

**DIVISION OF METEOROLOGY AND PHYSICAL OCEANOGRAPHY (MPO)**

**ROSENSTIEL SCHOOL OF MARINE AND ATMOSPHERIC SCIENCE**

**GRADUATE STUDENT GUIDE, 2008-2009**

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## **A. INTRODUCTION**

This Guide outlines the specific procedures and requirements for students in the Division of Meteorology and Physical Oceanography. This Guide serves as a supplement to the RSMAS Graduate Student Handbook (hereafter referred to as RSMAS Handbook), the RSMAS Bulletin, and the Graduate School Bulletin. Students should be aware of all the requirements and procedures in these documents. Students should take full responsibility to follow the procedures and meet the requirements in order to complete their degrees in due time. Any uncertainties regarding the procedures and requirements should be clarified with the MPO Academic Committee Chair and the RSMAS Graduate Studies Office.

All progress should be recorded in the students' files.

## **B. OUTLINE OF GRADUATION REQUIREMENTS**

Graduation requirements may change slightly from year to year. The applicable requirements for a given student will be those in effect during that academic year when he/ she first registered as a full-time graduate student in the Division. More detailed descriptions of the graduate requirements are given in Sections C - M of this Guide.

### *B.1. Master of Science*

RSMAS Handbook pages 5-9.

MPO requirements:

Seminar: Attending the MPO seminar series every semester and giving at least one 15-minute presentation each year after the Comprehensive Examination

- (a) Comprehensive Examination: A grade of PASS or HIGH PASS
- (b) Annual Progress Report

### *B.2. Doctor of Philosophy*

RSMAS Handbook pages 5-9.

MPO requirements:

Seminar: Attending the MPO seminar series every semester and giving at least one 15-minute presentation each year after the Comprehensive Examination and a one-hour presentation at least 6 months before dissertation defense.

- (a) Field and Laboratory Work: Participating no fewer than 5 days or 40 hours in field or laboratory work.
- (b) Entrance into Ph.D. Program: Three options: (i) a grade of HIGH PASS earned from the Comprehensive Examinations, (ii) recommended by the thesis committee after passing the M.S. thesis defense, or (iii) an M.S. bypass

(c) Annual Progress Report

*B.3. Master of Arts*

RSMAS Handbook pages 9-10.

MPO requirements

Seminar: Attending the MPO seminar series every semester (Section L.1)

(a) Comprehensive Examination: A grade of PASS

(b) Annual Progress Report (section L.3).

### C. TIMETABLE

The timetable shown below gives the recommended schedule to be followed by MPO students. (M.A. students are not required to follow the timetable.) Adhering to the schedule is the sole responsibility of the student. If a student fails to meet a required deadline, the student will be placed on RSMAS Academic Probation for one semester. Failure to correct the deficiencies during the probation period will result in either dismissal from the program or a change of degree objective. Deviations from this timetable must be approved in advance on an individual basis by the student's committee and the MPO Academic Committee.

<u>Milestone</u>	<u>Requirement</u>	<u>M.S.</u>	<u>Ph.D</u>
A. (Year 1)	Comp. Exam.	End of 1st year	End of 1st year
B.	Retake Comp. Exam	1st semester after A (Year 2)	N/A
C. Entrance into M.S. program		PASS Comp. Exam. (Year 1 or 2)	N/A
D. Entrance into Ph.D. program		N/A	HIGH PASS Comp. Exam. (Yr 1) Or Successful M.S. Bypass petition (Year 2 or 3) Or Successful M.S. Defense at MPO and committee approval (Year 3)
E.	Committee	Fall 2nd Year	1st semester after D (Year 2-4)
F.	Thesis Proposal	Fall semester of Year 2	N/A
G.	Dissertation Proposal	N/A	<u>Draft</u> : within 8 months from E <u>Final</u> : within 10 months from E (Year 3 – 5)
H.	Qualifying Exam	N/A	One year from E
J.	Retake Qualifying Exam	N/A	1st Semester after H
I.	Candidacy	Following F	Following H
J.	Defense	One year from F (Year 3)	Two years from G (Year 5 – 7)

### D. CREDIT REQUIREMENTS

Descriptions of all RSMAS courses are given in the RSMAS Bulletin. All MPO courses are listed and described in Appendix of this Guide. In order to gain a broader exposure to oceanic and atmospheric sciences, all students are encouraged to enroll in courses from

other divisions of RSMAS.

All courses taken by students should be approved by their advisors. Students are recommended to consult with their advisors and the MPO Academic Committee Chair regarding their choices of courses.

Deviations from the requirements must be approved by students' advisors and the MPO Academic Committee.

All first year students are required to take the following zero credit course:

RSM 600      Research Ethics

*D.1. Master of Science Degree*

See RSMAS Handbook (page 5).

The *required core courses* for all M.S. students of MPO are:

MPO 503	Principles of Physical Oceanography	3 credits
MPO 511	Geophysical Fluid Dynamics I	3 credits
MPO 551	Introduction to Atmospheric Science	3 credits

An additional core course for M.S. students in Meteorology is:

MPO 665	General Circulation of the Atmosphere	3 credits
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and, students in Meteorology are required to take at least one of the following:

MPO 518	Remote Sensing of the Atmosphere	3 credits
MPO 531	Physical Meteorology	3 credits
MPO 561	Tropical Meteorology	3 credits
MPO 611	Geophysical Fluid Dynamics II	3 credits
MPO 615	Numerical Weather Prediction	3 credits
MPO 623	Statistical Analysis of Geophysical Data	3 credits
MPO 624	Statistical Modeling of Geophysical Fields	3 credits
MPO 631	Air-Sea Interaction	3 credits
MPO 632	Climate Dynamics	3 credits
MPO 633	Marine Atmospheric Boundary Layer	3 credits
MPO 662	Computer Models of Fluid Dynamics	3 credits
MPO 663	Convection and Mesoscale Meteorology	3 credits
MPO 664	Atmospheric and Oceanic Turbulence	3 credits

An additional core course for M.S. students in Physical Oceanography is:

MPO 612	Large-Scale Ocean Circulation	3 credits
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and, students in Physical Oceanography must take at least one of the following:

MPO 521	Estuarine and Coastal Processes	3 credits
MPO 542	Physics of Remote Sensing	3 credits

MPO 611	Geophysical Fluid Dynamics II	3 credits
MPO 621	Waves and Tides	3 credits
MPO 623	Statistical Analysis of Geophysical Data	3 credits
MPO 624	Statistical Modeling of Geophysical Fields	3 credits
MPO 631	Air-Sea Interaction	3 credits
MPO 632	Climate Dynamics	3 credits
MPO 662	Computer Models of Fluid Dynamics	3 credits
MPO 664	Atmospheric and Oceanic Turbulence	3 credits
MPO 650	Coastal Oceanography	3 credits

The remaining 9 course credits can be obtained by taking other graduate courses offered by MPO, RSMAS, or the University.

Material from the required core courses will appear on the Comprehensive Examination for M.S. candidates (along with material from other courses from the first year).

MS candidates in the Division of Meteorology and Physical Oceanography are *not* required to take a class outside of our Division - but they are encouraged to do so.

Students who completed the 30 required credits must register for RES 720 in order to maintain full-time status as a graduate student. No tuition waivers (Section M.1) will be provided for RES 720. It is the students' responsibility to manage their waivers to complete their degrees in due time.

#### *D.2. Doctor of Philosophy*

See RSMAS Handbook (page 1) for RSMAS general requirements. In addition, MPO Ph.D. degree requires a minimum of 36 course credits, of which a minimum of 9 course credits should be taken from 600 level courses. All MPO Ph.D. students are required to take, or have taken an equivalent in another program, the following:

MPO 503	Principles of Physical Oceanography	3 credits
MPO 511	Geophysical Fluid Dynamics I	3 credits
MPO 551	Introduction to Atmospheric Science	3 credits
MPO 611	Geophysical Fluid Dynamics II	3 credits

and *one* of the following:

MPO 612	Large-Scale Ocean Circulation	3 credits
MPO 665	General Circulation of the Atmosphere	3 credits

In addition, all Ph.D. students are required to take at least one 3-credit course given by other divisions at RSMAS, unless they have arrived with an MS degree from another institution.

Material from MPO 503, 511, 551, 611, and either 612 or 665 will appear on the Comprehensive Examination for Ph.D. candidates.

Students may take any other graduate courses offered by MPO, RSMAS, or the University to meet the course credit requirement.

The credit transfer and waiver of required courses should be done during the first year of graduate study at RSMAS with approval from graduate advisors and the MPO Academic Committee Chair.

### *D.3. Master of Arts*

Required courses for all M.A. students of MPO are

MPO 503	Principles of Physical Oceanography	3 credits
MPO 511	Geophysical Fluid Dynamics I	3 credits
MPO 551	Introduction to Atmospheric Science	3 credits

and at least three other 3-credit courses from MPO.

The remaining 6 course credits can be obtained by taking other graduate courses offered by MPO, RSMAS, or the University.

## **E. GRADE REQUIREMENTS**

Any student with a cumulative grade point average falling below 3.0 in any semester will be on probation for one semester. That student must raise their cumulative average to at least 3.0 during that semester. Failure to do so may result in dismissal from the program.

## **F. THESIS/DISSERTATION COMMITTEE**

### *F.1. Faculty Advisor*

All students are admitted with a faculty advisor assigned by the Division Chairman in consultation with the MPO Academic Committee Chair. The function of the advisors is to assist the students in their academic and research affairs at RSMAS before their thesis/dissertation committees are formed. After the thesis/dissertation committee is formed (Section F.3), any committee member can serve as the student's advisor.

### *F.2. Committee Chair*

As soon as the student has settled on an area of research interest, he/she and his/her faculty advisor should determine which member of the faculty is the logical choice to be the Chair of his/her thesis/dissertation committee. The committee Chair is not required to be the student's faculty advisor.

### *F.3. Committee*

The M.S. thesis committee: RSMAS Handbook page 5. The thesis committee should be

formed during the first semester after passing the Comprehensive Examination.

The dissertation committee: RSMAS Handbook page 1

The committee for M.A.: RSMAS Handbook page 9. At least one member must be faculty of MPO (including secondary appointments).

Local members of the committee should meet once every 6 months in order to review the progress of the student.

Changes in the membership of an existing committee must be approved by the committee Chair and the MPO Academic Committee Chair, filed to the student's record at MPO, and relayed to the Graduate Studies Office.

## **G. EXAMINATIONS AND CANDIDACY**

### *G.1. Comprehensive Examination*

All M.S. and Ph.D. students are required to take the Comprehensive Examination. For full-time students, the Comprehensive Examination should be before the end of their first year of graduate studies at RSMAS. This examination will be arranged by the MPO Academic Committee Chair and the examiners will be the instructors (or their assignees) of the first year courses taken by the students.

The purpose of this examination is to evaluate students' understanding of materials in the courses completed up to the time of the examination and their capability of integrating these materials, and to determine whether the students are permitted to proceed to the M.S., M.A. or Ph.D. program.

The Comprehensive Examination will consist of an oral part and a written part. The written part, which lasts no longer than 8 hours, consists of closed-book questions, each from a RSMAS course required in the first year, and those taken as electives in the first year by each individual student. Each student must choose to answer four questions; at least one of the questions from GFD I and II must be answered. The oral part, which lasts no longer than 2 hours for each student, may include questions from all the required RSMAS courses, and the electives.

A student's performance in this examination, together with his/her cumulative grade point average, will determine whether the grade of HIGH PASS, PASS, or FAIL is given by the examining board. The examining board consists of faculty whose questions are answered by the student and any other RSMAS faculty who wish to participate.

HIGH PASS would allow the student to proceed to either the M.S. or Ph.D. program.

PASS would allow the student to proceed to only the M.S. or M.A. program. With a PASS, a student holding an M.S. in a closely related field and seeking a Ph.D. degree may take one of the following choices: (a) enter the M.S. program at RSMAS before proceeding to the Ph.D. program (see Section G.2, including the M.S. bypass option), or

(b) at the discretion of faculty, retake the Comprehensive Examination scheduled no later than the end of the following semester. If the student chooses to retake the examination but does not achieve a HIGH PASS on the second attempt, he/she may still be allowed to enter the M.S. program. A student who does not wish to enter the M.S. program at RSMAS must leave the program.

FAIL would require the student to retake the examination at a time to be determined by the MPO Academic Committee and no later than the end of the following semester. The student may be required to retake the full examination, or, at the discretion of the examining committee, only the oral part. Only PASS or FAIL can be achieved in a re-taken exam. A FAIL on the re-take will require leaving the program.

In the spring of 2006, the faculty voted to allow some students to earn a grade of PASS on the comprehensive exam without taking the oral part of the exam. To be eligible for this option, the student must have a GPA of 3.33 or higher at the time of the exam, and must have strong passing scores on the written part of the exam. Students must also understand that if they choose this option, they cannot change to a Ph.D. track at a later time without first earning an M.S. degree, i.e., an “M.S. bypass” (see G.2.c below) would not be possible. This is an experimental provision and may be withdrawn, by vote of the faculty, at any time.

### *G.2. Entrance into Ph.D. Program*

A student enters the Ph.D. program by meeting one of the following criteria:

- (a) A HIGH PASS on the Comprehensive Examination
- (b) A completion of an M.S. degree at RSMAS and a thesis committee approval of the request from the student to proceed to the Ph.D. program.
- (c) An approval by the MPO Academic Committee of a written petition for a M.S. bypass. The bypass petition must be submitted by the thesis committee of a student in the M.S. Program and based on (a) exceptional research the student has accomplished as evidenced by a presentation of his or her work in an accepted journal publication and (b) the potential of the student's research to lead to a significant Ph.D. dissertation.

After entering into the Ph.D. Program, a student may request to exit the program and enter into the M.S. Program, as long as he/she does not have an M.S. degree from MPO.

### *G.3. Admission to official candidacy for M.A., M.S., or Ph.D.*

The requirements for admission to official candidacy are:

M.A.: RSMAS Handbook page 9

M.S.: RSMAS Handbook page 6

Students should be advised of the following UM rule: *No student may graduate in the same semester as they are admitted to candidacy.* Therefore, we advise all students to proceed with admission to candidacy in the earliest possible semester.

#### *G.4. Ph.D. Qualifying Examination*

(RSMAS Handbook page 2)

The qualifying examination consists of three parts: submission of a dissertation proposal, a written examination, and an oral examination. Scheduling of this exam should be discussed with the dissertation committee and should not be more than two years from the entrance into the Ph.D. program. The purpose of this examination is to determine the student's knowledge of (a) general principles of meteorology and physical oceanography, (b) his/her individual specialty, and (c) peripheral and supporting disciplines. Upon satisfactory completion, the student enters into candidacy for the Ph.D., provided other requirements are met (i.e. course requirements, etc.).

A dissertation proposal, demonstrating the ability to formulate and test hypotheses and to systematically explore a well posted scientific problem, must be completed and reviewed by the dissertation committee at least three weeks before the examination. This proposal is described in section H below. Students are urged to submit a draft of their dissertation proposal to committee members at the earliest possible date, so that revisions or preparatory work recommended by the committee can be incorporated into a final draft that stands a maximum chance of being approved at the time of the oral examination. The dissertation committee, together with any other invited participants, will administer a written examination on the subjects outlined above. The oral examination should be held within one week of the written exam.

The written part will consist of take-home, open-book questions on the student's broad area of dissertation interest (e.g. large-scale ocean-circulation, tropical meteorology, climate, etc.) and are geared toward research topics likely to come up during the dissertation research. Written questions are submitted by the committee members at least one week before the examination and are finalized by the Dissertation Committee Chair. The student will be allotted three days to answer the questions. Emphasis will be on discussion that demonstrates the in-depth knowledge required to conduct dissertation research. The oral part will concentrate on (a) the proposal and its area of interest, (b) written examination answers, and (c) general knowledge of meteorology and/or physical oceanography. It will be assumed that the course materials previously covered by the Comprehensive Examination are known and assimilated. The oral part will last 2 hours.

If a student fails the qualifying examination, he/she may, at the discretion of the committee, be allowed one opportunity to be re-examined in whole or in part, but in this case no later than one semester after the original qualifying examination took place. In all cases, successful completion of the qualifying examination requires passing of both the written and oral parts and gaining written committee approval of the dissertation

proposal. Failure of the examination will result in either the student being placed in the M.S. degree program, or if the student has already received an M.S. degree from MPO, they will be dismissed from the program.

## **H. THESIS/DISSERTATION PROPOSAL**

The proposal should contain the following information:

- (a) Tentative title.
- (b) Statement of the problem and objectives of the proposed study.
- (c) Method of investigating the problem, including any equipment, facilities, data and models required.

A thesis/dissertation proposal should be prepared by student under the supervision of their committee Chair. Students are expected to discuss the proposed research with committee members during the developmental stages of the proposal.

A cover sheet (available in the Graduate Studies Office) must be signed by the committee members. A copy of the proposal and the cover sheet should be submitted to the Graduate Studies Office and filed to the student's record at MPO after approved by the committee.

### *H.1. Thesis proposal*

(RSMAS Handbook page 6)

M.S. students should submit their thesis proposal to be approved by members of their thesis committees during the first Spring semester following their Comprehensive Examination. A meeting among the students and their local committees to discuss the proposal is recommended.

### *H.2. Dissertation Proposal*

(RSMAS Handbook page 3)

Ph.D. students should submit their dissertation proposal to be approved by members of their dissertation committees at least three weeks prior to the Qualifying Examination. The proposal should be approved upon successful completion of the Qualifying Examination.

## **I. DEFENSE**

### **I.1. Thesis defense**

*(RSMAS Handbook page 7)*

Upon the request from the student, the thesis committee will determine whether the student is recommended for continuing to proceed to the Ph.D. program.

### *I.2. Dissertation Defense*

(RSMAS Handbook page 3)

At least two weeks prior to the Ph.D. dissertation defense, one copy of the dissertation should be given to the Division Secretary for public access.

## **J. THESIS/DISSERTATION SUBMISSION**

### *J.1. Thesis Submission*

(RSMAS Handbook page 7)

### *J.2. Dissertation Submission*

(RSMAS Handbook page 3)

## **K. GRADUATION**

(RSMAS Handbook page 17)

## **L. OTHER REQUIREMENTS**

### *L.1. Seminar*

All MPO students are required to attend the MPO seminar series every Fall and Spring semester. All students are required to give at least one 15-minute presentation on their research each year. All Ph.D. students are required to give a one-hour seminar on their research at least 6 months before their dissertation defense.

After the seminar, the student speakers will discuss with their advisors and local committee members their presentation skills and research progress.

### *L.2. Field and Laboratory Work*

All MPO Ph.D. students are required to participate in either field or laboratory work for at least 40 hours before they complete their degrees. The details of the field or laboratory work are determined by students and their advisors. A report summary of the work shall be submitted by students to their advisors.

### *L.3. Annual Progress Report*

The Annual Progress Report is due October 31 every year for all MPO students, except

for those in their first year. The reports should be completed by students and their advisors. The purpose of the Annual Progress Report is to document the students' progress and identify any existing and potential problems. Any delay of the report (e.g., due to travel of students and/or advisors) must be approved by the MPO Academic Committee Chair.

## **M. OTHER IMPORTANT INFORMATION**

### *M.1. Tuition Waivers*

Students who are supported through university teaching assistantships or divisional research assistantships normally receive tuition scholarships which cover the full cost of tuition necessary to complete the M.S. or Ph.D. course requirements. These tuition scholarships are distributed annually to each eligible student in the form of tuition waivers (i.e., 1 tuition waiver = 1 credit of tuition), on a schedule which conforms to the typical course load carried by students through the completion of their degrees. Students in the M.S. program receive a maximum of 30 waivers; students in the Ph.D. program receive a maximum of 36 waivers (if entering with a previous M.S. or equivalent degree), or a maximum of 60 waivers (if entering without a previous M.S. degree).

### *M.2. Financial Aid*

Students enrolled in MPO may receive financial support, through competitive scholarships, fellowships, or assistantships, which cover all or part of tuition and living expenses. Fellowship and scholarship programs available through the university are described in the RSMAS Handbook. The most common form of support for graduate students is the research assistantship, in which students actively engage in scientific research under the direction of a faculty member, usually the student's advisor or committee Chair. Funds for these assistantships are obtained through externally funded research grants to the university and are awarded to students on a competitive basis at the time of application.

Competitive scholarships and fellowships are also available from several state and federally-sponsored programs, and some of these scholarships include stipends for living expenses that are more favorable than those normally supplied by university-sponsored programs. Many of these independent scholarships can be applied for before entering the university, during the initial application stage. Some are limited to students who have completed one year or less of graduate study. Students are advised to take full advantage of these special state and federal opportunities; questions concerning procedures, application materials, and deadlines for these programs should be directed to the MPO Academic Committee and/or the Graduate Studies Office.

Ph.D. students are encouraged to take one semester of teaching assistantship, which is available through RSMAS or the Marine and Atmospheric Science Program of the University.

## N. APPENDIX - MPO COURSES

<u>COURSE</u>	<u>TITLE</u>	<u>CREDITS</u>	<u>SEM</u>
MPO 503	Principles of Physical Oceanography	3	fall*
MPO 511	Geophysical Fluid Dynamics I	3	fall*
MPO 518	Remote Sensing of the Atmosphere	3	
MPO 521	Estuarine and Coastal Processes	3	
MPO 531	Physical Meteorology	3	spring
MPO 542	Physics of Remote Sensing	3	fall*
MPO 551	Introduction to Atmospheric Science	3	fall*
MPO 561	Tropical Meteorology	3	spring#
MPO 611	Geophysical Fluid Dynamics II	3	spring*
MPO 612	Large-Scale Ocean Circulation	3	spring*
MPO 615	Numerical Weather Prediction	3	spring#
MPO 621	Waves and Tides	3	fall*
MPO 623	Statistical Analysis of Geophysical Data	3	spring*
MPO 624	Statistical Modeling of Geophysical Fields	3	spring*
MPO 631	Air-Sea Interaction	3	spring*
MPO 632	Climate Dynamics	3	fall
MPO 633	Marine Atmospheric Boundary Layer	3	spring#
MPO 650	Coastal Oceanography	3	spring
MPO 661	Synoptic-Scale Meteorology	3	
MPO 662	Computer Models of Fluid Dynamics	3	fall*
MPO 663	Convective and Mesoscale Meteorology	3	
MPO 664	Atmospheric and Oceanic Turbulence	3	spring#
MPO 665	General Circulation of the Atmosphere	3	spring*
MPO 671/674	Advanced Studies	1-4	

\* offered every year

# offered once every two years