reading courses, and certain courses constituting basic preparation in
the field of geology, such as Ge 106, Ge 112, Ge 114 ab, and Ge 115
ab. A grade of C or better is required for all course work that satisfies
these requirements. Knowledge of basic physics, mathematics, and
data analysis at the level of Ge 108 and Ge/ESE 118 is required of
all Ph.D. candidates in geology. Students entering the geology option
with a master’s degree in a science or mathematics may be exempt
from up to 45 units at the discretion of the option representative.

*Geophysics.* In addition to general Institute requirements, candidates
for the Ph.D degree in geophysics must successfully complete the fol-
lowing: (1) two of the following basic introductory courses: Ge 101,
103, 104, or ESE 101–103, and one term of Ge 109, which also fulfill
basic division requirements; (2) either Ae/Ge/ME 160 ab, APh 105
ab, MS 115, or a subject equivalent; (3) three of Ge 161, Ge 162, Ge
163, or Ge 164; (4) Ge 111 ab; (5) the choice between five additional
100- or 200-level science or mathematics courses or a minor in any
field at Caltech (for example, computational science and engineering).
It is highly recommended that (1)-(4) be fulfilled in the first
year and (5) in the second year. A grade of C or better is required for
all course work that satisfies these requirements. Knowledge of basic
physics, mathematics, and data analysis at the level of Ge 108 and
Ge/ESE 118 is required of all Ph.D. candidates in geophysics. This
requirement may be met by previous course work or through successful
completion of these classes. Students may substitute another course for
a required course if they can demonstrate to an option representative
that they have already had the material in the required course.

*Planetary Science.* In addition to general Institute and basic division
requirements, candidates for the Ph.D. degree in planetary science
must satisfy the following course requirements: Ge 101, Ge 102, and
courses in planetary formation and dynamics (Ge/Ay 133), plane-
tary atmospheres (Ge/ESE 150), planetary interiors (Ge 131), and
planetary surfaces (Ge 151). In addition, students shall successfully
complete 45 units of 100-level or higher courses in a coherent field of
specialization. This requirement may be satisfied by completion of a
subject minor or through a set of courses chosen in consultation with
and approved by the adviser and the option representative. All candi-
dates are expected to possess knowledge of physics and mathematics
at the level of Ph 106 and ACM 95. This requirement may be met by
previous course work or through successful completion of these classes.

*Subject Minor*
A student may, with the approval of the Division of Geological and
Planetary Sciences, elect a minor in any one of the major subjects list-
ed above. Such a subject minor will include at least 45 units in courses
at the 100 level or higher. Normally, a member of the division faculty
will participate in the student’s oral thesis defense.