

**THE Materials Science M.S. STUDENT
HANDBOOK**

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1. INTRODUCTION

Materials Science and Engineering is concerned with the processing, composition, crystallography, microstructure and the physical, chemical, and mechanical properties of metallic, semiconductor, ceramic, photonic, polymeric and composite materials, among others, for uses particularly in advanced applications such as solid state electronics, energy conversion and aerospace.

The USC Materials Science and Engineering Program was established in 1967. It is a graduate program only granting Master of Science, Doctor of Philosophy and Engineer degrees in Materials Science and Master of Science degrees in Materials Engineering and in Manufacturing Engineering.

The program has a fleet of full-time faculty, all of whom have established reputations for themselves in research and in teaching.

2. UNIVERSITY RULES

All M.S. students are subject to both the Viterbi School of Engineering rules and requirements described in the Materials Science M.S. Student Handbook as well as the University of Southern California's catalogue. It is expected that all M.S. students familiarize themselves with these rules and policies and abide by them.

3. DEGREES OFFERED

The University of Southern California offers three graduate degrees in Materials Science:

(i) The Master of Science Degree in Materials Science requiring 27 units of work beyond the Bachelor's Degree. The M.S. degree may be taken either with or without a thesis.

(ii) The Engineer Degree requiring a minimum of 60 units of graduate work beyond the Bachelor's Degree, a Qualifying Examination in Materials Science, and a suitable minor. Very few students choose this option.

(iii) The Ph.D. in Materials Science requiring 60 units of course work beyond the Bachelor's degree, a Screening Examination, a Qualifying Examination, an original investigation (research), a written dissertation, and a final oral dissertation examination. The Ph.D. degree is administered by the Graduate School.

The University of Southern California offers one degree in Materials Engineering, the Master of Science degree in Materials Engineering requiring 27 units beyond the B.S. degree. This degree may be taken either with or without a thesis. Students may work for this degree in Materials Science, Mechanical Engineering or Chemical Engineering in conjunction with the Materials Science Program or they may stay completely within the Materials Science Program.

4. GRADUATE ADMISSION

4.1 General Requirements

a) You should have a B.S. or an M.S. degree in Materials Science, Materials Engineering, Chemistry, Physics, Metallurgy, Mechanical Engineering, Electrical Engineering, Chemical Engineering, Ceramic Engineering, Biochemistry, Biomedical Engineering, Applied Mathematics or Computer Science. That degree must be completed before you begin your graduate studies here.

b) Application to the Viterbi School of Engineering - Materials Science and Engineering Program

Admissions applications should be filed with the [Admissions Office](#). Applications for the fall semester are due by December 15th for fellowship eligibility and January 15th for the general eligibility. For spring admissions, the due date is September 15.

4.2 Limited Students

For those who wish to take some courses but have not yet applied for admission, the following regulations apply:

(i) Limited Graduate Students may apply only 3 courses or a maximum of 12 units towards a degree.

(ii) All Limited Graduate Students must complete the admissions process before registering for additional course work beyond the above limitations.

(iii) International students and other students with international records are not eligible to register as Limited Graduate Students without the approval of the Office of International Admissions.

4.5 Master of Science Degree Students

Prerequisites: A Bachelor of Science Degree or equivalent with acceptable Grade Point Average (GPA) - at least 3.0 out of 4.0; admission to the Viterbi School of Engineering; and acceptable scores on the Quantitative, Verbal and Analytic portions of the Graduate Record Examination. Students not fulfilling these prerequisites may be admitted with conditions and given an opportunity to demonstrate their ability to do creditable work. There must, however, be good reasons to expect acceptable academic achievement at the graduate level.

If approved by the Program Director, a maximum of 4 units of coursework already completed can be counted towards the 27 units that will be required for the Master's Degree. These units must be at the 400 level (senior undergraduate) or above. They should have been taken during the last 7 years and not already counted towards a Bachelor's Degree.

If you are applying for the Master of Science Degree, either in Materials Science or in Materials

Engineering, you must have completed a Bachelor of Science Degree before you can be enrolled. This can be in any field of engineering, as well as in physics or in chemistry. If you have or will have a Master's Degree, it should not be in Materials Science or Materials Engineering.

4.6 Engineer Degree Students

Prerequisites: A Master of Science Degree or the completion of twenty-seven (27) units of acceptable course work; admission to the Viterbi School of Engineering; acceptance to the program by the Department; passing of a screening examination with the same standard as required for the Ph.D. screening examination. Admission and acceptance can be accomplished by an application of admission to the University with a degree objective of Engineer and a major of Materials Science.

4.7 Master of Science Degree in Manufacturing Engineering Students

This degree is administered by the [Department of Industrial and Systems Engineering](#). Prospective students should apply directly to that department:

5. REGISTRATION EACH SEMESTER

Registration procedures and schedules are given by the [Schedule of Classes](#) issued each semester by the [Registrar's Office](#). The [University Catalogue](#) also outlines general procedures and fees.

Most MASC courses do not require D clearances, but please email your academic advisor directly if D clearances are needed. Faculty permission is required for all directed research or courses in which the prerequisite is lacking. A signature can be obtained on the form or via an e-mail request to the professor forwarded to the Student Services Advisor.

6. GRADUATE COURSES

Only courses numbered 400 and above are available for graduate credit at USC and certain 400 level courses are not applicable to advanced degrees. A maximum of one third of the course units (excluding 794 units) may consist of 400 level courses. A student should always check with his graduate advisor in Materials Science prior to registering for a 400 level course in any department other than MASC 471. Courses numbered 500 and above are graduate level courses, but not all graduate courses in all departments are applicable to Materials Science graduate degrees. The following courses are NOT available for graduate credit in Materials Science: (a) any 300 level course or below; (b) any course listed as an undergraduate deficiency when the student was admitted; (c) MATH 400, 403, 407, 409L, 419ab, 423ab, 427ab, 429ab, 445, 449, 450, 454, 455, 456, 475; (d) PHYS 408, 450; (e) MASC 476.

A listing of all courses offered in Materials Science is given [here](#).

7. PROCEDURES TOWARDS DEGREES

7.1 Master of Science Degree in Materials Science

The M.S. Degree is conferred upon the satisfactory completion of 27 units of acceptable graduate work.

(a) Course Requirements for M.S. Degree

(i) Without Thesis:

(a) 27 units of acceptable graduate work; (b) At least 21 units in Materials Science or in approved electives at the 500 level or higher; (c) MASC 501, MASC 503, MASC 504, MASC 505, MASC (EE) 471, MASC 551 and CHE 501; (d) Electives may be selected only from Materials Science, Chemistry, Mathematics, Physics, Geological Sciences, Chemical Engineering, Civil Engineering, Electrical Engineering, or Mechanical Engineering; Electives not from Materials Science must be approved by the Program Director. (e) Not more than three units may be taken of Directed Research (MASC 590).

(ii) With Thesis:

(a) 27 units of acceptable graduate work of which a minimum of 4 units must be thesis (MS 594a, b); (b) at least 18 units in Materials Science, and at least 16 units (excluding thesis) at the 500 level or higher; (c) MASCS 501, MASCS 503, MASC 501, MASC 503, MASC 504, MASC 505, MASC (EE) 471, MASC 551 and CHE 501; (d) Electives may be selected only from Materials Science, Chemistry, Mathematics, Physics, Geological Sciences, Chemical Engineering, Civil Engineering, Electrical Engineering, or Mechanical Engineering; Electives not from Materials Science must be approved by the Program Director. (e) Not less than 4 nor more than 7 units of Directed Research (MASC 590) and Thesis (MASC 594a,b). The minimum thesis requirement is 2 units in MASC 594a and 2 units in MASC 594b.

(b) Grades, Time Limit, Transfers

M.S. degree candidates are required to maintain a 3.0 grade point average on all courses attempted at USC and on all transfer units applied toward the degree. If the grade point average drops below 3.0 a warning letter will be issued. The student must bring up the GPA to 3.0 after taking nine additional units or the student may be terminated from the program. (Transfer units count as credit (CR) and are not computed in the student's USC grade point average.) All work applied toward the M.S. degree must be completed in a period of seven calendar years. A maximum of four units of acceptable graduate course work done at another institution during the last seven years may be transferred for credit toward the degree. The transferable courses are listed in a credit evaluation which is done by the admissions office and is available by the end of the first year after admission. The Program Director then decides which of these courses can be transferred.

(i) When to file for candidacy. The application for admission to candidacy should be filed prior to registration for your last semester of course work. Late filing may preclude processing the application on schedule and jeopardize timely graduation. Earlier filing may require changes in

the approved academic program which may necessitate the use of a petition.

(ii) Procedures. (a) Access the [M.S. degree application form](#); (b) Complete the application to graduate form and have the academic program approved by the Program Director; (c) Return the form to the Student Services Advisor.

(iii) M.S. Degree with Thesis. A student taking an M.S. Degree with thesis must form a guidance committee of three faculty members before starting the thesis research. This committee directs the student in the choice of thesis subject and judges the thesis in a final oral examination. One of the committee members acts as the thesis supervisor. One of the committee members must be from another department.

7.2 Master of Science Degree in Materials Engineering

The Materials Engineering program is designed to give students an opportunity to work in a specialized area without undertaking the core curriculum required for the M.S. and Ph.D. degree in Materials Science.

A total of 27 units is required for the degree, of which at least 18 units must be from 500 or 600 level courses. A maximum of nine units may be from 400 level courses. A GPA of 3.0 (B) must be maintained for all courses taken at USC and for all courses applied towards the degree. A minimum grade of C is required for the course to be applied towards the degree.

The courses selected can be any of the Materials Science courses as well as courses from other departments. A minimum of 18 of the required 27 units should be Materials Science(MASC) or Materials Science cross-listed courses. MASC 476 “Chemical Engineering Materials” cannot be applied toward the degree.

A maximum of nine of the required 27 units may be non-Materials Science units. Approved non-Materials Science courses are listed below. Any course not on the list will require department approval to be applied towards the degree. Department approval may be obtained by sending an e-mail to Professor Goo with the course number and title.

Non-MASC courses that can be applied towards the degree:

AME 503 Advanced Mechanical Design

AME 509 Applied Elasticity

AME 525 Engineering Analysis

AME 526 Engineering Analytical Methods

AME 577 Survey of Energy and Power for a Sustainable Future

AME 578 Modern Alternative Energy Conversion Devices

AME 588 Materials Selection

ASTE 557 Spacecraft Structural Strength and Materials

BME 410 Introduction to Biomaterials and Tissue Engineering

CE 507 Mechanics of Solids I

CE 529ab Finite Element Analysis

CE 546 Structural Mechanics of Composite Materials

CHE 475 Physical Properties of Polymers

CHE 501 Modeling and Analysis of Chemical Engineering Systems

CHEM 463L Chemical Nanotechnology Laboratory

CHEM 630 Fundamentals of Electrochemical Energy Systems

CHEM 632 Introduction to Surface Chemistry and Electrocatalysis

EE 480 Introduction to Nanoscience and Nanotechnology

EE 504L Solid State Processing and Integrated Circuits Laboratory

EE 507 Micro and Nano-Fabrication Technology

EE 508 Nano-Fabrication Lithography

EE 513 Solid State Energy Devices

EE 529 Optics

EE 531 Non-linear Optics

EE 537 Modern Solid-State Devices

EE 540 Introduction to Quantum Electronics

EE 601 Semiconductor Devices

EE 606 Nonequilibrium Processes in Semiconductor

EE 607 Microelectromechanical Systems

EE 612 Science and Practice of Nanotechnology

ENE 505 Energy and the Environment

ISE 515 Engineering Project Management

ISE 525 Design of Experiments

PTE 545 Corrosion Control in Petroleum Production

7.3 Master of Science Degree in Manufacturing Engineering

Materials Science, Mechanical Engineering and Industrial and Systems Engineering jointly offer a curriculum leading to a Master of Science Degree in Manufacturing Engineering. Students may elect to work for this degree in any of these academic Programs. The program should include 27 units of course work beyond the B.S. degree. This program is administered by the Department of Industrial and Systems Engineering and potential students are recommended to discuss the requirements with Professor Goo.

7.4 Engineer Degree in Materials Science

(a) Course Requirements

This degree requires 33 units of course work beyond the M.S. degree with at least 12 units in Materials Science, 9 units in another area of engineering and 9 units outside the School of Engineering. A maximum of six units of directed research (MASC 690) is allowed.

(b) Residency, Grades and Time

At least one semester and twelve units must be taken as a full time graduate student; 6 units beyond the M.S. degree can be transferred for credit towards the Engineer Degree provided they are approved by the Guidance Committee as part of the program. A Grade Point Average of 3.0 must be obtained on all graduate course work applicable to the Engineer Degree and attempted at the University; transfer units count as credit (CR) and are not computed in the GPA. All work applied toward the Engineer Degree must be completed within a period of five calendar years

Continuous Registration

Students admitted to a graduate degree objective are required to be enrolled at USC for fall and spring semesters each year until all degree requirements have been satisfactorily completed, unless a leave of absence has been approved in advance by submitting a LOA form. A formal readmission is required after an unauthorized absence; Please contact your student services advisor for more details.

Leave of Absence

A student who must interrupt studies for compelling reasons may petition for a leave of absence for a stated period, usually not to exceed one year. A leave of absence must be approved in advance by submitting LOA form to the Student Services Advisor.

During the period of leave a student is not entitled to assistance from the faculty or use of university facilities, but the period of leave is not counted in the time allowed for the completion of the degree.

An international student must also obtain clearance from the office for International Students and Scholars.

Readmission

A student who leaves the university without obtaining a formal leave of absence from graduate study or does not return to enrolled status at the end of an approved period of leave IS NOT AUTOMATICALLY READMITTED.

A student wishing to apply for readmission to a graduate degree program should contact the student services advisor directly for instructions on how to petition for readmission. If readmitted, the student will be subject to all of the current requirements for the degree in effect at the time of readmission, as interpreted by the dean. He/She may also be liable for tuition payments for back registrations.