by the faculty to be at or above that of a senior level course at Rhodes. The student uses terms and constructions correctly and can usually recall precise definitions or justifications.
- Grade 1: The student's work demonstrates familiarity with the material at a level judged by the faculty to be at or above that of a senior level course at Rhodes. The student uses terms and constructions correctly but may not know precise definitions.

Applied Projects

- Grade 4: The project can be described in one of the following ways:
  - An in depth study of a method of calculation that can be applied in multiple contexts. The number of contexts should represent the extent of the current use of the method. The method should be at a level judged by faculty to be above that of methods given in senior level courses at Rhodes and the student should demonstrate mastery of the method within the multiple contexts discussed.
  - A study of multiple, complimentary methods in which the efficacy and efficiency of the methods is compared. The number of methods should represent the extent of subject area. Most of the methods should be at a level judged by faculty to be at or above that of methods given in senior level courses at Rhodes, and must be new to the student.
  - A solution of a non-mathematical problem using the processes of mathematical modeling. Execution of the cycle should demonstrate mastery of the modeling process and deep understanding of the phenomena being modeled. This would involve:
    - using established theory to write a mathematical description of the connection between known and unknown quantities.
    - using mathematical methods to gain information about the unknown quantities.
    - validating the derived knowledge against experimental evidence.
    - modifying the model repeatedly until predicted values are within pre-established error bounds or reassessing those bounds if it appears to be impossible to attain them.
    - using information from the model to better understand the underlying phenomenon.
- Grade 3: Project can be described in one of the following ways:
  - An in depth study of a method of calculation that can be applied in multiple contexts. The number of contexts should largely represent the extent of the current use of the method. The method should be at a level judged by faculty to be above that of methods given in senior level courses at Rhodes and the student should demonstrate mastery of the method within most of the contexts discussed.
  - A study of multiple, complimentary methods in which the efficacy and efficiency of the methods is compared. The number of methods should largely represent the extent of the subject area. Several of the methods should be at a level judged by faculty to be at or above that of methods given in senior level courses at Rhodes, and must be new to the student.
  - A solution, or attempted solution, of a non-mathematical problem using the processes of mathematical modeling. Execution of the cycle should demonstrate near mastery of the modeling process and a good understanding of the phenomena being modeled. This would involve:
    - using established theory to write a mathematical description of the connection between known and unknown quantities.
    - using mathematical methods to gain information about the unknown quantities
    - validating the derived knowledge against experimental evidence.
    - modifying the model repeatedly until predicted values are within pre-established error bounds or reassessing those bounds if it appears to be impossible to attain them.
    - using information from the model to better understand the underlying phenomenon.
- Grade 2: Project can be described in one of the following ways:
  - An in depth study of a method of calculation that can be applied in more than one context. The method should be at a level judged by faculty to be at or above that of methods given in senior level courses at Rhodes and the student should demonstrate mastery of the method within one of the contexts discussed.

- A study of multiple, complimentary methods in which the efficacy and/or efficiency of the methods is compared. The number of methods should be a sample of the ones in current use in the subject area. The methods should be at a level judged by faculty to be at, or above, that of methods given in senior or junior level courses at Rhodes, and must be new to the student.
- A solution, or attempted solution, of a non-mathematical problem using the processes of mathematical modeling. This modeling cycle should be execution of the cycle should demonstrate competency of the modeling process and an understanding of the phenomena being modeled. This would involve:
  - using established theory to write a mathematical description of the connection between known and unknown quantities.
  - using mathematical methods to gain information about the unknown quantities.
  - validating the derived knowledge against experimental evidence.
  - the model should be appropriately modified until predicted values are within pre-established error bounds or reassessing those bounds if it appears to be too hard to attain them.
  - using information from the model to better understand the underlying phenomenon.

- Grade 1: Project can be described in one of the following ways:
  - An in depth study of a method of calculation that can be applied in at least one context. The method should be at a level judged by faculty to be at or above that of methods given in senior or junior level courses at Rhodes and the student should demonstrate competency of the method within the context discussed.
  - A study of at least two complimentary methods in which the efficacy and/or efficiency of the methods is compared. The methods should be at a level judged by faculty to be at, or above, that of methods given in senior or junior level courses at Rhodes, and must be new to the student.
  - An attempted solution, of a non-mathematical problem using the processes of mathematical modeling. Execution of the cycle should demonstrate some facility with the modeling process and a partial understanding of the phenomena being modeled. This would involve a partial completion of:
    - using established theory to write a mathematical description of the connection between known and unknown quantities.
    - using mathematical methods to gain information about the unknown quantities.
    - validating the derived knowledge against experimental evidence.
    - using information from the model to better understand the underlying phenomenon.

Interdisciplinary Projects

- Grade 4: The mathematical content of the project should contribute to the study in at least two of the following ways:
  - Significantly clarifies an existing description of phenomena
  - Gives a new and beneficial description of phenomena
  - Generates new and beneficial knowledge about a quantity or quantities
  - Significantly simplifies existing methods of calculating a quantity or quantities
  - Introduces new methods of calculation to the discipline
  - Improves the efficiency of an experiment or experiment.
- Grade 3: The mathematical content of the project should contribute to the study in at least one of the following ways:
  - Significantly clarifies an existing description of phenomena
  - Gives a new and beneficial description of phenomena
  - Generates new and beneficial knowledge about a quantity or quantities
  - Significantly simplifies existing methods of calculating a quantity or quantities
  - Introduces new methods of calculation to the discipline
  - Improves the efficiency of an experiment or experiment.
- Grade 2: The mathematical content of the project should contribute to the study in at least one of the following ways:
  - Clarifies an existing description of phenomena
  - Gives a beneficial description of phenomena
  - Generates beneficial knowledge about a quantity or quantities
  - Simplifies existing methods of calculating a quantity or quantities
- Grade 1: The mathematical content of the project should generate knowledge about a quantity or quantities.

Independence Scores

Motivation and autonomy are two different expressions of independence. The score for independence is the maximum of the scores for motivation and autonomy, which are computed as described below.

Motivation

This will include aspects of personal growth and of ownership of the project's objectives.

- Grade 4: The student must form a personal connection with the project that creates a meaningful change in the student's life, learning or career path. Examples may include:
  - The student completely formulates the question of investigation.
  - The topic of investigation has a direct connection to the students life outside of the college. For example: suppose the student has a family member with an illness and the student designs and implements a project that uses statistics to determine the effectiveness of types of treatments on that illness.
  - The investigation leads to further study outside of the college. For example, the project is related to an internship or REU.
  - The investigation helps to shape a career or post-graduate path for the student.
  - The material is presented at conferences or in publications.
  - Volunteering to do more work, collect more data, attend more conferences etc. that goes beyond the requirements of the project.
  - A substantial improvement in the quality and understanding of the project and/or mathematics in general as the project progresses.
- Grade 3: The student must form some connection with the project. Examples may include:
  - The student contributes to the formulation of the question of investigation.
  - The topic of investigation has some connection to the student's life outside of the college.
  - The investigation leads to a related study outside of the college. For example, the project has some ties to an internship or REU.
  - The investigation helps to shape a career or post-graduate path for the student.
- Grade 2: The student must make enough of a connection to complete the project.
- Grade 1: The student makes a sufficient connection to submit a partially complete project.

Autonomy

- Grade 4: the student repeatedly takes significant actions beyond those suggested and directly supervised by his or her senior seminar mentor. Examples may include:
  - Formulating problems to study in senior seminar, perhaps through:
    - Specialization of known problems.
    - Improvements to, generalizations of, or other modifications to known results.
    - New approaches to known results.
    - Construction of meaningful examples or counterexamples.
  - Finding ways to solve these problems.
  - Finding resources relevant to the formulation or solution of these problems.
  - Acquiring knowledge of mathematics or of other disciplines from these resources.
  - Generating, gathering, or analyzing data.
  - Constructing, analyzing, or refining models.
  - Finding, learning to use, and using relevant software, including programs like GAP, Mathematica, Maple, LaTeX, R, or SPSS.
  - Creating forms of artistic expression using mathematical techniques.
  - Synthesizing historical understanding of the questions under study.
  - Writing computer programs.
  - Finding appropriate venues to attend or in which to publish or present results.
  - Submitting materials for acceptance to those venues.
  - Creating documents, posters, or slides for inclusion in those venues.
  - Attending or presenting materials in those venues.
  - Exploring future professional options, including graduate school and employment.
- Grade 3: The student repeatedly takes some action beyond those suggested and directly supervised by his or her senior seminar mentor. Examples may include:
  - Independently finding ways to solve part of the question of investigation.
  - Finding resources relevant to the formulation or solution of these problems.
  - Acquiring knowledge of mathematics or of other disciplines from these resources.
  - Generating, gathering, or analyzing data.
  - Constructing, analyzing, or refining models.
  - Finding, learning to use, and using relevant software, including programs like GAP, Mathematica, Maple, LaTeX, R, or SPSS.
  - Creating forms of artistic expression using mathematical techniques.
  - Synthesizing historical understanding of the questions under study.
  - Writing computer programs.
- Grade 2: The student takes little action beyond those suggested and directly supervised by his or her senior seminar mentor. What must be completed is the following:
  - Outside reading on the question of investigation.
  - Final paper.
- Grade 1: The student submits a final paper, and this contains some, but not all, of the tasks suggested by the students advisor.

Participation Scores

Students are required to participate in the broader mathematical community by attending lectures, attending conferences, and communicating their work. This participation will be measured using a point system. In each of the three semesters of their Junior and Senior Seminar, students are required to earn both the minimum number of points in each category and the total number of points combined from all categories.

Certain activities, such as participating in the Putnam Exam or the Mathematical Modeling Competition, may be given points at the discretion of the instructor. Activities that occur before or after a given term may earn points in that term with the approval of the instructor. The point values and requirements for a maximum Participation grade are listed in the following table.

Grade 4	Junior Spring	Senior Fall	Senior Spring
Attending a mathematical talk and writing a summary (1 point)	4	6	6
Presenting research to the seminar students and department faculty (2 or 4 points at the discretion of the instructor)	2	4	4
Attending a mathematical conference and writing a summary (2 points)			2
Presenting at a mathematical conference, including HRS and URCAS (3 points)			6
Submitting a mathematical paper for publication (2 points)			
Having a mathematical paper accepted for publication (3 points)			
Total points required each semester:	8	12	21

For instance, during the Junior spring semester, a student needs to attend 4 lectures and present their work once in the seminar. This earns them 6 points, and they need to earn an additional 2 points in any of the other categories. Students can, however, "double-dip" by presenting at a conference and counting both their presentation and attendance for points. Two notable exceptions are that (A) students may not consider *attendance* at URCAS for points, and (B) students who attend a mathematical conference may write a summary of at most ONE lecture at that conference.

Point requirements for lower grades are given in the following tables. Note that these requirements do not describe all possible cases. When considering these cases, the instructor will take the student's attendance in senior seminar and other circumstances into consideration.

Grade 3	Junior Spring	Senior Fall	Senior Spring
Attending a mathematical talk and writing a summary (1 point)	4	6	6
Presenting research to the seminar students and department faculty (2 or 4 points at the discretion of the instructor)	2	4	4
Attending a mathematical conference and writing a summary (2 points)			2
Presenting at a mathematical conference, including HRS and URCAS (3 points)			5
Submitting a mathematical paper for publication (2 points)			
Having a mathematical paper accepted for publication (3 points)			
Total points required each semester:	7	10	19

Grade 2	Junior Spring	Senior Fall	Senior Spring
Attending a mathematical talk and writing a summary (1 point)	2	4	4
Presenting research to the seminar students and department faculty (2 or 4 points at the discretion of the instructor)	2	2	2
Attending a mathematical conference and writing a summary (2 points)			2
Presenting at a mathematical conference, including HRS and URCAS (3 points)			3
Submitting a mathematical paper for publication (2 points)			
Having a mathematical paper accepted for publication (3 points)			
Total points required each semester:	5	8	15

Grade 1	Junior Spring	Senior Fall	Senior Spring
Attending a mathematical talk and writing a summary (1 point)	1	2	2
Presenting research to the seminar students and department faculty (2 or 4 points at the discretion of the instructor)	2	2	2
Attending a mathematical conference and writing a summary (2 points)			2
Presenting at a mathematical conference, including HRS and URCAS (3 points)			3
Submitting a mathematical paper for publication (2 points)			
Having a mathematical paper accepted for publication (3 points)			
Total points required each semester:	3	6	8

Communication Scores

Junior Seminar, Senior Seminar Fall, and Senior Seminar Spring will each require students to give a number of oral presentations and to submit a written report (for Junior Seminar this will be a project proposal, for Fall Senior Seminar this will be a progress report and for Spring Senior Seminar this will be final project report). All oral presentations will be graded using the rubric for oral communication given below. All written work will be graded with the attached rubric for written communication.

Junior and Senior Seminar Oral Presentation Evaluation Form
Department of Mathematics and Computer Science
2012– 2013

Evaluator:________________________Student under evaluation:___________________________
Date:___________________Start time:_____________________End time:____________________

Content:

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
4.0	3.7	3.3	3.0	2.7	2.3	2.0	1.7	1.3	1.0	.7	0

- Explains why topic is worthy of study
- New material presented
- Material presented is correct
- Appropriate level
- Sufficient detail
- Questions welcomed and answered correctly and concisely
- References and collaborators cited

Organization:

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
4.0	3.7	3.3	3.0	2.7	2.3	2.0	1.7	1.3	1.0	.7	0

- Clear purpose
- Title and abstract provided in advance
- Clear structure
- Emphasis on key ideas
- Strong transitions
- Begins and ends on time

Presentation:

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
4.0	3.7	3.3	3.0	2.7	2.3	2.0	1.7	1.3	1.0	.7	0

- Audible
- Legible
- Comfortable pace
- Verbally, physically, and visually engaging and appealing
- Relevant use of visual aids

Scheduled and gave practice talk: ____

Average:____

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
4.0	3.7	3.3	3.0	2.7	2.3	2.0	1.7	1.3	1.0	.7	0

Comments (continue on reverse if needed):

Junior and Senior Seminar Written Presentation Evaluation Form
Department of Mathematics and Computer Science
2012– 2013

Student under evaluation:___________________________ Date:__________________

Content:

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
4.0	3.7	3.3	3.0	2.7	2.3	2.0	1.7	1.3	1.0	.7	0

- Informative title
- Concise and accurate abstract
- Introduction includes background, motivation, and purpose
- Material presented is correct
- Appropriate level
- Sufficient detail
- Relevant use of graphs and tables
- Results appropriately summarized
- Gives directions for future research
- References and collaborators cited

Organization:

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
4.0	3.7	3.3	3.0	2.7	2.3	2.0	1.7	1.3	1.0	.7	0

- Clear purpose
- Emphasis on key ideas
- Strong transitions
- Appropriate use of appendices
- Appropriate length

Presentation:

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
4.0	3.7	3.3	3.0	2.7	2.3	2.0	1.7	1.3	1.0	.7	0

- Appropriate written voice and tone
- Correct grammar, syntax, and punctuation
- Proper incorporation of graphs and tables within text
- Mathematics properly incorporated into written text
- Visually appealing layout and spacing
- Reference style is clear and consistent
- Appropriate font and symbol choices

Average:____

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
4.0	3.7	3.3	3.0	2.7	2.3	2.0	1.7	1.3	1.0	.7	0

Comments (continue on reverse if needed)