

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Department of Electrical Engineering and Computer Science
Graduate Office, Room 38-444

THE TECHNICAL QUALIFYING EXAMINATION

The first component of the General Examination for the doctorate is the Technical Qualifying Examination (TQE). The purpose of this examination is to assure that students in the doctoral program have the technical background that will enable them to carry out their research effectively. The examination is not intended to rank order students or to eliminate them from the program. This memorandum describes the procedures and schedule that must be followed in the academic year 2006-2007 by new students in the doctoral program.

A student completes the TQE by demonstrating competence in four technical topic areas, each of which is associated with a specific subject offered by the Department. Basic topic areas are associated with undergraduate subjects; advanced topic areas are associated with graduate subjects. Competence in basic topic areas is demonstrated by performance on a written examination given at the end of the spring term. Competence in an advanced topic area is demonstrated by performance in the corresponding graduate subject.

Each student, in consultation with the Graduate Counselor, chooses the four topic areas that will constitute the TQE, subject to a set of constraints that depend on the student's research area. The constraints on selection of topic areas are explicitly listed at the end of this memorandum together with the list of approved topic areas. Students with an unusual educational background may petition for the substitution of an equivalent advanced subject for one of the approved advanced subjects. Please note that some graduate subjects are not offered every year and your plan should take this into account.

Each new graduate student must submit a plan for completing the TQE. Forms are included with this memorandum and are available on line at http://www.eecs.mit.edu/grad/TQE_CSform.pdf or http://www.eecs.mit.edu/grad/TQE_EEform.pdf. Students in Area II should submit a TQE plan using <https://area2.csail.mit.edu/students>. New students who expect to leave after completing an S.M. degree should also use this form to state their intentions. The form must be submitted to the Graduate Office before Registration Day of the spring term.

Each written examination is two hours in length and all written examinations will be taken in a single afternoon on Wednesday, May 30, 2007. Arrangements to take the examinations at another time will be made only in unusual situations. Examinations are graded as Satisfactory, Marginal or Unsatisfactory. Examples of previous examination questions are available in the Graduate Office.

Earning the grade of A+, A or A- in an advanced subject is regarded as satisfactory performance in that topic area. The grade of B+, B, or B- is usually interpreted as marginal performance and a grade of C+ or lower is unsatisfactory. When the student has completed the four topic areas that were specified in the student's plan, the TQE Committee will determine if the overall performance is satisfactory. Satisfactory performance in all four areas or satisfactory performance in three areas and marginal performance in the fourth area constitutes overall satisfactory performance at this stage.

If the overall performance is judged to be unsatisfactory, the student will need to supply further evidence of competence in **all** of the topic areas where performance was marginal or unsatisfactory. This evidence normally takes the form of an oral examination in the following term. Students whose only deficiency was unsatisfactory performance in a single written examination may petition to substitute performance in a related advanced subject for the oral examination.

The oral examination is conducted by a committee of two faculty members and focuses on material from all of the topic areas in which performance was marginal or unsatisfactory. The committee reports its conclusions to the Committee on Graduate Students. If performance on the oral examination is judged to be unsatisfactory, the Committee on Graduate Students will ask the student's Area Chair to consult with the oral examination committee, the student's Graduate Counselor and research supervisor. The Area Chair will advise the student on steps to take before having a second oral examination. If performance in the second oral examination is not satisfactory, the Committee on Graduate Students will normally require that the student leave the doctoral program.

Students who have not satisfactorily completed the TQE by the end of the fourth regular term may continue in the doctoral program only with the explicit approval of the Committee on Graduate Students.

The normal schedule for completing the TQE is summarized below:

Fall term (Sept. 2006):

Prepare plan for TQE.
Take one or more advanced subjects to satisfy TQE.

End of fall term:

Submit TQE plan by end of IAP

Spring term (Feb. 2007):

Take additional advanced subjects. Students should have completed at least one advanced subject by the end of the spring term and most will have completed more. TQE written examinations will be held on Wednesday, May 30, 2007.

Fall term (Sept. 2007):

Students who have completed all four topics and whose overall performance is not satisfactory will take an oral examination or otherwise provide evidence of competence. Students should complete all of their advanced subjects by the end of the fall term.

IAP (Jan. 2008) or spring term (Feb. 2008):

Students who have completed all four topics and whose overall performance is not satisfactory will take an oral examination or otherwise provide evidence of competence.

End of fourth regular term:

Students who have not completed the TQE can continue in the doctoral program only with the explicit permission of the Committee on Graduate Students.

Constraints on selection of topic areas:

Area II (see p. 4 for the detailed list of topic areas):

The topic areas are arranged in three groups: Systems, Theory, and Artificial Intelligence. Each group contains three advanced topic areas. Students in Area II must choose one topic area from each group; the fourth topic area may be in any group. There are no basic topic areas in Area II; students will normally take four graduate subjects to complete the TQE. Some advanced subjects are listed as alternatives and a student may choose only one from the list. For example, 6.840 and 6.875 are alternative ways to satisfy the advanced topic area of complexity and a student may choose only one of these.

An Area II student may change the TQE plan at any time up until Drop Date of the fourth regular term. The change is made by submitting a new form to the Graduate Office.

Areas I, III, IV, V, VII (see p. 6 for the detailed list of topic areas):

Each student must choose two basic topic areas and will be expected to take two written examinations in May 2007. Each student must also choose two advanced topic areas and take the corresponding advanced graduate subjects. Some advanced topic areas are listed as alternatives and a student may choose only one, i.e. a student may not choose both 6.631 and 6.632.

It is expected that a student will complete the plan as submitted. Changes in the choice of basic topic areas after Feb. 9, 2007 and changes in the choice of advanced topic areas after March 9, 2007 require a petition to the Committee on Graduate Students.

**Department of Electrical Engineering and Computer Science
January 2007**

**PLAN FOR COMPLETING THE TECHNICAL QUALIFYING EXAMINATION IN AREA II
(Please use the form available at <https://area2.csail.mit.edu/students>)**

Name _____ MIT ID #: _____

Date submitted _____ e-mail address _____

If you do not intend to continue for the doctorate, please check here, sign and return the form _____

Please check here if this is a new version of a previously submitted plan _____

Circle four subject numbers in the table below. (The names of the subjects are on the reverse side of this form.) You must choose one subject from each group. The fourth subject can be in any group. Do not circle more than one subject in any cell. If you have already received a grade in the subject, enter the grade in the cell. Please enter the term in which you took or will take the subject in the cell (e.g. FT06 is the term starting in September 2006, ST07 is the term starting in February 2007). Prior to Drop Date of Spring Term 2008, changes in your choices may be made by submitting a new version of this form; after that date, a petition to the Committee on Graduate Students is required.

GROUP I: SYSTEMS	6.821	6.824 or 6.829 or 6.830	6.823
GROUP II: THEORY	6.840 or 6.875	6.852	6.854 or 6.856
GROUP III: ARTIFICIAL INTELLIGENCE	6.345 or 6.863 or 6.864 or 6.866 or 6.869	6.825 or 6.867 or 6.437 or 6.438**	6.839*

*6.839 may be chosen as a second subject in Artificial Intelligence but not as the only subject in Group III.

**Offered as 6.972, FT06

THIS FORM IS DUE IN THE GRADUATE OFFICE, 38-444, BY FEBRUARY 9, 2007.

YOUR SIGNATURE: _____

GRADUATE COUNSELOR'S SIGNATURE _____

For Graduate Office use only:

Status: app oral subj _____ TA _____ comp del

Letters: T1, 1a T2 T3 T4 T5, 5a, 5b, 5c, 5d, 5e T6 T7 T8, 8a, 8b

Committee: _____

For students in Area II

GROUP I: SYSTEMS

Programming Languages:	6.821	Programming Languages (FT; not offered 2006-2007)
Systems Software:	6.824	Distributed Computer Systems Engineering (ST)
		or
	6.829	Computer Networks (FT)
		or
	6.830	Database Systems (FT)
Architecture:	6.823	Computer System Architecture (FT)

GROUP II: THEORY

Complexity:	6.840	Theory of Computation (FT)	
		or	
	6.875	Cryptography and Cryptanalysis (FT)	
Algorithms:	6.852	Distributed Algorithms (FT; not offered 2006-2007)	
	6.854	Advanced Algorithms (FT)	
		or	
	6.856	Randomized Algorithms (ST; not offered 2007-2008)	

GROUP III: ARTIFICIAL INTELLIGENCE

Robotics/ Vision	6.345	Automatic Speech Recognition (ST; not offered 2007-2008)
		or
	6.863	Natural Language & Computer Representation of Knowledge (ST)
		or
	6.864	Advanced Natural Language Processing (FT)
		or
	6.866	Machine Vision (FT)
		or
	6.869	Advances in Computer Vision (ST)
Learning/Language	6.825	Techniques in Artificial Intelligence (FT)
		or
	6.867	Machine Learning (FT)
		or
	6.437	Inference and Information (ST)
		or
	6.438	Algorithms for Estimation and Inference (Offered as 6.972, FT06)
Computer Graphics	6.839	Advanced Computer Graphics (ST)*

*6.839 may be chosen as a second subject in Artificial Intelligence but not as the only subject in Group III.

**Department of Electrical Engineering and Computer Science
January 2007**

PLAN FOR COMPLETING THE TECHNICAL QUALIFYING EXAMINATION IN AREAS I, III, IV, V, VII

Name _____ MIT ID #: _____

Date submitted _____ e-mail _____ Area _____

**If you do not intend to continue for the doctorate,
please check here, sign and return the form _____**

Circle two subject numbers in the table of basic topic areas below. (The names of the subjects are on the reverse side of this form.) These subjects will be the basis for the written examinations that you will take on May 30, 2007. The choice of basic topic areas may not be changed after February 9, 2007, except by petition.

6.002	6.003	6.012	6.013	6.041
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Circle two subject numbers from the list of advanced topic areas below. Do not circle more than one subject in any cell. If you have already received a grade in the subject, enter the grade in the cell. Please enter the term in which you took or will take the subject in the cell (e.g. FT06 is the term starting in September 2006, ST07 is the term starting in February 2007). The choices of advanced topic areas may be changed up until March 9, 2007 by submitting a new version of this form; after that date, a petition is required.

6.241 or 6.251	6.262	6.334	6.336	6.341 or 6.555	6.374	6.376 or 6.775
6.437 or 6.438*	6.450	6.521	6.522	6.551	6.561	
6.630	6.631 or 6.632	6.641	6.720	6.728 or 6.730	6.777	6.823

* Offered as 6.972 in FT06

THIS FORM IS DUE IN THE GRADUATE OFFICE, 38-444, BY FEBRUARY 10, 2006.

YOUR SIGNATURE:

GRADUATE COUNSELOR'S SIGNATURE

For Graduate Office use only:

Status: app oral subj _____ TA _____ comp del

Letters: T1, 1a T2 T3 T4 T5, 5a, 5b, 5c, 5d, 5e T6 T7 T8, 8a, 8b

Committee: _____

For students in Areas I, III, IV, V, VII

Basic Topic Areas

6.002	Circuits and Electronics
6.003	Signals and Systems
6.012	Microelectronic Devices and Circuits
6.013	Electromagnetics and Applications
6.041	Probabilistic Systems Analysis

Advanced Topic Areas

6.241*	Dynamic Systems and Control (FT)
6.251*	Introduction to Mathematical Programming (FT)
6.262	Discrete Stochastic Processes (ST)
6.334	Power Electronics (ST)
6.336	Introduction to Numerical Simulation (FT)
6.341**	Discrete-Time Signal Processing (FT)
6.374	Analysis and Design of Digital Integrated Circuits (FT)
6.376****	Low Power Analog VLSI (FT)
6.437***	Inference and Information (ST)
6.438***	Algorithms for Estimation and Inference(Offered as 6.972, FT06)
6.450	Principles of Digital Communication I (FT)
6.521	Quantitative Physiology: Cells and Tissues (FT)
6.522	Quantitative Physiology: Organ Transport Systems (ST)
6.551	Acoustics of Speech and Hearing (FT)
6.555**	Biomedical Signal and Image Processing (ST)
6.561	Fields, Forces, and Flows in Biological Systems (FT)
6.630	Electromagnetics (FT)
6.631*****	Optics and Photonics (FT)
6.632*****	Electromagnetic Wave Theory (ST)
6.641	Electromagnetic Fields, Forces and Motion (ST)
6.720	Integrated Microelectronic Devices (FT)
6.728*****	Applied Quantum and Statistical Physics (FT)
6.730*****	Physics for Solid-State Applications (ST)
6.775*** *	CMOS Analog and Mixed-Signal Circuit Design (ST)
6.777	Design and Fabrication of Microelectromechanical Devices (ST)
6.823	Computer System Architecture (FT)

- * You may not choose both 6.241 and 6.251
- ** You may not choose both 6.341 and 6.555
- *** You may not choose both 6.437 and 6.438
- **** You may not choose both 6.376 and 6.775
- ***** You may not choose both 6.631 and 6.632
- ***** You may not choose both 6.728 and 6.730