COLLEGE OF SCIENCE and COLLEGE OF ENGINEERING

University of the Philippines at Diliman

Guidelines for the Ph.D. Program in Materials Science and Engineering

1. Objectives of the Program

The Program leading to the degree of "Doctor of Philosophy in Materials Science and Engineering", or Ph.D. (MSE), aims to provide students with an advanced graduate education that will prepare them for professional careers as high-level materials scientists and engineers in industry, academia, or the public sector. The Ph.D. (MSE) Program is specifically designed to enable students to (a) obtain a broad, integrated, interdisciplinary understanding of the four core elements of MSE – the structure/composition, properties, synthesis/processing, and performance of materials – and their interrelationships; (b) acquire a specialized, thorough knowledge of at least one class of materials (e.g., ceramics, polymers, composites, alloys, semiconductors, etc.); and (c) gain the competence to undertake original and independent research in materials science and engineering.

2. Administration of the Program

The Ph.D. (MSE) Program will be a joint doctoral degree program of the College of Science and the College of Engineering that shall be administered by a joint intercollegiate graduate committee called the Materials Science and Engineering Committee (MSEC) and composed of those regular faculty members of either participating college who possess a doctoral degree and who are qualified to supervise graduate student research in MSE and/or teach graduate courses in MSE. The MSEC members from either participating college shall be officially appointed by their respective deans. The MSEC shall also be jointly chaired by two Co-Chairpersons, one each from the two participating colleges and designated by their respective deans.

The MSEC shall, in general, decide on the admission of students into the Program, their progress through the Program, and their graduation from the Program and, in particular, exercise the same powers and responsibilities as those of the Graduate Committee of an Institute/Department.

3. Admission into the Program

3.1 Admission into the Ph.D. (MSE) Program shall require (a) a BS or M.S degree in science or engineering or their equivalents from a recognized institution of higher learning and (b) a very high degree of intellectual capacity and aptitude for advanced study and research in materials science and engineering;

3.2 Applications for admission into the Program shall be submitted to the Graduate Office of either participating college (depending on whether the applicant has a science or engineering undergraduate background), referred to the MSEC for evaluation and decision, and endorsed by the MSEC to the appropriate dean for official notification of

the decision;

3.3 Each application for admission into the Program must be accomplished on the MSEC's official application form and accompanied by (a) an official transcript of records, (b) two (2) written recommendations from former professors, and (c) the officially prescribed application fee;

3.4 A student admitted into the Program shall be initially registered as a graduate student of either the College of Science or the College of Engineering depending on whether he/she has a science or engineering background, but his/her final college affiliation shall be to the college where his/her dissertation adviser belongs or where most of his/her graduate MSE courses were taken.

4. General Requirements of the Program

Qualification for the Ph.D. (MSE) degree shall require the following:

4.1 Completion of a Program of Study consisting of at least forty-five (45) units of formal graduate courses in MSE in the case of students admitted into the Program without a master's degree in MSE or of at least twenty-four (24) units of formal graduate courses in MSE in the case of students admitted with a master's degree in MSE;

4.2 Maintenance of a Cumulative Weighted Average Grade (CWAG) of 1.75 or better at the end of each academic year until the completion of the Program of Study;

4.3 Passing of the Preliminary Examination based on the core courses of the Ph.D. (MSE) Program;

4.4 Passing of the Candidacy Examination after completion of at least two-thirds (2/3) of the student's Program of Study;

4.5 Completion of at least one (1) unit of graduate seminars in MSE during the student's course work and presentation of a yearly research seminar during the student's dissertation research;

4.6 Completion of a Doctoral Dissertation based on an independent and original research in MSE;

4.7 Successful defense of the Doctoral Dissertation in a public Doctoral Examination;

4.8 Submission of a scientific preprint based on the approved Doctoral Dissertation and endorsed by the Dissertation Committee as an acceptable article for publication in a reputable science or engineering journal; and

4.9 Submission of at least six (6) bound and certified copies of the approved Doctoral Dissertation.

5. The Program Committee and Program of Study

5.1 The Program Committee

Each student admitted into the Ph.D. (MSE) Program shall be assigned a Program Committee composed of three (3) members to be designated by the MSEC from among its members. The Program Committee shall advise, monitor, and evaluate the student until he/she is advanced to Ph.D. Candidacy and is assigned a Dissertation Committee. The names of Program Committee members shall be submitted to the Graduate Office concerned within the first semester of the student's initial year in the Program.

5.2 Placement Examination

A student admitted into the Program may be required by the MSEC to take a Placement Examination for the purpose of assessing his/her academic preparation. A student who does not perform satisfactorily in the Placement Examination or who has a deficient academic preparation may be required to complete (without graduate credits) appropriate undergraduate remedial courses in the College of Science or College of Engineering.

5.3 The Program of Study

Within the first semester of the student's initial year in the Program, a Program of Study shall be designed by the Graduate Committee, in consultation with the student and on the basis of the latter's academic preparation and desired specialization, and submitted to the Graduate Office concerned through the MSEC. Subsequent revisions in the Program of Study must be authorized by the Program Committee and communicated as soon as possible to the Graduate Office concerned through the MSEC

5.4 Semestral Study Load

The normal study load per semester shall be nine (9) to twelve (12) units of formal graduate courses.

6. Course Requirements and Transfer of Credits

6.1 Course Requirements for Students without a Master's Degree in MSE

Students admitted into the Ph.D. (MSE) Program without a master's degree in MSE shall be required to complete at least forty-five (45) units of formal graduate courses in MSE consisting of the following:

A. Core Courses: Twenty-Four (24) units

MSE 201 (Fundamentals of Materials Science and Engineering)	3 units
MSE 211-219 (Combination of Laboratory Modules in MSE)*	6 units
MSE 225 (X-ray Crystallography and Spectrography)	3 units
MSE 231 (Thermodynamics of Materials)	3 units
MSE 233 (Kinetics of Materials)	3 units
MSE 241 (Physics of Solids)	3 units
MSE 251 (Mechanical Properties of Solids)	3 units

*The Laboratory Modules in Materials Science and Engineering consist of :

MSE 211 (Laboratory Module in Transmitted Light Microscopy)	1 unit
MSE 212 (Laboratory Module in Mineragraphy)	1 unit
MSE 213 (Laboratory Module in Crystallography)	1 unit
MSE 214 (Laboratory Module in Vacuum Technologies and Thin Film Deposition)	1 unit
MSE 215 (Laboratory Module in Electronic and Magnetic Measurements)	1 unit
MSE 216 (Laboratory Module in Ceramics Processing & Characterization)	2 units
MSE 217 (Laboratory Module in Scanning Electron Microscopy)	1 unit
MSE 218 (Laboratory Module in Metallography)	1 unit
MSE 219 (Laboratory Module in Thermal Analysis)	1 unit

B. Specialization Courses: Twenty-one (21) units of graduate MSE courses in the student's chosen area of specialization to be chosen from the following:

MSE 243 (Epitaxial Growth)	3 units
MSE 243.1 (Epitaxial Growth Laboratory)	2 units
MSE 245 (Semiconductor Characterization)	3 units
MSE 245.1 (Semiconductor Characterization Laboratory)	3 units
MSE 253 (Heat Treatment of Ferrous and Special Alloys)	3 units
MSE 255 (Metal Casting)	3 units
MSE 265 (Ceramic Materials)	3 units
MSE 266 (Polymer Materials)	3 units
MSE 267 (Surface Science)	3 units
MSE 268 (Degradation of Materials)	3 units
MSE 271 (Physics of Liquid Crystals)	3 units
MSE 271.1 (Applied Liquid Crystals I)	2 units
MSE 271.2 (Applied Liquid Crystals II)	2 units
MSE 275 (Advanced Physics of Solids I)	3 units
MSE 276 (Advanced Physics of Solids II)	3 units
MSE 281 (Dislocation Theory)	3 units
MSE 282 (Composite Materials)	3 units
MSE 283 (Semiconductor Materials and Processes)	3 units
MSE 283.1 (Semiconductor Device Fabrication Lab)	2 units
MSE 285 (Electron Microscopy)	3 units
MSE 286 (Powder Technology)	3 units
MSE 287 (Crystal Growth)	3 units
MSE 287.1 (Crystal Growth Laboratory)	2 units
MSE 298 (Special Problems)	3 units

Students who have previously taken a course equivalent to any of the core courses will be required to replace it with an appropriate specialization course to satisfy the 45-unit course requirement. Students who have not completed courses in

boundary-value problems and numerical methods will be required to take additional mathematics courses covering these subjects.

6.2 Course Requirements for Students Who Have a Master's Degree in MSE

Students admitted into the Ph.D. (MSE) Program with a previously earned master's degree in MSE shall be required to complete at least twenty-four (24) units of specialization courses in MSE.

6.3 Transfer of Credits from Another University

Subject to the recommendation of the MSEC and the approval of the Dean concerned, graduate courses taken by a student in another university may be credited towards his/her Ph.D. (MSE) course requirements provided that (a) these courses were taken within the last five (5) years prior to his/her admission into the Program, (b) these courses have been validated through appropriate means by the MSEC and (c) the total number of graduate units which may be credited shall not exceed three-eights (3/8) of the total number of units in the student's Ph.D. (MSE) course requirements.

6.4 Transfer of Credits from another Program

Subject to the recommendation of the MSEC and the approval of the Dean concerned, graduate courses taken by the student under another program of the University of the Philippines may be transferred for credit to his/her course requirements for the Ph.D. (MSE) degree provided that (a) these courses were taken within the last five (5) years prior to the student's admission or transfer to the Ph.D. (MSE) Program, and (b) these courses have not been credited to an undergraduate or graduate degree previously obtained by the student.

7. The Grade Requirement of the Program

7.1 Grading System

The following numerical grades shall be used in the graduate MSE courses: 1.0 (Excellent), 1.25, 1.50 (Very Good), 1.75, 2.0 (Good), 2.25, 2.50 (Satisfactory), 2.75, 3.0 (Pass), 4.0 (Conditional), INC (Incomplete) and 5.0 (Fail). In certain special courses, however, the following non-numerical grades may be given: "P" (Pass), of "R" (Repeat); "S" (Satisfactory), or "U" (Unsatisfactory).

7.2 Cumulative Weighted Average Grade

To remain in good standing in the Program, a student must maintain a Cumulative Weighted Average Grade (CWAG) of "1.75" or better in his/her course work until the completion of his/her program of study. The student's CWAG shall be computed at the end of each academic year by his/her Program Committee and reported by the MSEC to the Graduate Office concerned.

7.3 Failure to Satisfy the Grade Requirement

A student who fails to satisfy this grade requirement at the end of the academic year shall be disqualified from the Program unless the MSEC decides, on justifiable grounds and upon the recommendation of the student's Program Committee, to put him/her on probation for a period not exceeding two (2) semesters. Failure to obtain the minimum CWAG after the probation period shall automatically disqualify the student from the Ph.D. (MSE) Program.

8. THE PRELIMINARY EXAMINATION

8.1 Nature of the Preliminary Examination

The Preliminary Examination is a written and/or oral examination that has to be taken by the student within one (1) year after completion of the core courses in the Ph.D. (MSE) Program. This examination is intended to test the student's ability to integrate and apply the overall knowledge that he/she has gained from the core courses. A student who enters the Ph.D. (MSE) Program with a master's degree in MSE may be exempted from the Preliminary Examination by the MSEC.

8.2 Administration of the Preliminary Examination

The Preliminary Examination shall be formulated, scheduled, administered, and graded by the MSEC or a special subcommittee thereof. Results of the Preliminary Examination must be submitted by the MSEC to the Graduate Office concerned within one (1) month after the last day of the examination.

8.3 Rating of the Preliminary Examination

A student's performance in the Preliminary Examination shall be rated either “Pass” or “Fail” on the basis of the standard and guidelines adopted by the MSE. A student who fails the Preliminary Examination shall be allowed to retake the examination within one (1) year after the first examination. Failure of a student in the reexamination shall disqualify him/her from the Ph.D. (MSE) Program.

9. THE CANDIDACY EXAMINATION

9.1 Nature of the Candidacy Examination

The Candidacy Examination is an oral examination that must be taken by the student after passing the Preliminary Examination and completing at least two-thirds (2/3) of his/her Program of Study. In this examination the student is required to give a seminar on an approved research topic in his/her chosen field of specialization in MSE and is examined on his/her: (a) grasp of this chosen field of specialization, (b) mastery of the basic principles and methods of materials science and engineering; and (c) readiness for dissertation research in the chosen field of specialization.

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9.2 Administration of the Candidacy Examination

Upon the formal request of the student and the recommendation of his/her Program Committee, the MSEC shall designate a special examination panel composed of five (5) of its members which shall schedule, conduct, and rate the Candidacy Examination of the student. This oral examination shall last from two (2) to four (4) hours.

9.3 Rating of the Candidacy Examination

The Candidacy Examination shall be rated "Pass" or "Fail" by a simple majority vote of the special examination panel. Its result must be officially reported by the special examination panel to the Graduate Office concerned through the MSEC within the first working day after the examination.

If the student fails the Candidacy Examination, he/she will be allowed to take a second Candidacy Examination within one (1) year after the first examination. Failure in the second Candidacy Examination shall disqualify the student from the Ph.D. (MSE) Program.

9.4 Advancement to Ph.D. Candidacy

A student who passes the Candidacy Examination is advanced to candidacy for the Ph.D. degree.

10. THE DOCTORAL DISSERTATION

10.1 Standards for the Doctoral Dissertation

The major requirement for the Ph.D. (MSE) degree is the satisfactory completion of a doctoral dissertation which must: (1) embody an original, independent,

and significant scientific research by the student; (2) show the student's capacity to make a critical evaluation of previous work done in his/her chosen research topic; and (3) demonstrate his/her ability to present scientific research findings in a clear, systematic, and scholarly manner.

10.2 The Dissertation Committee

After the student advances to the Ph.D. Candidacy, he/she will be assigned a Dissertation Committee composed of the Dissertation Adviser and two (2) Dissertation Readers. In special cases requiring joint advising, the Dissertation Committee may consist of a Dissertation Adviser, a Dissertation Co-Adviser, and a Dissertation Reader.

Either the Adviser or the Co-Adviser, but not both, may belong to an institution outside U.P. Diliman. One (1) of the Dissertation Readers should preferably belong to an institution outside U.P. Diliman.

The members of the Dissertation Committee shall be formally appointed by the Dean concerned upon the recommendation of the MSEC.

The Dissertation Committee shall be responsible for: (1) advising the student in the preparation of the Dissertation Proposal; (2) guiding and monitoring his/her dissertation research; (3) submitting a yearly evaluation report of the progress of his/her dissertation research to the MSEC; and (4) endorsing his/her doctoral dissertation for defense.

10.3 The Dissertation Proposal

Before the dissertation research can be formally started, the student must first prepare a written dissertation proposal with the advice of his/her Dissertation Committee and submit it to the MSEC for approval. Upon approval of his/her dissertation proposal, the student may proceed to carry out his/her dissertation research under the guidance of his/her Dissertation Committee. A certified copy of the approved dissertation proposal must be submitted by the MSEC to the Graduate Office concerned.

11. SEMINAR REQUIREMENTS

11.1 Graduate Seminars

Prior to the Candidacy Examination, each student in the Ph.D. (MSE) Program must complete at least one (1) unit of graduate seminar as an additional requirement on top of the formal course requirements in his/her Program of Study.

11.2 Research Seminars

After the student is advanced to Ph.D. Candidacy, he/she must also give a yearly research seminar on the progress of his/her dissertation research. These yearly research seminars by the candidates for the Ph.D. (MSE) degree shall be organized by

the MSEC in coordination with the Graduate Office of the two colleges.

12. DEFENSE OF THE DOCTORAL DISSERTATION

12.1 The Doctoral Examination Panel

Upon completion of the doctoral dissertation and its endorsement by the Dissertation Committee to the MSEC, the latter shall recommend to the Dean concerned the formal appointment of two (2) Dissertation Examiners.

The two (2) Dissertation Examiners together with the three (3) Dissertation Committee members shall constitute the Doctoral Examination Panel of five (5) members. At least one (1) of the members of the Doctoral Examination Panel should come from an institution outside U.P. Diliman. One of the Dissertation Readers or Dissertation Examiners shall be designated by the Dissertation Adviser to chair the Doctoral Examination Panel.

12.2 Administration of the Doctoral Examination

The Doctoral Examination, in which the student must defend his/her dissertation before the Doctoral Examination Panel, may be held within U.P. Diliman at any mutually convenient time upon the recommendation of the Doctoral Examination Panel, the endorsement of the MSEC, and the formal authorization of the Dean concerned.

The Doctoral Examination may be held only if: (a) the student has already satisfied the seminar requirements; (b) the dissertation manuscript has been received by each member of the Doctoral Examination Panel at least one (1) month beforehand; and (c) at least four (4) members of the Doctoral Examination Panel are present.

The schedule and place of the Doctoral Examination shall be officially announced by the Dean concerned and publicized by the MSEC throughout the College of Science and College of Engineering at least two (2) weeks beforehand. The schedule of the Doctoral Examination may be changed only upon the recommendation of the Doctoral Examination Panel, the endorsement of the MSEC, and the formal authorization of the Dean concerned.

The Doctoral Examination shall be a public oral examination lasting no less than two (2) hours and no longer than five (5) hours. In accordance with the specific examination guidelines of the MSEC, questions may be asked by anybody during the examination, but the evaluation and rating of the student's dissertation defense shall be done by the Doctoral Examination Panel in a closed-door meeting to be held immediately after the Doctoral Examination.

12.3 Rating of the Doctoral Examination

The Doctoral Examination may be given either of the following ratings: “Pass”, if the dissertation defense is deemed acceptable; “Provisional Pass”, if the dissertation defense is deemed acceptable subject to certain minor revisions of the dissertation in form or content, or “Fail”, if the dissertation defense is deemed unacceptable.

Acceptance of the dissertation defense by at least four (4) members of the Doctoral Examination Panel shall merit the “Pass” rating while rejection of the dissertation defense by at least two (2) Panel members shall incur the 'Fail” rating. Any other combination of acceptance, conditional acceptance and/or rejection of the dissertation defense in between these two extremes shall result in a rating of “Provisional Pass”.

The result of the Doctoral Examination must be reported by the Doctoral Examination Panel to the Graduate Office concerned through the MSEC within the first working day after the examination.

12.4 Passing or Failing of the Doctoral Examination

If the student gets a “Pass” rating in the Doctoral Examination, his/her doctoral dissertation is considered approved.

If the student gets a rating of a “Provisional Pass” in the Doctoral Examination he/she must comply with the conditions imposed by the Doctoral Examination Panel within six (6) months after the examination in order to change his/her rating to “Pass”. Compliance with the conditions must be certified by the Doctoral Examination Panel and reported to the MSEC and the Graduate Office concerned before the doctoral dissertation can be officially endorsed for acceptance. Failure to comply with the conditions within the six-month period shall entail conversion of the rating of “Provisional Pass” to a “Fail” rating.

If the student gets a “Fail” rating in the Doctoral Examination, he/she may submit himself/herself to a second Doctoral Examination not earlier than six (6) months but not later than eighteen (18) months after the “Fail” rating is obtained in the first examination. A “Fail” rating in the second Doctoral Examination shall disqualify the student from the Ph.D. (MSE) Program.

13. THE DISSERTATION PRE-PRINT REQUIREMENT

Before the student can qualify for graduation from the Ph.D. (MSE) Program, he/she must first submit to the MSEC and the Graduate Office concerned a scientific preprint which is based partly or entirely on his/her approved dissertation and endorsed by his/her Dissertation Committee as acceptable for publication in a reputable, refereed science and/or

engineering journal.

14. RESIDENCE RULES

14.1 One-Year Residence before Graduation

The student must be officially enrolled in U.P Diliman for at least one (1) academic year prior to the conferment of the Ph.D. degree.

14.2 Maximum Residence Period

The time limit or “maximum residence period” for the completion of all requirements for the Ph.D. (MSE) degree shall be no more than six (6) years for students who enter the Program with a master's degree in MSE and no more than eight (8) years for those who enter the Program without a master's degree in MSE. The counting of the period of residence shall start from the student's first enrollment in a graduate MSE course after admission into the Ph.D. (MSE) Program and shall include all leaves of absence from the program. For graduate students with credits transferred from another university or from another program of the U.P. System, the maximum residence period shall be reduced by one (1) semester for every nine (9) units of transferred credits or a fraction thereof.

14.3 Extension of Residence

In exceptionally meritorious cases, extensions of residence beyond the above maximum residence period may be granted by the Dean concerned upon the recommendation of the MSEC for a period not exceeding one (1) calendar year at a time but in no case totaling more than five (5) years, provided the student is required to complete additional units of graduate courses in MSE during the extension period at a rate of three (3) units for every two (2) years of extension or fraction thereof.

14.4 Non-Compliance with Maximum Residence Rule

A student who fails to complete all the requirements for the Ph.D. (MSE) degree within the maximum residence period and any approved extension thereof shall be disqualified from the Ph.D. (MSE) program.

14.5 Absence without Leave

A student who goes on an absence without leave (AWOL) from the Ph.D. (MSE) program shall be automatically dropped from the Program.

15. GRADUATION FROM THE PROGRAM

15.1 Application for Graduation

After the student passes the Doctoral Examination, he/she is qualified to apply for graduation at the Graduate Office of the college where his/her dissertation adviser belongs or where the majority of his/her MSE courses were taken. The application must be recommended by his/her Dissertation Committee and endorsed by the MSEC.