

Is the GRE required by most departments?
Or only the "better" ones? The answer
proved unexpectedly complex.

GRE Policies in Electrical Engineering

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The Department of Electrical Engineering at the SUNY-Binghamton is relatively new and caught up in the excitement of new course development. Along with educational innovation, however, we have been coping with establishing regulations, policies, and procedures taken for granted in longer-standing programs. Most can be put in place fairly quickly by consensus. Others can be more controversial, but few more so than the question of the Graduate Record Examination (GRE)* for entry into the graduate program.

At SUNY, the "default" regulation requires an applicant to submit GRE results before consideration for admission to any graduate program. In practice, each program may deviate from the basic policy, with appropriate procedures and justification. In attempting to determine our department's policy, it became clear that the faculty's view of the validity of GRE results covered a wide range. We eventually reached a compromise between those who considered the GRE a total waste of time and those who thought it should be compulsory for all applicants, with the decision that the university's requirement be waived for graduates of ABET-accredited engineering programs.

*The GRE, widely used as a supplementary entrance test by graduate programs, is administered internationally by the Educational Testing Service (ETS) of Princeton, N.J. Both the General (or Aptitude) test, consisting of Verbal, Quantitative and Analytical sections, and various Advanced subject tests are offered.

In the meantime, however, it had become clear that there was not only considerable confusion about how the results were intended to be interpreted, but also a problem with specific cases of misinformation. In particular, everyone had a different idea of whether the "better" universities required the GRE or not, based on certain knowledge of specific cases. When it turned out that my own "certain" information about a particular university was in direct contradiction to another's, I decided to conduct a survey, which is the subject of this article, to determine whether the GRE is required by "most" colleges, or by the "better" colleges, or whether any such generalizations are valid.

The Survey

The brief survey, shown below, was addressed to the graduate adviser in the electrical engineering department and sent to 259 universities. In some cases the chairman replied, in a few the graduate admis-

The Questions Asked

We require the GRE for the following graduate student classifications:

- All All except:
(please specify)
 Only: (please specify)
 None

We require the Analytical section
 Advanced Engineering
 Either.

sions office did, but in no case is there any reason to believe that the policy stated is not specifically that of the appropriate electrical engineering department.

Of the 259 questionnaires sent out, 147 (57%) were returned. Six of the returns were from EE departments with no graduate program. (I polled all EE departments rather than chance missing some with recent graduate programs.)

Many survey respondents volunteered additional information that made it clear there are many more variations in GRE policy than anticipated. With a few simplifying assumptions, however, most of those policies can be categorized into one of three broad groups (tables 1-3).

The Numerical Results

Departments with no GRE requirement are listed in table 1. The survey identified a substantial group, shown in table 2, that requires GRE results of foreign students. Table 3 lists schools that require the GRE of all applicants.

It is immediately obvious that the Canadian departments rarely require the GRE, with only one requiring it of all applicants and one of foreign students. (It is not clear whether that classification includes U.S. students, but I suspect not.) All discussion here will refer to U.S. institutions.

Subject to the caveats listed in the notes to the tables, 35 (27%) of the 128 responding EE departments with graduate programs do not require the GRE (although four of these recommend it and use the results if available), 25 (20%) require it of foreign or non-ABET appli-

Table 1. Departments with No GRE Requirement for the M.S.E.E.

Akron	Gannon	Purdue
Alaska-Fairbanks	Geo. Washington (3)	*Queens
*Alberta (1)	Georgia Tech	*Regina
Arkansas	Hawaii-Manoa (3,4)	Rochester Tech
*British Columbia	Kansas State	*Saskatchewan
Brown	Kansas	*Sherbrooke
*Calgary	*Manitoba	S. Ill.-Edwardsville
Cal. State-Long Beach (5)	M.I.T.	Stevens
*Carleton	Minnesota (1)	Tennessee (4)
Catholic	Monmouth College	*Toronto
Clarkson	New Haven (1)	Villanova (1,2)
Colorado State	Oklahoma State	Washington-St. Louis
Colorado-Boulder (3)	Pennsylvania	Widener
*Concordia	Pittsburgh	Wisconsin-Milwaukee
Florida Tech	Portland State (4)	Worcester Polytech
		Youngstown State

* Canadian university.

- 1) GRE recommended and/or taken into consideration if results submitted.
- 2) GRE may be required of "some" students.
- 3) GRE required of applicants for financial aid. (Hawaii requires both General and Advanced Engineering tests.)
- 4) GRE required of Ph.D. applicants. (Portland State—General test, U. Tennessee—Advanced Engineering, Hawaii—both).
- 5) Requires GPA standard for entry and runs own qualifying exam for candidacy.

Table 2. Departments Requiring the GRE of Foreign Students for the M.S.E.E.

	General Test			Advanced Engineering	ABET Engrg.	Exemption ABET EE	(&GPA)
	Verbal	Quant.	Analyt.				
Arizona State			X				
Cal. State Pomona				X	X		X
Dayton (1)			X	X			X
Drexel (3)							
Illinois Tech	X	X	X	X		X	
Iowa State (5)			X				
*McGill			X	X			
Missouri							X
New Hampshire			X	X			
SUNY-Binghamton			X		X		
SUNY-Buffalo			X				X
N. Carolina A&T			X				
North Dakota						X	
Oakland			X				
Old Dominion			X				
Oregon State	X	X	X			X	
Rose-Hulman (4)			X				
Santa Clara							
South Carolina	X	X			X		
S.E. Mass. (2)				X			
Toledo				either			X
Tufts (5)	X	X	X			X	
Utah	X	X	X				
Virginia Tech							
Washington			X	X	X		X
Wisc.-Madison (6)				either			

*Canadian university.

- 1) Requirement specifies GRE "if GPA doesn't meet minimum requirements."
- 2) Requirement specifies GRE "if student's BSEE or equivalent is questionable."
- 3) GRE may also be waived for graduates of "known" foreign institutions.
- 4) Listing here anticipates extension of GRE waiver to ABET graduates. Waiver currently limited to own graduates.
- 5) GRE also recommended for U.S. students.
- 6) GRE also required for all applicants requesting financial aid.

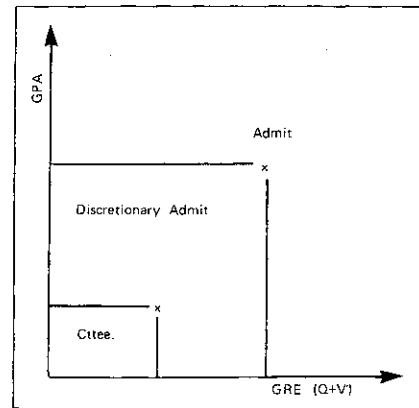


Figure 1. University of Texas quantification of GPA and GRE thresholds.

cants, and 68 (53%) require it of all applicants. Roughly 75 percent of the responding EE departments in the U.S. require the GRE in some way. The first objective of the survey was to determine this point, which is subject to the assumption that non-responding departments follow a similar pattern.

To try to confirm the conclusion's validity, I turned to two other sources: the ETS directory¹ and ASEE's graduate study directory.² A secondary survey objective was to assess the reliability of both sources. It turns out that both are reasonably consistent with the survey and with each other overall, despite some contradictions in individual cases.

The first step was to establish which of the three broad table classifications the nil-return departments fall into. My expectation was that the non-responding schools would be more likely to have no requirement, since no return suggested less interest in the subject, and the result—23 (38%) no requirement, three (5%) required for foreign/non-ABET, 26 (43%) required for all, and eight (13%) contradictory data—seems at first to confirm that expectation. But a further cross-check of the ASEE and ETS data with the survey returns revealed that the reported EE departmental requirements as practiced are in general more stringent than the ASEE or ETS listings would suggest. Of the 128 U.S. departments in the return group, 25 (20%) report requirements which would either place them in table 3, where the ASEE/ETS data would

Understanding the Tabulations

In general, minor deviations from the norm within each category are identified in footnotes to the appropriate table. In establishing table 1, for example, which lists departments with no "requirement," I have taken the term literally; some of those listed do actually *recommend* the GRE. All such comments returned on the questionnaires are recorded in the footnotes. Note that according to ETS data,¹ seven others in the table, besides those identified in the footnotes, also recommend the test.

A few additional points require comment. Note 4 on table 1 refers to a GRE requirement for Ph.D. students. Some responses specified different policies for M.S. and Ph.D. candidates (see also note 4, table 3). In most cases, where no distinction has been indicated, one can presume that policies are identical. The tables as listed, however, are for the M.S.E.E. candidates. Similarly, some respondents identified a variety of postgraduate qualifications that do not require the GRE, where the "regular" M.S.E.E. does. These are mentioned in note 2 of table 3. In some cases (note 3, table 1; note 6, table 2; note 8, table 3), a more stringent GRE policy is applied to students seeking financial aid.

In tables 2 and 3, the specific GRE tests required (or used) have been listed where these were given in the returns. The choice of Analytical or Advanced Engineering as given in the questionnaire may have been unfortunate, for it led to some ambiguity in comparing results. The tables cite the information exactly as returned, so readers can reach their own interpretations. Since the Verbal, Quantitative, and Analytical tests are given together as the General Test, I presume that an indication of a requirement of the Analytical implies a requirement of the Verbal and Quantitative. The converse is not true, though; several responses stated that only the Verbal and Quantitative are considered.

Only five suggested that the GRE scores were used to establish absolute cut-off levels. ETS specifically warns against doing so, but in each case the boundaries stated were sufficiently low that I am sure they are used solely as a minimum threshold with further selection to follow. The V+Q totals given ranged from 900 to 1100, with one requiring $V+Q+A > 1900$, and another operating on the Quantitative percentile range rather than absolute score. Two departments specified higher thresholds for the Ph.D. than the M.S.E.E.

Table 2 represents a coalescence of some separable categories. Most of the departments listed here do indeed require the GRE of foreign applicants, as the title states. From the exemption column, however, a number of distinctions can be made. If there is no entry, the requirement was specifically expressed as being for foreign students. In many cases, however, the policy is expressed as a waiver of the GRE for graduates of ABET-accredited programs. In our own case, it was set up this way to require U.S. students from related disciplines (e.g., physics, computer science) to take the GRE, too. We at Binghamton, and others, specify the waiver for "ABET-accredited engineering programs," but others narrow it to electrical engineering specifically, thereby also requiring those from other engineering specialties to submit test results. A number also have a GPA requirement, i.e., a U.S. applicant will still have to take the GRE if the GPA is less than some threshold, varying from 2.7 to 3.5. I expect others have their own ways of handling applicants with low GPAs, since most use a GPA admission threshold anyway. We use a provisional matriculation effectively to place the doubtful student on probation. Only one department (Texas-Austin) specifically explained a method of quantifying both GPA and GRE (Q+V) scores into thresholds. The method is shown in figure 1, where two datum points define three admission categories. For Ph.D. candidates, the thresholds are set higher than for the M.S.E.E.

place them in tables 1 or 2, or in table 2, where the ASEE/ETS data specifies table 1. Only seven (5%) report less stringent requirements, and of these four (4%) just relax the absolute requirement stated in ASEE/ETS to one for foreign or

non-ABET students only. So it appears that the apparent difference in average policy for the non-responding departments may only be the result of the different assessment methods.

The responding departments' poli-

cies were therefore assessed on the same basis as the non-respondents (from the ASEE and ETS tables), and gave a remarkably similar distribution: (40%/4%/47%/9% corresponding to 38%/5%/43%/13% above). These figures are repeated in table 4 for ease of comparison, with the obvious conclusion that the policy distribution of reporting departments is typical of the total group. Also according to ASEE/ETS data, 35 percent of departments that do not require the GRE, do however recommend it. Table 4 suggests that the extra factor in actual EE practice is the waiver policy for U.S./ABET applicants.

A few comments must be made about the method of policy assessment from the ASEE and ETS tables, since some assumptions and approximations were built into the data interpretation. First, the survey is intended to examine EE policies, not those of engineering departments in general, and survey responses refer to EE departmental policies only. Although the ETS table used specifies electrical engineering (and related computer, electronics and telecommunications programs), it is clear that the information is drawn from a broader source—such as policy statements by the Graduate Divisions—since in many cases the listing will cite "Required or recommended for certain programs" where only one is listed. Similarly in the ASEE listings, which would generally come from the engineering schools, it is apparent that the information does not always represent the actual policy implementation of individual departments. In some cases, again, a broad statement is made that policies vary among programs, but in general one or other of the two sources will be more specific, with the other at least consistent.

For example, if ASEE says the GRE is not required and ETS says it is recommended, then the ETS statement is consistent with ASEE, but more specific. Similarly, if ASEE says that policy varies with programs, then the ETS statement for EE must be consistent with that. If neither makes a definite statement,

Table 3. Departments Requiring the GRE of all M.S.E.E. Applicants.

(X - Required, O - Recommended)

	General			Advanced		General			Advanced
	Verbal	Quant.	Analyt.	Engineering		Verbal	Quant.	Analyt.	Engineering
Alabama-Birmingham (1a, g)			X		Rutgers			X	X
Alabama-University (1b)			X		San Diego State				
Auburn			X	X	San Jose State			X	
Bucknell				X	Southern Calif. (7)			X	X
Cal. State Fullerton			X		Southern Methodist			X	X
Cal.-Berkeley (1b)			X		South Florida (8)				
Cal.-Santa Barbara	X	X	X		Southwestern Louisiana				
Carnegie-Mellon			X		Stanford (1b)				
Central Florida (2a)	X	X			Syracuse (1d)			X	
Clemson (2b)					Tennessee Tech			X	
Columbia			X		Texas A&I			X	
Dartmouth College			X		Texas A&M			X	
Delaware			X		Texas Tech.	X	X		
Duke					Texas-Arlington	X	X		
Embry-Riddle Aero.	X	X			Texas-Austin	X	X		
Fairleigh-Dickinson			X		Texas-El Paso (1c)			X	
Florida Atlantic	X	X			Tulane	X		X	
Florida (2a)			O		Tulsa			X	
Illinois-Chicago (5)			X	X	Vanderbilt				
Iowa			X		Virginia			X	
Kentucky					W. Virginia Tech				
Lehigh (1e)					W. Virginia		X		
Louisiana Tech (3)			X	X	Wyoming				
Louisville (2b)	X	X							
Maryland (6)			either						
Miami (1f, 10)			X	X					
Michigan Tech									
Milwaukee Sch. Engrg.			X						
Mississippi State			X						
Mississippi			X	X					
Missouri Columbia (4)			X						
Montana State			X						
Nebraska Lincoln (1g)			either						
*New Brunswick			X						
New Mexico State	X	X							
New Mexico			X						
N. Carolina State			X						
Northwestern			X						
Notre Dame			X						
Oklahoma	X	X	X						
Pacific				X					
Pennsylvania State			X						
Princeton	X	X	X	O					
Rensselaer Poly									
Rice (2b)			X						
Rochester (2b)			X						

- 1) GRE exemptions for:
 - a) Registered PE by examination.
 - b) Applicant with Ph.D.
 - c) Applicant with master's degree.
 - d) Part-time student.
 - e) Part-time student not seeking financial aid.
 - f) Some foreign applicants where GRE unavailable.
 - g) Own graduates with GPA >3.0.
- 2) GRE not required for:
 - a) Post-baccalaureate studies (non-matriculated or not for degree)
 - b) M.Eng., terminal M.S., non-thesis M.E.E., etc.
- 3) Required prior to registration.
- 4) Required prior to acceptance for Ph.D., prior to graduation for M.S.
- 5) Universal requirement effective January 1987.
- 6) Universal requirement no longer in effect but expected to be reinstated; inclusion here anticipates reinstatement.
- 7) Advanced subject test required, but any of engineering, physics, mathematics or computer science accepted.
- 8) Advanced Engineering required for foreign students applying for financial aid.
- 9) Although required, GRE used only rarely in evaluation.
- 10) Analytical is primary criterion, subject test secondary.

the department is not included in the ASEE/ETS percentages. The "contradictory" category means that one source says the GRE is required of everybody when the other says nobody has to do it, or some less extreme but still inconsistent combination.

Discussion

Clearly the majority of EE departments use the GRE, almost exclusively the General test, for entrance

evaluations. Several stress that the results are used only in conjunction with other information, in keeping with ETS's own policy. Stepping outside this study's results for a moment and indulging a personal impression, much of the skepticism expressed with regard to the validity of GRE test results stems from a misconception of what the test sets out to measure. For this reason, the term "aptitude test" may be a better title than "general test," since it emphasizes the basic nature of the exam, as dis-

tinct from its breadth. Some faculty comment that excellent students have fared poorly on the test, but there are many explanations for that phenomenon, quite apart from the obvious statistical fluctuation. Students also must be persuaded that the test is too broad and basic to be one for which they can study in a conventional sense, although it is clear that one can improve scoring by "training" techniques. Even in this case, from the evidence which crosses my desk, such gains are al-

Table 4. Comparison of U.S. EE Departmental GRE Policies in Percentages.

Department Classification	Assessment Method	Table 1 (Not Req'd.)	Table 2 (Foreign)	Table 3 (Req'd.)	Contradictory Data
Responding	Survey	27%	20%	53%	—
Responding	ASEE/ETS	40	4	47	9%
Non-responding	ASEE/ETS	38	5	43	13

most never substantial, or even sufficiently significant to affect an entry decision.

Another valid purpose in requiring the GRE, even if the data are not to be used to satisfy admission criteria, is to establish a national standard against which to place one's own graduate students. This seems to me to be particularly important for a new program such as our own.

The widespread use of the GRE just for foreign applicants is interesting, although not necessarily surprising. The main difficulty with assessing foreign transcripts is not necessarily familiarity with the institution so much as grade scales or percentage marks which bear no relationship to commonplace American ranges. In many cases the GRE is the only significant information available. One questionnaire bore the comment that although the GRE was required of foreign applicants, it could be waived for graduates of a known institution, i.e., one for which a sufficient background had been developed to interpret grades. A special difficulty exists for students from the People's Republic of China, where many students, especially those outside Beijing, just cannot get access to the test site. For some departments, this means that PRC students cannot meet the entry requirements; others make alternative arrangements—for example, we permit provisional matriculation for students from known reputable institutions but still require the GRE to be taken at the first opportunity in the U.S.

The survey did not request TOEFL information, but several respondents volunteered the information that it was an absolute requirement for foreign students. Several of

the Canadian departments base their entry requirement on familiarity with English. We also use the TOEFL at Binghamton, rather than the Verbal section of the GRE, since the latter can be quite subtle for those for whom English is a second language. But those departments that do operate a combined threshold, Q+V for example, are in effect requiring a higher technical level of foreign students than local ones. In practice, this might provide a needed balance to the initial language handicap.

The problem with the exemption of U.S. students or ABET graduates—however it is specified—is the implication that while the foreign student is placed at a particular percentile on the U.S. standards, there is no way to do the same thing for a U.S. applicant with a particular GPA from a given U.S. institution. (In fact, correlation of U.S. GPAs against the percentile scale could be a most useful service for the ETS or elsewhere.) While this mixed, compromise system seems to work reasonably, it does establish a dual entry standard.

The last point for comment is the distinction between full-time and part-time students, which seems difficult to justify on academic grounds. In some instances, the GRE requirements for applicants for financial aid will have essentially the same effect of distinguishing between full-time and part-time students. Naturally, if one is considering a foreign student for a teaching assistantship, one may have an increased stake in establishing academic background, but in principle the same criteria should apply for entry. Experience says that problems with foreign students as teaching as-

sistants are more commonly associated with language than with subject deficiencies.

Conclusions

The primary conclusion of the survey is that roughly 75 percent of U.S. Departments of Electrical Engineering require the GRE. Most require it of all applicants, but in a significant number of cases the requirement covers only foreign or non-ABET graduates. These figures were reached from the departments that returned surveys but have been shown by cross-checking with other sources to be valid for the entire group. These other sources, the ETS directory¹ and the annual ASEE directory,² are not necessarily accurate for a given department but are broadly self-consistent with each other and the survey, except that EE departments actually administer a more stringent GRE policy in general than the ETS or ASEE tables would indicate.

Acknowledgments

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