

## Nanoscience and Microsystems Oral Qualifying Exam Procedure

(Adopted Fall Semester 2012)

The graduate committee will pick a set of three published journal articles representing the three concentrations in NSMS. The student selects one of these three papers which becomes the basis for the oral exam. The **students will be instructed that they are to work alone without discussing or consulting each other, other students, faculty, post-docs, etc. about the topic.** The purpose of using the same set of papers is to provide a more uniform basis of judging performance than could be done if each student was examined on a different topic. The papers will be chosen to avoid the specific research areas of all students taking the exam but still have appreciable nanoscience and microsystems technical content.

*Students will have two weeks from the date they receive the paper until the date of the oral exam.* Thus, once the paper and oral committees have been set, each student will contact his committee members and arrange a date and time for the exam. Each student will be given the paper exactly two weeks before the scheduled exam date.

### EXAMINATION EXPECTATIONS AND PROCEDURES

Students will be expected to read the paper and research sufficient background and supplementary materials related to the paper to: (1) develop a critique of the paper that demonstrates deep understanding of the content and fundamentals in the paper, and (2) develop a proposal for a research project that builds on the material presented in the paper. The paper critique and the research proposal will be the basis of the oral exam presentation, as described below.

Each student will be asked to prepare a 30 minute presentation for the oral exam. The talk should provide a critique of the paper and a research proposal. This critique should be concise, approximately 15 minutes, and should communicate a basic understanding of what the paper was about, and summarize especially important conclusions, findings, analysis or experimental methods. The presentation should emphasize the novel aspects of the paper, and the significance of the contributions that the paper makes to the field. The student should do a literature review and comment on related work or other approaches.

The research proposal should define a Ph.D. level research project, which might be appropriate for one person over a span of approximately two years, and achievable with available equipment and resources. The proposal should address the classical elements of a research proposal: motivation/need for the work, objectives, approach and methods, anticipated results, and potential significance and impact of the work. The proposal must emphasize the novel aspects of the proposed work, how it differs from what is already published in the literature. A well formulated research plan is needed that includes the variables to be studied, a time line for the research, expected outcomes and milestones. Due to limited presentation time, the approach, methods and anticipated results should probably constitute most of the presentation, with brief descriptions of each of the other elements. Lastly, the student should explain the connection

between the paper content and the research proposal. One set of copies of the overheads used in the presentation should be printed for each of the the examination committee members.

The examination committee will question the student after the critique and after the proposal but will not interrupt the presentation except to seek clarification. Questions could address the details, rationale and thinking behind the proposal, as well as the students understanding of the content and fundamentals of the paper. In addition to a creative and carefully thought-out proposal, it will be expected that the students demonstrate an in-depth understanding of the content of the assigned paper. The proposal must demonstrate novelty and originality and work of sufficient scope to qualify for a PhD.

## NSMS STUDENT

### Qualifying Exam Check List

v	Description
	Set a day and time with all committee members.
	Reserve a room for your qualifying exam. (2 hour block)
	Email Heather ( <a href="mailto:heathera@unm.edu">heathera@unm.edu</a> ) 2 weeks before your exam to request papers.
	Send paper you selected to all committee members.
	Reserve (if needed) a projector for your qualifying exam.
	Borrow laser pointer & have extra batteries.
	Create handouts (3 slides per page) of your PPT presentation for each committee member.
	Print out a copy of the qualifying exam reports for each committee member.

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

Advisor Name: \_\_\_\_\_

**REPORT OF – (Student Name)**

**NSMS PhD Qualifying Examination Report**

*(This page should be filled out by the student prior to the exam and one copy given to each committee member)*

Chair of Evaluation Committee \_\_\_\_\_

Date of Qualifying Exam \_\_\_\_\_

Qualifying Exam Presentation Title

\_\_\_\_\_  
\_\_\_\_\_

Committee Members Name	Departments

After evaluating the oral qualifying exam, each committee member should fill out the response sheets provided. For each attribute which a committee member feels is somewhat or very deficient, a short explanation should be provided. Committee members may be asked to defend their grading to the qualifying exam committee. Completed forms are to be treated as confidential and are to be turned in to the Chair of the NSMS program, or to the NSMS program coordinator.

A summary of written comments from committee members as well as any edited copies of the oral qualifying exam reports submitted by committee members will be provided to the student by program coordinator (Heather). The student is encouraged to schedule a meeting with the chair as well as the rest of the committee members, after receiving the exam reports, to get additional feedback and further suggestions.

All evaluation documents including rubrics and written comments must be completed by all committee members.

A copy of the completed forms (both rubrics and written comments) must be delivered to the NSMS Program Office immediately following the qualifying exam.

FACULTY NAME:		Student Performance (Part A – Communication Skills)			
Category	Unacceptable (0)	Marginal (1)	Good (2)	Excellent (3)	Rating (0 – 3)
<b>Organization &amp; Structure</b>	No clear organization.	Some organization is present, but there are several significant gaps in the presentation.	Organized, with a small number of minor gaps.	Presentation is well organized and flows logically from start to finish.	
<b>Oral Presentation</b>	Confused speech, with poor use of technical English. Speaker is difficult to understand or even to hear properly.	Some significant flaws in use of technical English. Speech is somewhat awkward or some minor effort is required to understand the speaker.	Use of technical English is good, with only a few minor flaws. Speech is audible and understandable.	Masterful use of technical English. Speech is clear and easily understood.	
<b>Discussion</b>	No discussion generated. Speaker evades answering any questions that were asked.	Speaker has clear difficulties in handling most questions.	Speaker is able to address most questions with confidence.	Speaker is able to answer all questions clearly, effectively, and with confidence.	
<b>Visual Effectiveness</b>	Visual aids are illegible or not understandable without substantial effort. Visual aids make no contribution to the overall effectiveness of the presentation.	A minority of visual aids are clear and well described. Most visuals do not contribute to the effectiveness of the presentation.	Most visual aids clear and well described. Most contribute to the overall effectiveness of the presentation.	All visual aids are very clearly readable, and explained thoroughly. All visuals contribute to the overall effectiveness of the presentation.	
				<b>Total</b>	
				<b>Score (Maximum 12)</b>	

FACULTY NAME: _____					
Student Performance (Part B -Critical Analysis of Paper and Student's Research Proposal)					
Category	Unacceptable (0)	Marginal (1)	Good (2)	Excellent (3)	Rating (0 - 3)
<b>Critical Analysis of Research Paper</b>	Insufficient depth. Inappropriate technical level. Missed the big picture – impact and significance of the paper	Technical content was too low for a Ph.D. level.	Most topics sufficiently described, but not enough emphasis on the most important points. Technical level is appropriate.	Demonstrates excellent understanding of the paper with emphasis placed on the most significant areas, at a high technical level.	
<b>Understanding of NSMS core concepts</b>	Inadequate knowledge of the basic underlying principles of science and engineering	Student has significant gaps in their basic knowledge of core technical subjects	Student is deficient in some areas	Excellent mastery over fundamentals	
<b>Novelty &amp; Originality</b>	Proposed research lacks novelty and originality. Research is a simple continuation of previous work.	Proposed research has some novel aspects, but these are poorly developed.	Research breaks new ground, demonstrates a clear understanding of the needs and goals.	Proposes original work that is well thought out and justified. The research problem is clearly stated..	
<b>Technical Feasibility of proposed research</b>	Research isn't feasible.	Not much thought given to how the research can be accomplished.	The necessary equipment or theoretical framework is well defined, but with some gaps.	The proposed research is both feasible and novel and the tools – experimental and theoretical are available.	
<b>Research Plan</b>	No appreciation for the timeline, how long it would take to do the research.	A reasonable timeline is presented, but the resources available (time and equipment) do not match what is needed. No research plan is included that provides details on how the research will be done.	A good deal of thought has been devoted to the conduct of the research, an experimental plan is proposed.	A well defined research plan, with clear milestones and deliverables. The work can definitely be accomplished within 2 years.	
<b>Total</b>					
<b>Score = total out of 15</b>					

FACULTY NAME: \_\_\_\_\_

**Part A Communication Skills**

- 0-6. Based on the presentation and discussion, this student is **not prepared** for articulating and presenting scientific work at the PhD level.
- 7-10. This student is **satisfactorily prepared** for scientific communication.
- 10-12. This student is **well prepared** to articulate and defend a research program at the PhD level.

**Part B Technical Competence & Creativity**

- 0-7. This student is **not prepared** for successfully completing original work at the PhD level.
- 8-10. This student is **minimally prepared** for successfully completing work at the next level. A student at this level may struggle with the tasks necessary for successfully completing the work independently. For example, this student may have a hard time conducting a thorough literature review or writing about the literature in a way that integrates findings and ideas from the review. As additional examples, a student at this level may have a difficult time stating research questions, identifying an appropriate research design, analyzing data, or interpreting the results without serious assistance from an advisor.
- 11-12. This student is **satisfactorily prepared** for successfully completing work at the next level. A student at this level will have little difficulty producing quality work at the next level. However, some areas of improvement are recommended. For example, a student at this level may need to state their ideas more clearly, discuss results more concisely, or review fundamental concepts.
- 13-15. This student is **well prepared** for successfully completing work at the next level. This student can produce high quality work at the next level with little or no supervision or input from others.

Committee member comments:

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