Graduate Education

Graduate education embraces study for all degrees and certificates beyond the bachelor’s degree — principally, the master’s and doctoral degrees. Graduate degrees fall into two broad categories:

1. **Academic**: Degrees awarded in recognition of a student’s command of a wide range of subject matter and research methodologies within an academic field, and, at the doctoral level, generation of original research leading to a significant contribution to a field of study.

2. **Professional**: Degrees awarded in recognition of a student’s command of a comprehensive body of professional knowledge and demonstrated ability to organize and carry out investigation of significant problems in the field. These degrees are offered largely by the professional schools, although some academic departments also offer professional degrees.

Graduate study aims to inspire independence and originality of thought in the pursuit of knowledge and new insights. Graduate students are expected to achieve mastery of their chosen field through independent study and research as well as advanced course work. Graduate courses demand a capacity for critical analysis and a specialization of research interests beyond the expectations for an undergraduate major. Course offerings include:

1. Advanced lecture courses
2. Seminars in which faculty and students critically examine specific problems within the subject field
3. Independent study or reading courses
4. Research projects conducted under faculty supervision

For a complete list of doctoral and master's degrees offered at UC Berkeley, and links to the programs offering them, see the Graduate Division website (http://grad.berkeley.edu/admissions/list.shtml).

**Interdisciplinary Graduate Degrees: Graduate Groups**

Berkeley offers graduate programs in a number of fields that constitute distinct cores of knowledge while cutting across traditional departmental lines. These officially approved Graduate Groups are administered by faculty from several related departments (and include faculty from another campus, if it is a joint degree).

**Individual (Ad Hoc) Doctoral Programs**

If students wish to pursue a field of study outside the disciplinary parameters of an academic department or an interdisciplinary graduate group, they may establish an ad hoc interdisciplinary PhD program, subject to Graduate Council approval. To be considered for an interdisciplinary program, students must have completed at least two semesters of graduate study in a doctoral program on this campus and have shown superior academic performance in their graduate studies here. To apply for an individual major, students prepare a proposal for a course of study under the sponsorship of five faculty members. Final approval of each graduate program and admission of each student into such a program must be granted by the Graduate Council. Interdisciplinary students must complete degree requirements in accordance with Plan A of the Graduate Council policies, and the degree is awarded in the field approved. For more information, see the Graduate Division website (http://grad.berkeley.edu/).

**Interdisciplinary Doctoral Minors: The Designated Emphasis**

Berkeley offers a variety of interdisciplinary minors for PhD students. A Designated Emphasis is defined as an area of study constituting a new method of inquiry or an important field of application relevant to two or more existing doctoral degree programs. It is administered by participating faculty in an approved Graduate Group. Students are required to complete the academic work in the Designated Emphasis in addition to all the requirements of their PhD program. Students must apply to a DE before taking the qualifying examination, as they must have completed required course work and have faculty representation from the DE on their qualifying examination committee as well as their dissertation committee. The DE is shown on the diploma and transcript. For more information, contact the DE graduate group of interest.

**DE graduate programs offered:**

- Cognitive Science (http://guide.berkeley.edu/graduate/degree-programs/cognitive-science/)
- Computational and Data Science and Engineering (http://guide.berkeley.edu/graduate/degree-programs/computational-science-engineering/)
- Computational and Genomic Biology (http://guide.berkeley.edu/graduate/degree-programs/computational-biology/)
- Computational Precision Health (http://guide.berkeley.edu/graduate/degree-programs/computational-precision-health/)
- Critical Theory (http://guide.berkeley.edu/graduate/degree-programs/critical-theory/)
- Development Engineering (http://guide.berkeley.edu/graduate/degree-programs/development-engineering/)
- Dutch Studies (http://guide.berkeley.edu/graduate/degree-programs/dutch/)
- Energy Science and Technology (http://guide.berkeley.edu/graduate/degree-programs/energy-science-technology/)
- European Studies (http://guide.berkeley.edu/graduate/degree-programs/european-studies/)
- Film Studies (http://guide.berkeley.edu/graduate/degree-programs/film/)
- Folklore (http://guide.berkeley.edu/graduate/degree-programs/folklore/)
- Global Metropolitan Studies (http://guide.berkeley.edu/graduate/degree-programs/global-metropolitan-studies/)
- Indigenous Language Revitalization
- Jewish Studies (http://guide.berkeley.edu/graduate/degree-programs/jewish-studies/)
- New Media (http://guide.berkeley.edu/graduate/degree-programs/new-media/)
- Political Economy (http://guide.berkeley.edu/graduate/degree-programs/political-economy/)
- Renaissance and Early Modern Studies (http://guide.berkeley.edu/graduate/degree-programs/renaissance-early-modern/)
- Science and Technology Studies (http://guide.berkeley.edu/graduate/degree-programs/science-technology-studies/)
• Sociology of Organizations and Markets
  (http://guide.berkeley.edu/graduate/degree-programs/sociology-organizations-markets/)
• Study of Religion
• Women, Gender and Sexuality
  (http://guide.berkeley.edu/graduate/degree-programs/women-gender-sexuality/)

Applying for Graduate Admission
A complete list of graduate academic departments, the degrees offered, and the deadlines for application can be found on the Graduate Division website
(http://grad.berkeley.edu/programs/list/).

Prospective students must file a completed Graduate Division application to be considered for admission, in addition to any supplemental documents specific to the program for which they are applying. The online application can be found on the Graduate Division website (http://grad.berkeley.edu/admissions/).

Exceptions to this rule apply to master’s programs in the Haas School of Business, the Doctor of Optometry program in the School of Optometry, the Master of Information and Data Science and the Master of Information and Cybersecurity programs in the School of Information, and programs in the School of Law. Prospective students should contact those schools directly for the appropriate application.

Applicants must pay a fee by credit card when they apply. The application fee is not refundable. Only United States citizens or Permanent Residents may request a fee waiver by following the instructions and completing the waiver form in the payment section of the application. International applicants are not eligible for waivers and must pay the application fee.

Admission Requirements
The minimum graduate admission requirements are:

1. A bachelor’s degree or recognized equivalent from an accredited institution;
2. Sufficient undergraduate work to undertake graduate work in the chosen field;
3. A grade point average (GPA) of 3.0 (B) or better.

Many departments or groups have additional requirements, such as higher GPA minimums or scores from the Graduate Record Examination (GRE) or other tests. Check the program’s specific requirements: department contact information can be found here (http://guide.berkeley.edu/graduate/degree-programs/).

Satisfying minimum standards, however, does not guarantee admission, since the number of qualified applicants far exceeds the number of places available. As a result, many well-qualified applicants cannot be accommodated.

Graduate Record Examination (GRE)
Some degree programs require applicants to take a standardized test such as the General Test of the GRE, a Subject Test of the GRE, the GMAT, MCAT, OAT, or LSAT. Applicants should check with the department to which they are applying for specific test requirements and deadlines. For more information, or to register for the GRE, consult their website (http://www.ets.org/gre/), or call 1-866-473-4373.

International Applicants
International applicants must fulfill all previously stated admission requirements and have an excellent command of the English language before beginning graduate study at Berkeley; students cannot be admitted to graduate standing to learn English. Applicants from a country in which English is not the official language are required to submit official evidence of English language proficiency. One of two standardized tests may be taken, the Test of English Language as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS). Minimum score and other requirements for these tests are listed on the Admissions section of the Graduate Division website. Individual academic departments may choose to require a higher score than the minimum requirement set. Further information on TOEFL can be found here (http://www.ets.org/toefl/) or by calling 1-877-863-3546 or 1-609-771-7100. IELTS information can be found here (https://www.ielts.org/).

Graduate students who plan to teach but do not speak English as a native language and do not hold a bachelor’s degree from an institution in the United States must demonstrate oral English proficiency to be eligible for appointment as a graduate student instructor (GSI). In those countries where the iBT TOEFL has been introduced, English language proficiency is determined by the speaking section score of the iBT TOEFL. In those countries where the iBT TOEFL is not available, applicants can demonstrate their proficiency by taking and passing the Test of Spoken English (TSE) before enrolling in Berkeley or the SPEAK test offered on the Berkeley campus. Information on passing scores, testing options, and language courses can be found on the GSI Teaching and Resource Center’s website (http://gsi.berkeley.edu/)

Special Circumstances
Reenrollment and Admission to a Second Degree Program
A student who has previously registered for graduate study at Berkeley, who withdrew and intends to reenroll in the same degree program, must file a Petition for Reenrollment. Please check with the department’s advising staff regarding the process. Approval of reenrollment is not guaranteed. The Graduate Division and the department, school, or group will review the student’s application and academic record. A program is not obligated to reenroll any student who has withdrawn except those who withdraw on an approved Parenting Leave or Internship Leave. See the Guide to Graduate Policy (http://grad.berkeley.edu/policy/) for information about Parenting Leave or Internship Leave status for graduate students. A Statement of Legal Residence must also be submitted.

A student who has previously registered for graduate study at Berkeley, regardless of whether the degree was completed, and who is applying to a different degree program at Berkeley, will be required to apply to that program via the Graduate Application for Admission (http://grad.berkeley.edu/admissions/apply/). Please contact the intended department for application requirements and deadlines.

Duplication of Higher Degrees
Duplication of degrees is not permitted. A student may enroll for a second academic or professional degree if the second degree is in a distinctly different field. Approval to enroll in a second doctoral degree requires an exception from the Graduate Division. The second degree program must be in an area of knowledge distinctly different from the field of the first doctorate. Applicants that hold a doctoral degree may be admitted to
a professional doctorate or master's degree if there is no duplication of training involved.

**Notification of Action on Admission**

The only valid and official proof of admission is a written notice from the Dean of the Graduate Division. Notice from departments is unofficial and provisional only. Students will be advised as soon as possible after admission decisions have been reached. Acceptance letters for admission are normally issued between February and March for the coming fall semester.

**The Master's Degree**

A partial description of basic Master's degree requirements follows. For complete and up-to-date information, refer to the Guide to Graduate Policy (http://www.grad.berkeley.edu/policies/ggp/ggp.pdf).

**Academic Residence Requirement**

A minimum of two semesters of academic residence is required for the master's degree. Academic residence is defined as enrollment in at least four units in 100-200 series courses, but enrollment in 12 units per semester is required for all degree programs, except for part-time self-supporting degree programs.

**Transfer of Credit**

A maximum of four semester or six quarter units completed in graduate status at an institution outside the University of California system may be transferable if:

1. The units were not required for the completion of a previous degree.
2. The units involved are equivalent to work normally offered within the current program of study and were completed previously in graduate status at an institution of high standing.
3. The grade recorded was at least a B; and
4. An overall scholastic record of at least a 3.3 GPA was maintained at both the original institution and at Berkeley.

**Concurrent Enrollment—UC Berkeley Extension**

Courses taken concurrently through UC Berkeley Extension but held on the Berkeley campus under the instruction of a regular member of the Berkeley faculty are not applicable toward a Berkeley master's degree unless they have the "XB" designation. These courses are intended to provide Extension students with an opportunity to take courses that would not ordinarily be available to them. Concurrent enrollment cannot replace normal registration by Berkeley graduate students, nor may it be used to accumulate credit toward a Berkeley degree by an individual not formally admitted to graduate standing at Berkeley.

**Master's Degree Plans**

A student working toward a master's degree on the Berkeley campus must complete one of two plans, as authorized for the program. Many programs require more units than the minimums listed below.

- **Plan I** requires a minimum of 20 semester units of upper division and graduate courses and a thesis. At least 8 of these units must be in graduate courses (200 series) in the major subject. Course units are not granted for the thesis. A degree program may require more than the minimum of 20 units. If the degree requires more than the 20-unit minimum, 40% of the unit total must be 200-level course work.

- **Plan II** requires a minimum of 24 semester units of upper division and graduate courses, followed by a comprehensive final examination administered by the school, department, or group. At least 12 of the units must be in graduate courses (200 series) in the major subject. Degree programs may require more than the 24-unit minimum. If the degree requires more than 24 units, half of the unit total must be 200-level course work.

**Advancement to Candidacy: Master's Plan I**

All students under Master's Plan I who plan to file a thesis are required to submit an approved advancement to Candidacy application no later than the end of the fifth week of the semester in which the degree will be awarded. Students must be advanced to candidacy to be eligible to receive their degree. The Advancement to Master's Candidacy form is available from the Graduate Division website (http://grad.berkeley.edu/academic-progress/forms/). The application must be approved by the program's head graduate advisor. Students should consult their advisors as early as possible about constituting their thesis committee.

**The Master's Thesis**

A student who follows Plan I, described above, must submit a thesis according to the Library-designated format described in Thesis Writing and Filing Guidelines (http://grad.berkeley.edu/academic-progress/thesis/). For filing deadlines, refer to the Graduate Division website (http://grad.berkeley.edu/academic-progress/deadlines/).

The thesis explicates results obtained in an original investigation of a problem. The problem in question is limited in scope; however, the thesis should be comparable to a doctoral dissertation in style and organization.

A student must submit the thesis to a committee of three Academic Senate faculty appointed by the Graduate Division, one of whom may be chosen from a department other than that of the major subject. A student must confer with all members of the committee before beginning the thesis. If it involves use of human subjects or animals, see that subsection below. The Graduate Division will not accept a thesis that involves human or animal subjects without official evidence of an approved protocol number from the appropriate committee.

**Use of Human Subjects or Animal Subjects**

If the research for a master's thesis involves the use of human subjects, the student is required to have an approved protocol from the Committee for Protection of Human Subjects (http://www.cphs.berkeley.edu/) before beginning any research. Students using human subjects also must complete the “Course in the Protection of Human Subjects” (referred to as the CITI course), which is available online at citiprogram.org (https://www.citiprogram.org/), and print out the certificate of completion. The certificate of completion must be submitted with the advancement form.

Students whose research projects involve the proposed use of live vertebrate animals must contact the Animal Care and Use Committee (ACUC) before the initiation of research and, if so advised by the ACUC:

1. The faculty member who is supervising the research must obtain ACUC approval prior to any proposed use of live vertebrate animals; and
2. The student must ask the ACUC to inform the Graduate Division of
the advisor’s approved Master Animal Use Protocol number within six months of the advancement to candidacy date.

The Doctoral Degree

The doctoral degree is awarded in recognition of a student’s knowledge of a broad field of learning and for distinguished accomplishment in that field through an original contribution of significant knowledge and ideas that demonstrates high critical ability.

Basic requirements for the doctoral degree are described in the sections below. However, consult with the individual program to verify all its program requirements, in particular what courses must be undertaken. For complete and up-to-date information on specific topics, refer to the Guide to Graduate Policy (http://grad.berkeley.edu/policy/).

Academic Residence Requirement

A minimum of two years or four semesters of academic residence is required for the PhD degree. For a joint doctoral degree, a minimum of one year of academic residence is required at each campus.

Foreign Language Requirement

Programs may have a foreign language requirement to ensure that students have the ability to acquire wide knowledge in the field of study and to monitor developments in the field in a language other than English. Students are urged to complete the foreign language requirement early in their graduate career. Students must fulfill the foreign language requirement before admission to the qualifying examination and advancement to candidacy. Prospective students are urged to inquire about the foreign language requirement as soon as possible and, if possible, to fulfill it while still an undergraduate. In some graduate programs, applicants for admission must have satisfied the foreign language requirement before applying.

Qualifying Examinations

To be admitted to doctoral candidacy, a student must pass an oral qualifying examination administered by a four- or five-member committee approved by the Graduate Division on behalf of the Academic Senate’s Graduate Council. The student must be registered in the semester in which the examination is taken. To be eligible to apply to take the qualifying exam, any previous deficiencies in training must be addressed or removed, including incomplete grades in courses required by the graduate adviser for the program. A student must have at least a B average in all coursework undertaken in graduate status and must have fulfilled any language requirement(s).

Some programs have performance standards that are higher than the minimum B average required by the Graduate Division. Some may also require passage of preliminary examinations before a student is eligible to apply for the qualifying examination.

Advancement to Candidacy

A student must have completed all doctoral degree requirements except the dissertation before becoming advanced to candidacy. As soon as possible after passing the qualifying examination, a student must submit an approved Advancement to Candidacy petition, available on the Graduate Division website (http://grad.berkeley.edu/policies/forms.shtml/). It must be endorsed by the head graduate advisor and dissertation chair. Payment of a fee is required when filing the application, and students must have completed all doctoral degree requirements except the dissertation before they may be advanced to candidacy.

Advancement to Candidacy and Reduced Nonresident Supplemental Tuition

For nonresident graduate students who have been advanced to candidacy for the doctorate, nonresident supplemental tuition (NRST) is reduced by 100 percent, for a maximum calendar period of three years. All such students who continue to be enrolled or who re-enroll after the three-year period will be charged the full nonresident supplemental tuition rate that is in effect at that time.

Satisfactory Academic Progress and Normative Time

Normative time is the elapsed time (calculated to the nearest semester) recommended by program faculty and approved by the Graduate Council that students need to make satisfactory progress in completing requirements for the doctorate. Normative time has two components:

1. Time from the beginning of the student’s graduate work to advancement to doctoral candidacy; and

2. Time in candidacy until the dissertation is filed. Graduate programs have total normative times ranging from five to seven years (10 to 14 semesters). In order for a student to be considered in good standing, the student must be progressing within the normative time established for the program. The student is responsible for being aware of the program’s normative time standards.

Annual Review of Doctoral Candidates: the Doctoral Candidacy Review

The Graduate Council requires all doctoral students who have been advanced to candidacy to meet annually with at least two members of their dissertation committees to discuss progress during the last year and to set goals for the next. Prior to the meeting, students complete the Doctoral Candidacy Review (DCR). The dissertation chair reads the student’s report, works with the student to schedule a progress meeting, and records the results in the DCR. For full information, see the Graduate Division website (http://grad.berkeley.edu/academic-progress/advanced/academic-progress-report/).

The Doctoral Dissertation

The dissertation, the product of independent investigation under faculty supervision, is the capstone requirement for the doctoral program. The dissertation must be submitted to the committee in charge (see below) and must receive its approval. The dissertation must be filed according to Graduate Division procedures (http://grad.berkeley.edu/academic-progress/dissertation/). For filing deadlines see the Graduate Division website (http://grad.berkeley.edu/academic-progress/deadlines/). A student may work under one of two plans, as authorized for the degree program:

• Plan A: On behalf of the Graduate Council, the Graduate Division appoints a committee of five Academic Senate members which determines whether a candidate has met the requirements for the degree. Three members of the committee, one of whom must be from a department other than that of the major subject, guide the student in research and judge the merits of the dissertation. The entire committee conducts a final oral examination dealing with the relationship between the dissertation and the general field of study.
in which the subject of the dissertation lies. Admission to the final oral examination may be restricted to the members of the committee, members of the Academic Senate, and guests of equivalent rank from other institutions.

- **Plan B:** On behalf of the Graduate Council, the Graduate Division appoints a committee of three Academic Senate members, one of whom must be an Academic Senate member outside the unit administering the degree program. This committee may require any necessary conferences to elucidate the subject treated in the dissertation. After submission of the dissertation but before final action is taken upon it, the committee may, at its discretion, require the candidate to defend the dissertation in a formal oral examination.

After the student’s committee has approved the dissertation, the dissertation must be filed according to Graduate Division Guidelines (http://grad.berkeley.edu/academic-progress/dissertation/).

**Programs using Plan A:** Buddhist Studies, Interdisciplinary Program, Logic and the Methodology of Science

**Programs using Plan B:** All other programs not listed above

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### More Information on Academic Policies and Procedures

For up-to-date and detailed information, see the Graduate Division website (http://grad.berkeley.edu/) and the Guide to Graduate Policy (http://grad.berkeley.edu/policy/).

### Exchange Programs

Graduate students in good standing who are not enrolled in self-supporting professional degree programs may participate in several campus exchange programs. These programs enable them to take advantage of research facilities, courses, and faculty expertise that might not be available at Berkeley. Applications and further information on all of the programs are available from the department’s Graduate Degrees Adviser in the Graduate Degrees Office (http://grad.berkeley.edu/academic-progress/advising/) or the Guide to Graduate Policy (http://grad.berkeley.edu/policy/).

Berkeley students will not automatically receive credit for courses taken at schools that are not part of the University of California system. For information on transferring credit; see the Degree Requirements tab (http://guide.berkeley.edu/graduate/education/#degreerequirements). The Berkeley registration fee entitles students to library, health service, and other services at the host campus. Students who participate in the intercampus exchange program can receive credit for courses they take at the host campus. Students in self-supporting programs at Berkeley cannot enroll in state-supported courses at another UC.

To be eligible for the Intercampus Exchange Program, a student must be registered at Berkeley by the semester deadline and have the approval of the Head Graduate Adviser, the Chair of the host department, and the Dean of the Graduate Division (or equivalent title) at both Berkeley and the host campus. Students must apply for this program at least three weeks before the beginning of the term of enrollment at the host campus (all other UC campuses except Merced are on the quarter system). Applications are available on the Graduate Division website (http://grad.berkeley.edu/). Students should make personal arrangements with faculty members on both campuses to ensure that the courses, seminars, and facilities will be available to them.

### Stanford-California Exchange Program

Students may participate in this program if they want to take courses that are not offered at Berkeley. Their participation must be approved by the Graduate Division, their departments, and Stanford University. Students are not usually allowed to participate in the Stanford program until they have completed a year of graduate study at Berkeley. Participants register and pay the applicable fees at Berkeley and are exempt from tuition and fees at Stanford. Students who want to apply for this program must enroll in at least one course at Berkeley.

### Exchange Scholar Program

This program permits doctoral students from Berkeley, Brown, the University of Chicago, Columbia, Cornell, Harvard, MIT, the University of Pennsylvania, Princeton, Stanford, and Yale to study at one of the other participating universities. Berkeley registration entitles students to student privileges at the host campus for up to a year. Students are not usually eligible for this program until they have completed one year in a Berkeley graduate degree program. Students who wish to enter this program should review this form (http://guide.berkeley.edu/graduate/education/academicopportunitiestext) and familiarize themselves with its “Terms and Conditions” statement on page nine, which provides information on additional fees for which the student is responsible. For example, the host institution is responsible for assuring that hospitalization and health services are locally available. However, the host institution may charge the student additional fees for local health services.

### Cross Registration Programs with Local Institutions

With the approval of the Graduate Division and the departments involved, students may attend any of the campuses of the California State University or the Community Colleges systems, as well as Dominican, Holy Names, Mills, and St. Mary’s Colleges, and John F. Kennedy University. Students may enroll for only one course per semester, and they must register and pay applicable fees at Berkeley. For more information, contact the Degrees Office (https://grad.berkeley.edu/academic-progress/advising/).

### Graduate Theological Union (GTU) Reciprocity Program

Students registered at either UC Berkeley or GTU may take courses at the other institution, subject to appropriate academic approvals. Contact your department’s Graduate Degrees Office Adviser (http://grad.berkeley.edu/academic-progress/advising/) for information.

### Studying Abroad

Graduate students may be granted permission to study abroad. To be eligible, they must have completed at least one year in residence at
Graduate students must have the approval of their departments and the Graduate Division.

To avoid jeopardizing their immigration status, international students in F or J status intending to participate in any of the exchange programs described above must consult with an international student adviser at the Berkeley International Office (http://internationaloffice.berkeley.edu/) (International House, 2299 Piedmont Avenue; 510-642-2818).

Teaching and Research Appointments

At Berkeley, teaching assistants are called graduate student instructors (GSIs) and research assistants are named graduate student researchers (GSRs). Many programs hire qualified graduate students as GSIs, readers and tutors as well as GSRs. Students should contact the department for more information, refer to the Graduate Division’s Graduate Student Academic Appointments page (http://grad.berkeley.edu/financial/appointments/) and see the Tuition, Fees, and Financial Aid (http://guide.berkeley.edu/tuition-fees-financial-aid/) section of the Berkeley Guide.

Visiting Scholar and Postdoc Affairs (VSPA)

Visiting Scholar and Postdoc Affairs (VSPA) is the central UC Berkeley unit for administrative guidance, support, and resources for postdoc scholars and the visiting researcher community. Supporting thousands of scholars and students each year, the VSPA plans, implements, and evaluates training, professional development, and wellness initiatives that add value to the UC Berkeley research experience. Established in 1994, the VSPA is one of the first postdoc offices in the nation, and the first within the University of California.

Appointments at UC Berkeley are contingent upon the interest and ability of a campus department or organized research unit (ORU) to accommodate the affiliate for the period of time desired. A postdoc, visiting scholar, or visiting student researcher appointment must be sponsored by a UC Berkeley faculty member and approved by the VSPA.

Visiting scholars and visiting student researchers (but not postdoctoral appointees) are assessed an annual University Services Fee (https://vspa.berkeley.edu/university-service-fee/), which enables access to bConnected, University libraries, and other campus resources.

Access to campus work space is dependent on the sponsoring unit.

For more information, visit the VSPA website (http://vspa.berkeley.edu/).