





## GRADUATE STUDIES

This section of the catalog provides information to prospective, continuing graduate, and postbaccalaureate students. Included in this section is information regarding admission criteria, graduate and postbaccalaureate academic requirements, and the programs leading to master's degrees offered by the academic colleges and the College of Education and Integrative Studies. It includes descriptions of all graduate-level courses offered by the university in those departments and colleges with master's degree programs.

### MASTER'S DEGREES AND CREDENTIALS OFFERED BY THE UNIVERSITY

All graduate study in the university is under the general direction of the Associate Vice President for Academic Programs. The advanced programs are the product of the facilities of the academic colleges and the College of Education and Integrative Studies. The graduate and postbaccalaureate programs offered at the university are as follows:

#### MASTER'S DEGREE PROGRAMS

Master of Science in Agriculture  
 Agricultural Science  
 Animal Science  
 Nutrition and Food Science  
 Plant Science  
 Sports Nutrition  
 Master of Architecture  
 Master of Science in Biological Sciences  
 Master of Business Administration  
 Master of Science in Business Administration  
 Information Systems Audit  
 Entrepreneurship, Creativity, and Innovation Management  
 Master of Science in Chemistry  
 Master of Science in Computer Science  
 Master of Science in Economics  
 Master of Arts in Education  
 Master of Science in Electrical Engineering  
 Master of Science in Engineering  
 Master of Arts in English  
 Rhetoric/Composition  
 Literature  
 Teaching English as a Second Language  
 Master of Arts in History  
 Master of Landscape Architecture  
 Master of Science in Mathematics  
 Master of Science in Kinesiology  
 Master of Science in Kinesiology/Agriculture  
 Sports Nutrition  
 Master of Public Administration  
 Master of Science in Psychology  
 Master of Urban and Regional Planning

### COLLEGE OF EDUCATION AND INTEGRATIVE STUDIES

#### Credentials and Certificates

##### Multiple Subjects

- Multiple Subjects with a Cross-cultural, Language and Academic Development (CLAD) Emphasis
- Multiple Subjects with a Bilingual (Spanish) Cross-cultural, Language and Academic Development (BCLAD) Emphasis

##### Single Subject

- Agricultural Education
- Art
- Business Education
- English
- Home Economics
- Science
- Mathematics
- Music
- Physical Education
- Social Sciences
- Single Subject with a Cross-cultural, Language and Academic Development (CLAD) Emphasis
- Single Subject with a Bilingual (Spanish) Cross-cultural, Language and Academic Development (BCLAD) Emphasis
- Special Education—Learning Handicapped (LH)
- Special Education—Severely Handicapped (SH)
- Resource Specialist Certificate
- Agricultural Specialist
- Adapted Physical Education Specialist
- CLAD Certificate
- Designated Subjects Adult Education Teaching Credential
- Computers in Education Certificate
- Educational Multimedia Certificate

#### THE GRADUATE COUNCIL

The Graduate Council consists of a representative from each of the academic colleges and the College of Education and ex-officio members from appropriate areas of the university. The Council is advisory to the Associate Vice President for Academic Programs in matters dealing with curriculum, graduate student affairs, graduate studies policy, and other areas related to the university's graduate and postbaccalaureate programs.

Graduate Council Chair	Elhami T. Ibrahim
College of Agriculture	Melinda Burrill
College of Letters, Arts, and Social Sciences	Jeff Mio
College of Business Administration	Eric McLaughlin
College of Engineering	Uei-Jiun Fan
College of Environmental Design	Joan Safford
College of Science	H. Norton Riley
College of Education and Integrative Studies	Jane S. McGraw
Associated Students	
University Library	Erik Ennerberg
Graduate Studies Analyst	Paula Sandoval

## GRADUATE AND POSTBACCALAUREATE ADMISSIONS

### APPLICATION PROCEDURES

All graduate and postbaccalaureate applicants (e.g., master's degree applicants, those seeking credentials, and those interested in taking graduate level courses for personal or professional growth) must file a complete graduate application as described in the graduate and postbaccalaureate admission booklet. Applicants who complete undergraduate degree requirements and graduate the preceding term are also required to complete and submit an application and the \$55 nonrefundable application fee. Since applicants for postbaccalaureate programs may be limited to the choice of a single campus on each application, redirection to alternative campuses or later changes of campus choice will be minimal. To be assured of initial consideration by more than one campus, it will be necessary for an applicant to submit separate applications (including fees) to each. Applications may be obtained from the Graduate Studies Office of any California State University campus in addition to the sources noted for undergraduate applicants.

### POSTBACCALAUREATE STANDING

For admission to postbaccalaureate standing, a student must:

- (a) hold an acceptable baccalaureate degree from an institution accredited by a regional accrediting association or have completed equivalent academic preparation as determined by an appropriate campus authority;
- (b) have attained a grade point average of at least 2.5 (4.0 A) in the last 90 quarter units (60 semester units) attempted; and
- (c) have been in good standing at the last college attended.

All applicants seeking admission to postbaccalaureate study at this university must apply and be accepted in one of the following categories:

### SECOND BACHELOR'S DEGREE

Students who have earned a baccalaureate from an accredited institution may earn a second bachelor's degree. A grade point average of 2.50 on the last 60 semester/90 quarter units is required for admission. Students seeking a second bachelor's degree are exempt from the EPT/ELM.

### GRADUATE STANDING. NON-CREDENTIAL. UNDECLARED

Students who are eligible for admission to a California State University campus in undeclared, non-certificate/credential graduate standing must state in their application that they do have graduate intentions in either a master's degree program or a credential program, though they have not entered such yet. A cumulative grade point average of 3.0 (B) must be maintained in upper-division and graduate courses. Admission to this status does not constitute admission to a graduate degree curriculum. A maximum of 13 units, 300 level or above, can be taken while in this classification.

### GRADUATE STANDING. CREDENTIAL-CERTIFICATE. CONDITIONAL/UNCONDITIONAL

Students who are eligible for admission to a California State University campus in undeclared graduate standing may be admitted to a particular postbaccalaureate credential or certificate program, provided that such professional, personal, scholastic and other standards, including qualifying examinations, as may be required for the particular program, are satisfied. Until the application for classification is approved by the appropriate campus authority, the student's standing will be as a

conditional certificate/credential student. A student who has been accepted in a certificate/credential program while an undergraduate at this university must apply for admission as a graduate student upon his/her attainment of an undergraduate degree with an overall GPA of 2.75. A cumulative grade point average of at least 3.0 (B) must be maintained in upper-division and graduate courses.

### MASTER'S DEGREE

#### Conditional Status Admission

Students eligible for admission to a California State University campus in the undeclared, non-certificate/credential graduate status above, but who have deficiencies in prerequisite preparation that, in the opinion of the appropriate campus authority, can be remedied by specified additional preparation, including qualifying examinations, may be admitted to an authorized graduate degree curriculum with conditional master's degree standing. A cumulative grade point average of at least 3.0 (B) must be maintained in upper-division and graduate courses. Students in this status must complete deficiencies and file a change of major form to obtain unconditional status. Graduation Writing Test requirements may/may not be satisfied.

#### Unconditional Status Admission

Students eligible for admission to a California State University campus in the undeclared or conditional master's degree standing may be admitted to an authorized master's degree curriculum of the campus as unconditional master's students if they satisfactorily meet the professional, personal, scholastic, or other standards for admission to the master's degree curriculum, including qualifying examinations required by appropriate campus authority. Only those applicants who show promise of success and fitness will be admitted to the master's degree curricula. Only those who continue to demonstrate a satisfactory level of scholastic competence with a 3.0 (B) grade point average or better shall be eligible to proceed in such curricula. Graduation Writing Test requirements may or may not be satisfied.

### LIMITATIONS ON ADMISSIONS

The admission of postbaccalaureate students lacking degree or credential objectives may be limited or suspended because of limitations in facilities or staff. Master's degree or credential programs may be limited in enrollment whenever the lack of facilities and/or staff warrants.

### RE-ENROLLMENT OF CONTINUING POSTBACCALAUREATE STUDENTS

Whenever graduate students complete a degree objective and wish to continue taking course work at this university, they must complete a graduate application and pay the admissions fee.

### REAPPLICATION AFTER FAILURE TO ENROLL

Applicants who fail to register for the quarter for which they have been accepted will have their admission eligibility canceled. A new application must then be filed, and admission requirements existing for the term of the new application must be met.

All transcripts on file for students who apply but do not attend are kept for two years if the student so requests. These transcripts may be used for admission during that period. However, transcripts of any additional work completed since the original transcripts were filed must be requested by the applicant from the college(s) attended as part of the new application procedure.

### FORMER STUDENTS

Former students returning to the university after an absence of more than two consecutive quarters in a calendar year must file a complete

Required Admission Tests							
Program	GRE (General)	GRE (Subject)	GMAT	Program	GRE (General)	GRE (Subject)	GMAT
M.S. in Agriculture	X			Master of Electrical Engineering	X <sup>3</sup>	X <sup>3</sup>	
Master of Architecture				M.A. in English			
M.S. in Biological Science				M.A. in History			
Master of Business Administration			X	Master in Landscape Architecture			
M.S. in Business Administration				M.S. in Mathematics			
M.S. in Chemistry		X		M.S. in Kinesiology			
M.S. in Computer Science		X <sup>2</sup>		M.S. in Psychology	X	X	
M.S. in Economics				Master of Public Administration			
M.A. in Education	X			Master of Urban and	X <sup>4</sup>		
Master of Engineering	X <sup>3</sup>	X <sup>3</sup>		Regional Planning			

<sup>1</sup> GRE only required for Nutrition and Food Science Option; Sports Nutrition Option.  
<sup>2</sup> Fifty percentile or better required.  
<sup>3</sup> Under 3.0 undergraduate GPA in upper division courses in math, science and engineering; or undergraduate degree from a non-ABET accredited curriculum  
<sup>4</sup> Under 3.0 undergraduate GPA.

application for admission and pay the application fee. Former students absent for five or more years should request official transcripts from all institutions to be sent to the Admissions Office.

#### ADMISSION FROM NON-ACCREDITED SCHOOLS

Applicants who are graduates of nonaccredited schools but show evidence of unusual promise and superior background may petition the department concerned for conditional graduate student status and if the petition is granted may proceed in the graduate program.

#### FOREIGN APPLICANTS

Applicants from foreign countries should contact the Office of Admissions at least one year in advance of the quarter in which they seek admission so that they can supply all required materials.

#### TESTS AND EXAMINATIONS

##### TOEFL

Applicants with a bachelor's degree from a college of university, where the principal language of instruction was not English, must request official results of the Test of English as a Foreign language (TOEFL) to be mailed directly to the Admissions Office prior to admission. The TOEFL score requirement varies by department. A minimum TOEFL score of 550 (paper-based)/213 (computer-based) is required for all programs, except for MBA and Urban and Regional Planning that require a score of 580 (paper-based)/237 (computer-based), and English that requires a score of 585 (paper-based)/238 (computer-based). The essay portion is mandatory in certain programs.

Foreign nationals who are not graduates of Cal Poly Pomona will be accepted as graduate students only if they hold a baccalaureate degree from an accredited institution in the United States or Canada or have comparable academic credentials from a foreign country. The admission of international students to graduate status may be limited or suspended because of facility or staff limitations.

##### GRE and GMAT Test Requirements

Some departments require new graduate students enrolling at this university with a degree objective to take the General and/or Subject Test of the Graduate Record Examination (GRE) before admission.

The Graduate Management Admission Test (GMAT) is required for those who seek the Master of Business Administration degree or the degree of

Master of Science in Business Administration. Some departments also require the Subject Test of the Graduate Record Examination in their subject matter areas. Other departments require a locally developed qualification examination. Admission generally will depend upon test scores. See the respective departmental sections of this catalog and the preceding chart that contains required admission tests.

#### Graduation Writing Test (GWT) Requirement

All students subject to degree requirements listed in the 1977-78 and subsequent general catalogs must demonstrate competency in writing skills as a requirement for graduation. Based on action taken by the Academic Senate in 1978, writing competence at Cal Poly Pomona is assessed by means of a written test. All persons who receive undergraduate, graduate, or external degrees from Cal Poly Pomona must pass the Graduation Writing Test (GWT).

Graduate students are eligible to take the GWT upon entrance to the university and are required to take the GWT by the quarter following the completion of 8 units. If the GWT is not taken by this time, a hold will be placed on a student's registration materials. While a student's records are on hold, registration may not be allowed, nor will transcripts of credits be released.

Important information about specific exemptions from the test is contained in the GWT Study Guide and Information Bulletin, which is available to all students.

Since the GWT requirements are subject to modifications subsequent to the publication of this catalog, students are advised to check for up-to-date information on these requirements at the Test Center (CLA Building, Room P2-4).

Students who have passed the GWT in undergraduate status at Cal Poly Pomona will not be required to take the test again when they change to graduate student status.

Students who did not pass the GWT in undergraduate status and had the test waived (either for continuous enrollment or by special consideration) in order to receive their bachelor's degrees will be required to take AND pass the GWT before Advancement to Candidacy and a graduate degree may be awarded. The GWT cannot be waived for a second time. The waiver in undergraduate status applies only for the baccalaureate degree.

**GRADUATE AND POSTBACCALAUREATE SCHOLASTIC REQUIREMENTS****Standards of Graduate Study**

Graduate study deals with more complex ideas and demands more sophisticated techniques, searching analysis, creative thinking, and time than undergraduate study. The research required is extensive in both primary and secondary sources and a high quality of writing is expected.

A student seeking a graduate degree enjoys certain privileges not available to other students and is obligated to follow some procedures not required of those pursuing other objectives. Careful and prompt attention to required procedures should be followed in pursuing a master's degree program to prevent unnecessary confusion and delay. Although advisory services are provided to assist students, students alone are responsible for following the procedures and completing the steps required in a program. Failure of an advisor to remind a student of a requirement or deadline date is not acceptable as a basis for waiver of the requirement. Requirements for advanced degrees, both procedural and substantive, may be waived only upon a written request of the student and/or committee concerned and approved by the director of Academic Programs, and by the academic college dean, if required by college policy. Petition forms are available in department offices and in the office of the Graduate Studies analyst.

Students who wish to enroll in postgraduate courses before their transcripts or test scores have been transmitted to the department concerned may receive unofficial advisement by making an appointment with a graduate advisor at the appropriate department or school office. If the students bring their own copies of transcripts with them to the conference, the advisor can make specific suggestions, but the advisor can make no formal decisions on the basis of hand-carried transcripts.

**REQUIREMENTS FOR MASTER'S DEGREES**

Graduate programs are based upon adequate preparation at the undergraduate level. Students who plan to become candidates for a master's degree must hold a bachelor's degree substantially equivalent to that of California State Polytechnic University, Pomona in the discipline in which they intend to do their advanced work, or they must be prepared to undertake additional work to make up any deficiency.

Students seeking a master's degree at this university will submit an acceptable thesis, or project, or successfully pass a comprehensive examination after advancement to candidacy. See "Advancement To Candidacy" section in this catalog.

**General Requirements**

The requirements for graduation depend upon the master's degree program undertaken and upon the major field. The following requirements apply to all master's degrees offered by the university:

1. The program for the one-year master's degree must consist of not fewer than 45 units in courses numbered 300 (400 for Engineering and Business Administration) and above, with a minimum of 24 units of 500 and 600-level courses completed at the university consistent with departmental requirements. Work unacceptable for graduate credit in the institution where it was taken is not acceptable for graduate credit at this university. 300-level coursework may only be used with permission of the department.
2. A total limit of 13 transfer and/or extension and/or units petitioned for graduate credit may be included on a master's contract.
3. For lower division course work (100-200 level at this university), no graduate credit will be given.
4. All 600-699 courses are open only to graduate students classified as unconditional.
5. At least 32 units of upper-division and graduate-level offerings must be completed in residence at this university.
6. Two-year master's degrees have higher unit requirements than specified above. See detailed information in the appropriate sections of this catalog.
7. A minimum of 3.0 (B) average must be earned in all graduate work taken at this university while in postbaccalaureate standing and in degree programs. No course with a grade lower than "C" (2.0) may apply toward the fulfillment of degree requirements. Once a graduate study contract has been established, courses may be moved to or from the contract by means of a properly approved graduate petition, except for the purpose of improving GPA. Contract courses with a grade of "F" must be repeated with a passing grade.
8. A course may not be used for credit toward both a baccalaureate and a master's degree.
9. A graduation check must be received the quarter before graduation.
10. A thesis, a project, or a comprehensive examination is required in all programs.
11. A favorable vote of the department, school, or center faculty is required before the degree may be conferred.
12. A graduate student who expects to receive a degree at the end of any quarter must complete an application for graduation in the Evaluations Office prior to the deadline listed in the academic calendar. The student must be enrolled in the university the quarter he/she graduates. Degree requirements are outlined in departmental sections of this catalog. Students seeking a master's degree will be held responsible for meeting requirements applicable to the program of their choice and for fulfilling general master's degree requirements.
13. The Graduation Writing Test requirement must be fulfilled before Advancement to Candidacy.

**DEGREE PROGRAM OF STUDY (CONTRACT)**

At the time students are admitted to a master's degree curriculum, they should arrange with the advisor to prepare an official program. If they are admitted as unconditional graduate students, they should accomplish this step as soon as possible. A program must be prepared and submitted for approval no later than the end of the second quarter of attendance.

Any contracts filed beyond that date will not be accepted without justification by the graduate coordinator. If the contract is accepted, units taken beyond the 13-unit requirement may possibly not be included on the contract.

Students who do not file graduate contracts prior to the completion of the 13-unit requirement may have a hold placed on their fee bill and may face administrative disenrollment from the program if they are not able to show cause for non-compliance with the contract regulation.

When the program has been approved by the Graduate Studies analyst, a copy is sent to the student and to the advisor who has approved it. The original is retained by the Graduate Studies analyst. A copy is sent to the Evaluations Office and is used as the official record of the student's progress toward the degree.

The program must meet the following specifications:

1. It must comply with the general requirements outlined above and with departmental requirements listed in this catalog.

2. The complete program may be chosen from within the offerings of the major department or it may include offerings drawn from other fields acceptable to the major advisor or committee. In developing the program, the student and advisor will seek to plan a meaningful pattern of courses focused upon the objectives of the major and the student. If the student has deficiencies or lacks prerequisites to enroll in certain courses necessary to a program, he/she will be expected to complete them in addition to the minimum requirements of the approved master's degree program. Advisors will permit the use of already completed courses in a master's degree program only if they clearly fit into the requirements of the student's curriculum.
3. No course in teaching methods or directed teaching may be included in a master's degree program.
4. No more than 9 quarter units of credit for thesis or project may be included.
5. The master's degree program must be approved by the student's departmental advisor and verified by the Graduate Studies analyst. The approved program is an official agreement between the institution and the student.
6. Graduate students may not file for "Credit by Examination."
7. Work experience is not acceptable as fulfillment of any requirement

### ELECTION OF REQUIREMENTS

Graduate students remaining in continuous attendance may elect to meet the degree requirements in effect either (1) at the time they take their first course as a conditional or unconditional student in that degree program or (2) at the time they graduate. Substitutions for discontinued courses may be authorized or required by the department offering the degree.

### GRADUATE ENROLLMENT PRIORITIES

Departments with high graduate enrollments may assign priorities to students wishing to enroll in graduate-level courses. Applicants for a master's degree who are in the last quarter of residence have first priority; other unconditional graduate degree or credential students have second priority; conditional and undeclared graduate have third priority. Undeclared postbaccalaureate students are admitted on a space-available basis.

### MAXIMUM UNIT LOAD

The normal maximum load for graduate students is 16 units (Architecture allows 18 units). Exceptions may be made by the advisor. A student must petition for permission to carry over 16 units in one quarter. Maximum program limits will be waived only upon presentation of evidence of the student's ability to complete successfully such a group of courses. Graduate and postbaccalaureate students are considered as full-time for most purposes, such as veteran's benefits, when they are enrolled for 8 units.

### ADVANCEMENT TO CANDIDACY

Some type of culminating experience is required for each master's degree. Acceptable culminating experiences include thesis, project or comprehensive examination. Individual departments permit the experience in one or more forms.

It is only upon the removal of all conditions, having an approved contract on file, being in good academic standing (at least 3.0 GPA), completing all preparatory courses, and receiving a pass/waive on the GWT that the graduate student will be advanced to candidacy for his/her culminating experience for the master's degree.

### THESIS OR PROJECT

If a thesis or project is included in the degree program, the candidate may register for 695 (project) or 696 (thesis) only with approval of the major professor. Before registration for thesis, the candidate shall confer with the thesis advisor and have selected a thesis committee and a tentative subject. Each candidate registering for thesis or project is required to register each succeeding regular quarter until the work is complete in order to receive university services. However, total registration shall not exceed the number of units of thesis or project in the approved degree program. The candidate who has enrolled for the maximum number of units of thesis or project prior to completing the work, should register for 699 (Master's Degree Continuation) to avoid break in residence. During any break in residence, either non-enrollment or leave of absence, a candidate may not use university facilities or receive faculty assistance. When a candidate has failed to maintain resident status through non-enrollment or leave of absence after commencing a thesis or project, readmission to the program will require departmental approval. Since passing the final oral exam is a part of the completion of thesis in several disciplines, the graduate candidate must be enrolled the quarter the oral is taken.

A thesis or project in the official master's degree program will carry not fewer than 2 nor more than 9 units of credit depending upon departmental policy. When the thesis has been completed, the committee has signed the approval page, and there has been library clearance of the thesis, the credit for course 696 will be submitted by the professor to be recorded on the official transcript. Deadline dates for submission of the thesis to the Graduate Office can be found in the academic calendar and verified with the Graduate Coordinator. Projects (695) must be completed on the same time schedule but may have separate departmental rules for approval and submission.

The candidate must submit the approved original copy and one additional copy of the thesis to be deposited in the library. Arrangements for binding are made through the Graduate Studies Analyst. Further information is contained in the thesis instructional manual available from the Graduate Studies Analyst and in department offices.

The Cal Poly Pomona Foundation, Inc., offers a loan fund for candidates who find it impossible to finance master's degree thesis and project costs. Up to \$100 may be borrowed on a short-term basis. The loan is limited to direct costs for this purpose including research or other materials and reproduction and binding. Applications may be made through the University Financial Aid Office.

### PLAGIARISM

Students are hereby informed that the university considers plagiarism a serious academic offense which subjects those engaging in the practice to severe disciplinary measures. Moreover, some forms of plagiarism, the uses of purchased term papers, and pirated computer software, have been considered so serious that the state and federal governments have enacted laws providing for criminal penalties for use, sale or other distribution of such materials. Students are, therefore, cautioned against this and all other forms of plagiarism.

### COMPREHENSIVE EXAMINATION

A comprehensive examination may be required in lieu of a thesis or project as a culminating experience for the master's degree. When a comprehensive examination is an element in a candidate's approved degree program, it must be completed satisfactorily before the candidate will be certified to receive a master's degree.

The comprehensive examination is administered by a departmental graduate faculty committee under the leadership of the graduate

coordinator or major professor. A candidate for the master's degree at this university shall be permitted to take the comprehensive examination no more than two times. Failure to complete the examination satisfactorily the second time will result in termination of the candidate's master's degree program and of further registration in the department in which the candidate is enrolled.

In some departments credit is given for successful completion of parts of the comprehensive examination. There may then be different criteria than stated here for full compliance. Candidates will be fully informed of any departmental variations in requirements.

#### **FOREIGN LANGUAGE**

A reading knowledge of a foreign language may be required by some departments. A student should consult the advisor or the section of this catalog in which requirements for the degree field are given.

#### **TIME LIMIT**

The graduate degree program of not fewer than 45 units shall be completed within 7 years from the time the first course (including transfer courses) which applies to the degree requirements is started. This time limit, at the option of the university, may be extended for students who pass a comprehensive examination in the entire subject field or who validate the outdated work by examination. Such certification must be placed in the student's permanent file.

#### **GRADUATION CHECK FOR THE MASTER'S DEGREE**

Before the end of the third week of the quarter preceding that in which a candidate expects to receive the master's degree, an application for

graduation check must be completed. Written notification of status will be sent to the student usually about three weeks after application.

#### **GRADUATION**

Candidates must be enrolled in the university during the quarter in which they graduate.

An application for graduation must be filed at the Office of Evaluations no later than the date specified on the campus calendar. The graduation fee is paid at the Cashier's Office at that time. This fee includes the diploma cost. Participation in the annual commencement exercises is not mandatory but is strongly recommended. Commencement ceremonies are held once a year, in June. Diplomas may be obtained from the Records Office.

Verification that the master's degree has been awarded may be secured through an official transcript, ordered from the Registrar. If a letter of verification of completion of requirements is needed prior to the availability of a transcript, it will be provided by the Records Office upon request.

#### **PARTICIPATION IN GRADUATION CEREMONIES**

Graduate students who have not completed all of the graduation requirements may not participate in the June 2001 commencement ceremonies and thereafter.



## ACADEMIC POLICIES

### SCHOLARSHIP REQUIREMENTS

Master's degree students, conditional or unconditional (8000/6000), and credential students, conditional or unconditional (1000/7000) will be subject to disqualification and may be disqualified from the university if their cumulative grade point average falls below 3.0 (B) in upper-division and graduate courses after the second quarter of attendance.

Undeclared graduate students, noncertificate/noncredential, who have declared that they will be enrolling in either a master's degree program or a certificate/credential program, but have not entered such yet (3100), will be subject to disqualification and may be disqualified from the university if their cumulative grade point average falls below 3.0 (B) in upper-division and graduate courses after the second quarter of attendance. Maximum of 13 units, 300 level or above, may be taken while in undeclared classification. Graduate students may not use either the campus course repeat policy or academic renewal which apply only to undergraduate students.

Graduate students will be restored to good standing when they are no longer subject to disqualification. Graduate students admitted to a master's degree curriculum may be considered to be maintaining satisfactory progress provided they are fulfilling the conditions of their respective degree programs in a timely manner as determined by the graduate coordinator of the department concerned.

### DISQUALIFICATION/REINSTATEMENT FOR GRADUATE STUDENTS

In special instances, a disqualified graduate student may be permitted to be reinstated into a different graduate program. All cases involving the reinstatement of a disqualified graduate student must have the approval of the graduate committee in the new department and the Associate Vice President for Academic Programs.

Master's degree students and certificate/credential or 3100 students will be automatically disqualified at the end of any fall or spring quarter if they are 9 or more grade points below a 3.0 GPA. Students may petition through their respective graduate coordinators and/or department chairs to the Associate Vice President for Academic Programs for a variance under exceptional circumstances.

### MINIMUM GRADE POINT AVERAGE

If a graduate student has attempted all the courses in an approved master's degree program with less than a 3.0 (B) average in contract courses, with less than a 3.0 (B) average in graduate work at Cal Poly Pomona, or with less than a 3.0 average in all upper division and graduate work attempted while on graduate standing, the student's major department may (1) terminate the program, or (2) require the student to take additional courses in an attempt to raise the program grade point average to the minimum 3.0. When the student's major department recommends that he/she be allowed to do the latter, the additional courses selected must:

1. Be at least two courses at the 500-699 level and total not fewer than 6 quarter units.
2. Apply directly to the student's master's degree objective, although they need not be drawn from offerings in the student's major department.
3. Be new courses (courses previously completed but not originally listed in the master's degree program may not be used).

If the student fails to earn the minimum 3.0 (B) grade point average on completion of the revised master's degree program as outlined above, the program may be terminated without award of the master's degree.

Grades earned at another institution may not be used to offset grade point deficiencies in courses taken at this university.

A graduate petition is to be filed in the Office of Graduate Studies. In order to be accepted, such a petition must be reviewed and filed by the appropriate graduate coordinator and/or program director. The Associate Vice President for Academic Programs will consider each petition on an individual basis and will grant such approvals for deviation only after consultation with and approval by the appropriate graduate coordinator.

### TRANSFER CREDIT

If accepted by the faculty of the discipline involved, graduate credit (up to 13 units) from another accredited institution may be applied toward the master's degree. The stipulations under "Time Limit" apply to transfer courses.

Extended University course work (up to 13 units) may be used to satisfy prerequisites or degree requirements when such work is acceptable to the department or school offering the master's degree. See the appropriate sections for special regulations applying to professional master's degrees (more than 45 units). A limit of 13 transfer, Extended University, and/or units petitioned for graduate credit may be included on a contract. Correspondence courses may not be used to satisfy degree requirements.

### COURSES TAKEN BY UNDECLARED STUDENTS

Courses taken by a student while in undeclared, postbaccalaureate standing will be accepted in fulfillment of degree requirements only if the department and graduate advisor approve them. Such work taken when the student is not enrolled in a program must average "B" or better with no grades below "C," if the student wishes consideration for unconditional status for an advanced degree. The student must declare his/her chosen program by the time 13 units, 300 or above, have been completed.

Colleges and departments shall deny enrollment in graduate-level courses to undeclared postbaccalaureate students if such enrollment will prevent degree objective students from meeting requirements or may hamper their progress toward the master's degree.

### TRANSFER TO ANOTHER MASTER'S DEGREE PROGRAM

A student in good standing in a master's degree program may transfer to another program with the approval of the new department. The amount of credit transferred from one program to another will be determined by the new department. Credit earned at this university in one master's degree program may be carried from that program to another subject to approval.

### CONCURRENT ENROLLMENT IN POSTBACCALAUREATE PROGRAMS

A student may not enroll for a bachelor's and a master's degree or for two master's degrees concurrently. This does not apply to enrollment with the goal of obtaining a master's degree and a credential at the same time. Qualified students may request to enroll in a credential program concurrently with a master's degree at this university. For eligibility requirements, please refer to the appropriate program section in this catalog.

### CHANGES IN OBJECTIVE

Examples of graduate changes are: (1) Changing from one major field to another for the master's degree. (2) Changing from a certificate/credential objective to a master's degree objective. (3) Changing from a master's degree objective to a certificate/credential objective. (4)

Changing from no objective to some stated objective listed in this catalog. (5) Changing from conditional to unconditional objective. (6) Changing from certificate objective to credential objective.

The evaluation of credits transferred to the university is based primarily upon the student's objective. Thus, a change in objective may affect the acceptance of transfer credits. A student who wishes to change his/her objective from that indicated on the original application must follow these procedures:

1. Obtain a Petition to Change Graduate Degree Objective from the Graduate Studies Office or department office.
2. Obtain the signature of the graduate coordinator in the department to which he/she plans to transfer.
3. Submit a new graduate program in the new discipline to the Graduate Studies Office.

A student who discontinues working for a master's degree in one department to undertake master's work in another department shall replace the first master's program by one in the new field. Degree credit may be transferred from the original program, but the transfer of credits must be approved by the new department and the Graduate Studies Office.

### GRADING SYSTEM

(see undergraduate catalog section for complete definitions)

The university employs the following grading system for graduate courses:

- A Superior work, representing effective representation, unusual competence, and high skill.
- B Very good work, meeting full requirements for performance at the graduate level.
- C Adequate, meets minimum requirements of the course; acceptable for graduate credit, (2.0).
- D Minimally Acceptable Work; not acceptable for graduate contract work.
- F Unacceptable, below minimum requirements of graduate courses. CR/NC—Credit/No-Credit, see undergraduate section of catalog for definition.
- I Incomplete.
- AU Audit (no credit).
- SP Satisfactory Progress.
- W Withdrawal.
- RDR Report Delayed.

At the discretion of the instructor, plus and minus (+/-) grading symbols may also be granted. The grade points associated with each grade are as follows:

A = 4.0	C+ = 2.3	F = 0
A- = 3.7	C = 2.0	I = 0
B+ = 3.3	C- = 1.7	SP = 0
B = 3.0	D+ = 1.3	W = 0
B- = 2.7	D = 1.0	AU = 0
	D- = 0.70	U = 0

Every course included on a graduate contract requires a grade of "C" or higher to fulfill the requirements of the contract. A "C-" grade or lower

would not be acceptable and the course would have to be repeated.

The "SP" grade is approved for all university courses numbered 690-699. All "SP" symbols must be changed to letter grades within a one-year time-limit. The only exceptions are Project 695 and Thesis 696 which have two-year allowances. In any 600 level course, if not completed within the allotted time, the student must re-enroll to receive credit.

Refer to the undergraduate section of the catalog for detailed definitions of grading and administrative symbols.

Students, under the provisions of Executive Order 320, "Assignment of Grades and Grade Appeals," and Cal Poly Pomona University's "Statement of Student Rights, Responsibilities, and Grievance Procedures," may appeal grades that they consider to be unfair. In the appeal process, however, it is a basic presumption that the grades assigned to a student are correct. Thus, the burden of proof rests with the student who is appealing. For specifics of the appeal procedure, students should contact the Associate Vice President for Academic Programs or the Associate Vice President for Student Affairs.

### REPETITION OF COURSES

A graduate or postbaccalaureate student may not file a repeated course form, but may repeat a course if a grade of "C-" or less was assigned. Repeated grades will be averaged with other attempts.

### ACADEMIC RENEWAL

Academic renewal is not available to graduate students.

### RETROACTIVE WITHDRAWAL

See catalog section concerning retroactive withdrawal, which is available to graduate students.

### ADMINISTRATION OF GRADUATE PROGRAMS

The Associate Vice President for Academic Programs is responsible for leadership and coordination of graduate programs. The Graduate Council advises the Associate Vice President for Academic Programs in all matters of the university's graduate and post-baccalaureate programs. It also addresses issues that affect programs and students and serves as an advisory body to the administration in setting policies.

Each college program coordinator or director is responsible for establishing clear implementation procedures for individual programs and for administering those consistently and fairly in a manner that agrees with the Graduate Council and university policies. Autonomy within programs and colleges is preserved while overall policies and standards of excellence are maintained at a consistent level throughout the university. In addition, the larger programs have graduate committees that set specific program policies and standards, review student selection and academic progress, develop curriculum, and provide general guidance concerning program matters.

College graduate program directors/coordinators and department program coordinators regularly provide academic advising, oversee academic standards, and assist students. They are responsible for monitoring program quality. They approve student programs and petitions, schedule courses, coordinate faculty assignments, and review curriculum. Graduation procedures include a graduation check.

For more information contact the Office of Academic Programs, Building 98, Graduate Studies Analyst, (909) 869-3331.

## AGRICULTURE

### Master of Science in Agriculture

#### Agricultural Science Option

Flint Freeman, Graduate Coordinator, M.S. in Agriculture, Agricultural Science Option and Agricultural Education Advisor

#### Agricultural Science Concentration

The Master of Science degree in Agriculture, Agricultural Science option provides students the opportunity to enhance knowledge and competence in a selected area of specialization and encourages individual study and research. The curriculum is designed to assist individuals employed in a variety of agricultural occupations to become more proficient in research methodology and design, statistical analysis, utilization of technology, and in an advanced concentration area of their choice. Students desiring additional experience with industry can include as a part of their program an internship with an industry of their choice. This degree has successfully enhanced the careers of individuals employed in public schools, cooperative extension, food processing, marketing and distribution, public and private research organizations, and the agronomic and horticultural industries. Graduates of the program have been successfully employed throughout the world.

#### ADMISSION TO THE PROGRAM

An applicant for admission to the master's degree program in Agricultural Science should have a baccalaureate degree in agriculture. Applicants without a baccalaureate degree in agriculture will be required to take undergraduate level courses in the College of Agriculture prior to being unconditionally admitted into the program. A cumulative undergraduate grade point average of 2.75 overall, or 2.75 in the final 90 units of coursework, is required. In addition, the Department of Food Marketing and Agribusiness Management must receive three letters of recommendation from individuals familiar with the applicant's academic qualifications and potential as a graduate student. International students seeking admission into the program must achieve a score of 550 on the TOEFL. An applicant not meeting these standards may be conditionally admitted with the approval of the program's Graduate Admissions Committee. The conditional student must comply with the requirements of admission within three quarters.

The student, along with an appointed advisory committee, will develop a program by the end of the second quarter, based on the student's interests and preparation. The student's approved program will include required basic core courses, a selection of additional courses in a specialization, electives, independent study, and a thesis or comprehensive examination. The student must have on file an approved program within two quarters of admission to the master's program. Students electing to complete additional coursework and the comprehensive examination in lieu of the thesis must be agricultural education teachers.

#### Advancement to Candidacy

Admission to the program does not admit a student to candidacy for the degree. Advancement to Candidacy is contingent upon the recommendation of the graduate coordinator. A student who has not been admitted to candidacy is not eligible to register for the thesis (AGS 696) or comprehensive examination (AGS 697). In order to advance to candidacy for the Master of Science in Agriculture, Agricultural Science option, a student must: (1) complete at least 12 units of graduate coursework at Cal Poly Pomona with a GPA of 3.0 or better; (2) pass the Graduation Writing Test; and, (3) with the major professor and Graduate Coordinator, develop and file a program of study. The official program of

study must be prepared and submitted for approval no later than the end of the second quarter of attendance.

#### REQUIREMENTS

1. The degree program shall include a minimum of 45 quarter units of which at least 24 units shall be in graduate level courses. Additional coursework may be required to eliminate subject matter deficiencies.
2. A grade point average of 3.0 (B) or better must be maintained in all upper division undergraduate and all graduate courses. No course with a grade lower than "C" (2.0) may apply toward the fulfillment of degree requirements.
3. No more than 13 units of acceptable graduate credit may be transferred from another graduate institution. No more than 13 units taken through Extended University may be used on a contract. No more than 13 units of acceptable graduate credit may be petitioned by an undergraduate student. A total limit of 13 transfer, Extended University, and/or units petitioned for graduate credit may be included on a master's contract. The stipulated time limit of 7 years applies to all of the above.
4. Graduate students enrolled in the Single Subject Credential program who have completed their undergraduate degree may complete more than 13 units of the master's program prior to admission under the following conditions: (a) The student must meet the requirements for unconditional admission into the master's program; (b) prior permission from the department Graduate Coordinator must have been obtained.
5. The student will develop a program based upon the curriculum outline that follows, in consultation with the major professor and the department Graduate Coordinator and be approved by the Graduate Studies Analyst.
6. Advancement to Candidacy is required.
7. A candidate completing thesis must submit two final copies for binding in accordance with university regulations and successfully complete a final oral examination covering the thesis and the candidate's area of specialization.
8. The candidate must be enrolled in the university during the quarter of graduation.

#### CURRICULUM

##### Required Courses

Young and Adult Programs and Adult Leadership	.AGS	505/505L	(2/1)
Internship	.AGS	560	(1-3)
Statistics for Agriculture	.FMA	575	(4)
or Design and Analysis of Experimental			
Research	.AVS	545	
Directed Study	.AGS	591	(1-2)
Special Topics for Graduate Students	.AGS	599/599A/599L	(1-4)
Independent Study	.AGS	692	(1-2)
Comprehensive Examination (Credit/No Credit)	.AGS	697	(1)
Master's Degree Continuation	.AGS	699	(0)
Educational Computer Technology	.GED	505	(3)
Total units			(14-20)

##### Elective Courses

Units to be selected with consent of the student's major professor and graduate committee	(13-24)
Program total units	(45)

**GRADUATE COURSE DESCRIPTIONS****AGS 505/505L Young and Adult Programs and Adult Leadership (2/1)**

Organization, history, philosophy, administration and procedures in advising of the Future Farmers Association (FFA) chapters and conducting classes for out-of-school youth and adults. Surveys and plans for development of rural and urban adult programs, FFA and Young Farmer programs, techniques and methods. 2 lecture discussions; 1 two-hour activity. Concurrent enrollment required.

**AGS 560 Internship (1-3)**

On-the-job experience with public and private agencies for graduate students. Professional experience new to the student to enhance the level of competence in agriculture. One unit credit for each 40 hours of experience. Written reports necessary. Approval required before enrolling. Students are permitted to take only 1-3 units per quarter.

**FMA 575 Statistics for Agriculture (4)**

A summary of statistical tools and techniques used in agriculture. Application of computers to selected statistical techniques. Open to graduate students only. 4 lectures.

**AGS 591 Directed Study (1-2)**

Individualized study, research, or readings in a specialized area under the direction of a faculty member. May be repeated for a maximum of 4 units. Students are permitted to take only 1- 2 units per quarter.

**AGS 599/599A/599L Special Topics for Graduate Students (1-4)**

Group study of selected topics, the title to be specified in advance. Instruction by lecture, activity, laboratory or a combination. Prerequisite: permission of major professor and graduate committee.

**AGS 692 Independent Study (1-2)**

Individualized study, research, or readings in a specialized area proposed by the student and conducted under the direction of a faculty member. May be repeated for a maximum of 4 units. Students are permitted to take only 1-2 units per quarter. Unconditional standing required.

**AGS 697 Comprehensive Examination (1) (Credit/No credit)**

Preparation for and completion of the written comprehensive examination. The examination may be taken no more than two times. Failure to complete it satisfactorily the second time will result in termination from the program. Advancement to Candidacy required.

**AGS 699 Master's Degree Continuation (0)**

Registration or an approved leave of absence required for any quarter following the final assignment of the "SP" grade until the completion of the thesis or comprehensive examination. The candidate must be enrolled in the university during the quarter in which he/she graduates. Advancement to Candidacy required.

## AGRICULTURE

### Master of Science in Agriculture

Animal Science Option in the Department of Animal and Veterinary Sciences, College of Agriculture

Edward S. Fonda, Chair

Melinda J. Burrill, Graduate Studies Coordinator

The Master of Science degree program in Agriculture with an option in Animal Science provides students the opportunity to enhance their knowledge and competence in a selected area of specialization encourages individual study and research. The curriculum is designed to expose students to research techniques and the use of scientific literature, and to prepare them for positions of responsibility in animal production, business, or the related animal industries. The attainment of a master's degree also permits qualified candidates to pursue further specialized training, gain entrance to professional schools, or to pursue a Ph.D. degree. The degree program also allows an internship through which students may complement theoretical and technical studies and assure industrial orientation. Students in this program may pursue one of several areas of animal science: animal nutrition, animal breeding, meat science, or physiology.

### ADMISSION TO THE PROGRAM

An applicant for admission to the Master of Science program in Animal Science must have a baccalaureate degree in animal science or in a related area. An undergraduate grade point average of 2.5 or better with a 3.0 average in all upper division coursework and a minimum of college algebra and trigonometry are required for unconditional admission. In addition, the Department of Animal and Veterinary Sciences must have received three letters of recommendation from individuals familiar with the applicant's academic qualifications and potential as a graduate student. Applicants not meeting these standards may be conditionally admitted with the approval of the Department of Animal and Veterinary Sciences. The conditional student must comply with the requirements of the conditional admission within two quarters of that admission to the master's program. Students must also comply with any University requirements for admission to a graduate program.

The student along with an appointed advisory committee will develop a program by the end of the second quarter in a selected area of animal science based on the student's interest and preparation. The student's approved program will include required basic core courses, a selection of additional courses in a specialization, electives, independent study, and a thesis.

Admission to the program does not admit a student to candidacy for a degree. Advancement to Candidacy is required for registration in AVS 696 and the awarding of the M. S. degree. In order to advance to candidacy for the Master of Science in Agriculture with the Animal Science option, a student must: (1) pass the Graduation Writing Test or have it waived; (2) achieve a GPA of 3.0 (B) or better for at least 35 contract units.

### REQUIREMENTS

- The degree program will include a minimum of 45 quarter units of which at least 24 units shall be in graduate-level courses. Deficiencies in undergraduate preparation must be made up in addition to the 45 quarter units required for the degree.
- The student will develop a program based upon the curriculum outline that follows, in consultation with the major professor and the graduate advisory committee.
- No more than 13 units of acceptable graduate credit may be transferred from another graduate institution. No more than 13 units taken through Extended University may be used on a contract. No more than 13 units of acceptable graduate credit may be petitioned by an undergraduate student. A total limit of 13 transfer, Extended University, and/or units petitioned for graduate credit may be included on a master's contract. The stipulated time limit of 7 years applies to all of the above.
- Achieve Advancement to Candidacy.
- A grade point average of 3.0 (B) or better must be maintained in all upper-division undergraduate and all graduate courses.
- The candidate must complete a formal thesis and submit at least two final copies for binding in accordance with university regulations.
- A final oral examination covering the thesis and the candidate's area of specialization must be successfully completed.
- The candidate must be enrolled in the university during the quarter of graduation.

### CURRICULUM

#### Required Courses

Design and Analysis of Experimental Research . . . . .	AVS	545	(4)
New Research Proposal . . . . .	AVS	594	(1)
Animal Science Seminar . . . . .	AVS	598	(3)
Thesis Research . . . . .	AVS	694	(3-8)
Master's Degree Thesis . . . . .	AVS	696	(3)
Total units. . . . .			(14-19)

#### Animal Science Specialization Courses

To be selected with consent of the student's major professor and thesis committee. . . . . (22-30)

#### Elective Courses

To be selected from graduate level courses with consent of the students major professor and thesis committee . . . . . (4-7)

Program total . . . . . (45)

### GRADUATE COURSE DESCRIPTIONS

#### AVS 512 Nutritional Energetics (4)

The biochemical, physiological, and nutritional functions of energy transformation involved in the formation of animal products. 4 lecture discussions. Prerequisites: non-ruminant or ruminant nutrition, physiology, and biochemistry, or permission of instructor.

#### AVS 513/513L Computer Data Management and Analysis (2/2) Sp

Computer-aided data management and analysis, utilizing spreadsheets, database, and text editors to transfer data between microcomputers and minicomputers. Analysis of data utilizing PC-based spreadsheets, graphics and/or database software, and SAS system on IBM compatible microcomputers and VAX minicomputers. 2 lectures/problem-solving; 2 three-hour laboratories. Concurrent enrollment required. Prerequisite: AVS 428/428L or consent of instructor.

#### AVS 514 Population Genetics (3)

The population concept of genetics. The forces influencing gene frequencies in both equilibrium and dynamic populations; the development of breeding programs. 3 lecture discussions. Prerequisites: AVS 404/404A and BIO 411.

**AVS 520/520L Advanced Topics in Reproductive Physiology (3/1) Sp (Odd Years)**

Advanced study of the reproductive physiology of domestic animals. Study of the physiological processes of reproduction, from gametogenesis to parturition, for food-producing animals. Recent research into male and female reproductive physiology. 3 lectures, 1 three-hour laboratory. Concurrent enrollment required. Prerequisite: AVS 412 or AVS 414/414L.

**AVS 545 Design and Analysis of Experimental Research (4)**

Experimental statistics. Applications of statistical estimation and inference. Linear regression and correlation; analysis of variance for completely randomized design, randomized blocks, Latin squares, factorials and analysis of covariance; non-parametric statistics. Concepts of design for experimental investigations. 4 lecture discussions. Prerequisite: any course in statistics.

**AVS 547 Advanced Meat Science (3)**

Microstructure and chemistry of skeletal muscle and connective tissue. Chemical and physical changes during the conversion of muscle to meat and their relationship to meat quality and processing. Meat preservation. Analytical methods. 3 lecture discussions. Prerequisites: AVS 427/427L and CHM 321/321L, or consent of instructor.

**AVS 550/550L Advanced Topics in Animal Physiology (2/1) Sp (Even Years)**

An advanced study of the physiology of domestic farm animals. Recent research developments in animal physiology. Topics include in-depth discussion of the nervous, endocrine, digestive, respiratory, circulatory, and excretory systems. 2 lectures, 1 three-hour laboratory. Concurrent enrollment required. Prerequisite: AVS 350/350L or equivalent.

**AVS 560 Graduate Internship in Animal Science (1-4)**

On-the-job experiences in areas of animal science that best complement the professional objective of the student. May be repeated for a maximum of 4 units. Prerequisite: consent of internship coordinator.

**AVS594 New Research Proposal (1)**

The preparation and presentation of the proposed thesis research problem to the faculty of the Department of Animal and Veterinary Sciences and interested public. The student will develop and present, with the aid of the major professor, the scientific and statistical hypotheses, research design, proposed analytical methodologies, as well as a substantial selection from the literature review demonstrating the need and validity of the proposed thesis study. Prerequisite: Graduate Standing.

**AVS 598 Animal Science Seminar (1)**

Study of selected topics in animal science. 1 seminar. Minimum of 3 units required.

**AVS 599/599A/599L Special Topics for Graduate Students (1-4)**

Group study of a selected topic, the title to be specified in advance. Instruction is by lecture, laboratory, activity or a combination. Prerequisite: permission of major professor and graduate committee.

**AVS 691 Directed Study (1)**

Individual research in a specialized area, directed by a faculty member. Work does not pertain directly to the thesis. May be repeated. Maximum credit 4 units. Unconditional standing required.

**AVS 692 Independent Study (1)**

Research proposed by the student, conducted under the supervision of a faculty member. Work does not pertain directly to the thesis. May be repeated. Maximum credit 4 units. Unconditional standing required.

**AVS 694 Thesis Research (3-8)**

Individual research pertaining directly to the thesis, under the supervision of the major professor. May be repeated. Maximum credit 9 units. Unconditional standing required.

**AVS 696 Master's Degree Thesis (1-3)**

Compilation of data culminating in the summarizing and reporting, in approved thesis form, of independent supervised research. Total credit limited to 3 units. Prerequisite or concurrent: AVS 694. Advancement to Candidacy required.

**AVS 699 Master's Degree Continuation (0)**

Enrollment in this course is for students who have completed all course work but who must be enrolled in the university in the quarter in which they graduate. Advancement to Candidacy required.

## AGRICULTURE

### MASTER OF SCIENCE IN AGRICULTURE

Nutrition and Food Science Option in the Department of Food, Nutrition and Consumer Sciences, College of Agriculture.

Anahid T. Crecelius, Department Chair  
Mark S. Meskin, Graduate Coordinator

The Master of Science in Agriculture with the option in Nutrition and Food Science offers interdisciplinary in-depth study of the principles and application of nutritional and food sciences. The program is structured to meet the objectives of both the generalist and those seeking specialization in one of the following areas: nutritional biochemistry, community nutrition, clinical nutrition, or food science. The successful candidate will acquire skills to pursue careers in teaching, research, community service, or industry or pursue advanced graduate studies. The teaching format includes discussions, laboratory work, field experiences, seminars and independent research.

The Departments of Food, Nutrition and Consumer Sciences and Kinesiology and Health Promotion now offer an option in Sports Nutrition under both the Master of Science in Agriculture and the Master of Science in Kinesiology programs. Refer to Sports Nutrition section in this catalog.

### ADMISSION TO THE PROGRAM

An applicant for admission to the Master of Science program in Nutrition and Food Science must have a baccalaureate degree in Foods and Nutrition or a baccalaureate degree with a minimum of 24 quarter units of courses in foods and nutrition and 12 units in closely related areas such as biochemistry, physiology, or microbiology from an accredited university. Science classes, (i.e. physiology, biochemistry, microbiology) will include a minimum of 3 hours laboratory experience per week. An undergraduate grade point average of 3.0 and the GRE are required for unconditional admission. Graduates of foreign institutions should have a TOEFL score of 580 or better. In addition, the Department of Food, Nutrition and Consumer Sciences must be in receipt of three letters of recommendation from individuals familiar with the applicant's academic qualifications and potential as a graduate student. Applicants not meeting these standards may be conditionally accepted and must meet the requirements for unconditional admission within two quarters of their acceptance into the master's program. Admission to the program does not admit a student to candidacy for a degree.

### ADVISORY COMMITTEE

The student and the graduate coordinator will develop a program by the end of the second quarter of admission in a selected area of nutrition or food science based on the student's interest and preparation. The student's approved program will include required core courses, a selection of additional courses in a specialization, electives and a thesis.

### REQUIREMENTS

1. The degree program shall include a minimum of 45 quarter units of which at least 24 units shall be in graduate 500 and 600-level courses. Deficiencies in undergraduate preparation must be made up in addition to the 45 quarter units required for the degree.
2. The student will develop a program based upon the curriculum outline that follows, in consultation with the major professor.
3. No more than 13 units of acceptable graduate credit may be transferred from another graduate institution. No more than 13 units

taken through Extended University may be used on a contract. No more than 13 units of acceptable graduate credit may be petitioned by an undergraduate student. A total limit of 13 transfer, Extended University, and/or units petitioned for graduate credit may be included on a master's contract. The stipulated time limit of 7 years applies to all of the above.

4. A grade point average of 3.0 (B) or better must be maintained in all upper-division undergraduate and all graduate courses. A grade point of 3.0 (B) or better must be maintained in all core courses.
5. A candidate must achieve Advancement to Candidacy. Advancement to Candidacy is required for registration in FN 696, Thesis, and for awarding of the master's degree. In order to advance to candidacy for the Master of Science in Agriculture, Nutrition and Food Science option, the student must (a) pass the Graduate Writing Test; (b) achieve a GPA of 3.0 or better; (c) satisfactorily complete a written examination in the field studied; (d) successfully complete FN 693 Presentation of Research Proposal.
6. The candidate must complete a formal thesis. The thesis must be presented and defended no later than the third week of the quarter in which the candidate expects to graduate. Two copies must be submitted for binding in accordance with university regulations.
7. The candidate must be enrolled in the university during the quarter of graduation.

### REQUIRED CORE COURSES

Seminar in Nutrition or Food Science . . . . .	FN	570	(4)
Presentation of Research Proposal . . . . .	FN	693	(1)
Thesis Research in Nutrition or Food Science . . . . .	FN	694	(6)
Master's Degree Thesis . . . . .	FN	696	(3)
Total . . . . .			(14)

### Courses Strongly Recommended for Nutrition Specialization:

Advanced Nutrition . . . . .	FN	533	(3)
Recent Advances in Nutrient Metabolism* . . . . .	FN	535	(3)

### Courses Strongly Recommended for Food Science Specialization:

Advanced Food Chemistry . . . . .	FN	520	(3)
Recent Advances in Nutrient Metabolism# . . . . .	FN	535	(3)

\*Choose at least three of the five different topics; see course descriptions for more information.

#Choose at least one of the five different topics; see course descriptions for more information.

### Nutrition: Suggested Courses

Epidemiology . . . . .	MIC	330	(3)
General Virology . . . . .	MIC	430/430L	(3/2)
Hematology . . . . .	MIC	444/444L	(3/1)
Human Genetics . . . . .	BIO	403/403L	(3/1)
Population Genetics . . . . .	BIO	445/445L	(3/1)
Endocrinology . . . . .	BIO	520/520L	(3/1)
Renal Physiology . . . . .	BIO	521	(3)
Molecular Biology of Development . . . . .	BIO	555	(4)
Cellular Immunity and Disease . . . . .	BIO	570/570L	(3/1)
Advanced Physiology of Exercise . . . . .	KIN	683/683L	(3/1)
Advanced Concepts in Exercise Testing and Counseling . . . . .	KIN	684	(3)

## Food Science: Suggested Courses

Strength of Biological Materials	AE	330	(3)
Food Process Engineering	AE	332/332L(3/1)	
Meat Utilization	AVS	327/327L(3/1)	
Seafood and Poultry Processing Technology	AVS	328/328A(3/1)	
Nutritive Analysis	AVS	424	(2)
Meat Processing and Technology	AVS	427/427L	(3/2)
Applied Thermodynamics	ETM	306	(4)
Applied Heat Transfer	ETM	308	(3)
Machine Elements/Laboratory	ETM	315/325L(3/1)	
Applied Total Quality Management	ETP	300	(3)
Industrial Safety	ETP	302	(3)
Quality Assurance	ETP	375	(3)
Polymer Chemistry	CHM	409	(3)
Chemical Thermodynamics	CHM	415	(3)
Solution Equilibria in Analytical Chemistry	CHM	421	(2)
Enzymology	CHM	451/451L(3/1)	
Agribusiness Marketing	FMA	504	(4)
Commodities and Risk Management	FMA	505	(4)
Essentials of Marketing Management	GBA	517	(4)
Production and Operations Management	GBA	531	(4)
Organizational Management Principles and Behavior	GBA	535	(4)
Advanced Engineering Thermodynamics	EGR	545	(4)
Heterogeneous Phase Equilibria	EGR	546	(4)

These are not all-inclusive courses. Student may choose others in consultation with their graduate advisor.

Nutrition and Food Science Specialization courses to be selected with consent of the student's major professor from 300, 400, 500 and 600 level courses with no more than 21 units from 300 and 400 level courses.

## GRADUATE COURSE DESCRIPTIONS

**FN 520 Advanced Food Chemistry (3)**

Selected advanced topics on chemical properties and changes in foods and their role in food processing and preservation. Prerequisite: FN 420/420L or equivalent.

**FN 533 Advanced Nutrition (3)**

Coordination of structure and function related to metabolic needs of specialized cells and their environmental response. Interrelationship of metabolism, physiological roles and nutrition. Comprehensive study of control of food intake. Oral presentation and evaluation of current studies in nutrition. 3 lecture/discussions. Prerequisites: FN 433, 434, 435 or equivalent or consent of instructor.

**FN 535 Recent Advances in Nutrient Metabolism (3)**

Recent developments and research in nutrient metabolism. A major nutrient class (proteins, fats, carbohydrates, vitamins and minerals) to be studied during each quarter.

Each course to be subtitled identifying the nutrient class to be discussed. 3 lecture/discussions. Maximum of 9 units may be earned. Prerequisites: FN 433, 434, and 435 or equivalent or consent of instructor.

**FN 536 Nutrition Through the Life Cycle (3)**

Nutrient requirements and food needs as modified by developmental and behavioral changes during pregnancy and lactation, periods of growth, adulthood and old age. Planning diets to promote and maintain health of specific age groups. Oral presentation and discussion of

special nutritional problems of the life cycle. 3 lecture/discussions. Prerequisite: graduate standing.

**FN 538/538L Research Methods (1/1)**

Contemporary research techniques and methods used in the field of nutrition. Interpretation of data in relationship to the nutritional status of humans and experimental animals. 1 lecture discussion, 1 three-hour laboratory. Concurrent enrollment required. Prerequisites: FMA 575 or equivalent.

**FN 540 Field Experience (2)**

Supervised experience in various areas determined by graduate advisor. Prerequisite: consent of advisor.

**FN 543 Diet Therapy (3)**

Study of the physiological and biochemical changes imposed on the body by certain diseases and dietary modifications used for treatment. Adaptation of dietary patterns of individuals to special needs of disease states and preventative care. 3 lecture discussions. Prerequisite: FN 433, FN 434 or equivalent.

**FN 545 Current Topics in Clinical Practice (3)**

Presentations by professionals on selected topics. Student case presentations. To be taken concurrently with FN 560 Clinical Practice. Prerequisite: acceptance into Dietetic Internship. No graduate credit given.

**FN 550 Independent Study (1-2)**

Individual investigation and original study to be conducted in a field of interest selected by the student with consent of advisor. Designed to meet individual student needs. Maximum of 2 units may be earned.

**FN 560 Clinical Practice I, II, III (3, 3, 3)**

Supervised preprofessional practice in an assigned clinical site. Does not count towards completion of master's degree. Maximum of 9 units. To be taken concurrently with FN 545 Introduction to Clinical Practice. CR/NC grading. Prerequisite: acceptance into Dietetic Internship. No graduate credit given.

**FN 570 Seminar (2-4)**

Study of selected topics in foods and nutrition. Each seminar subtitled to describe its emphasis. Total credit limited to 4 units. 2 seminars. Prerequisite: consent of instructor.

**FN 599/599A/599L Special Topics (1-3)**

Group study of a selected topic, the title to be specified in advance. Total credit limited to 3 units. Instruction is by lecture, laboratory, activity, or a combination. Prerequisite: permission of major professor and graduate committee.

**FN 691 Directed Study (1-2)**

Individualized research in a specialized area under the direction of a faculty member which may or may not lead to a thesis. Maximum credit 2 units.

**FN 692 Independent Study (1-2)**

Individual investigation and original study to be conducted in a field of interest selected by the student under the supervision of a faculty member. Study may not lead to a thesis. Maximum credit 2 units. Unconditional standing required.



**FN 693 Presentation of Research Proposal (1)**

A public oral presentation and discussion of a written proposed research plan for the master's thesis. Required for Advancement to Candidacy. Prerequisites: ABM 575 and FN 538/538L or KIN 590 and KIN 591 or equivalent with consent of graduate coordinator or thesis advisor. Unconditional standing required. No graduate credit is given.

**FN 694 Thesis Research (1-6)**

Individual research in an area of specialization conducted as part of the preparation for writing a thesis under the direction of graduate faculty. Maximum credit 6 units. Unconditional standing required. Must have completed FN 693.

**FN 696 Master's Degree Thesis (3)**

Compilation of data culminating in the summarizing and reporting, in thesis form, of independent supervised research. Maximum credit 3 units. Advancement to Candidacy required.

**FN 699 Master's Degree Continuation (0)**

Registration or an approved leave of absence is required for any quarter following the final assignment of the grade "SP" until the completion of thesis and final oral examination. The candidate must be enrolled in the university during the quarter in which he/she graduates. Advancement to Candidacy required.



## AGRICULTURE

### Master of Science in Agriculture

### Master of Science in Kinesiology

### Sports Nutrition Option

A joint program in the College of Letters, Arts, and Social Sciences, Department of Kinesiology and Health Promotion, and the College of Agriculture, Department of Food, Nutrition and Consumer Sciences.

Dr. Wanda Rainbolt, Graduate Coordinator, Department of Kinesiology and Health Promotion

Dr. Mark S. Meskin, Graduate Coordinator, Department of Food, Nutrition and Consumer Sciences

The Sports Nutrition graduate study option is an interdisciplinary program offered jointly by the Kinesiology and Health Promotion Department and the Food, Nutrition and Consumer Sciences Department. It is designed for students interested in pursuing graduate work which integrates nutrition science and human performance.

The curriculum has been developed to provide an advanced understanding of nutrition science and exercise physiology and to facilitate the pursuit of a variety of careers in clinical and/or applied settings. The curriculum consists of a required core area and a restricted electives area. Students can choose courses from the electives area in accordance with their particular interest and goals. Students are expected to meet all of the prerequisites for the core courses.

### ADMISSION TO THE PROGRAM

An applicant for admission to the program must have received a baccalaureate degree in kinesiology or foods and nutrition or a related discipline from an accredited institution. A student with a baccalaureate degree in a major other than kinesiology or foods and nutrition may be admitted subject to review of the student's performance and academic background by the graduate coordinators of the respective departments. The student must file complete application forms, three letters of recommendation, a statement of purpose, and official transcripts from all colleges and/or universities attended.

### CURRICULUM

#### REQUIRED CORE (19- 21 units required)

Research Methods in Nutrition/Laboratory	.FN	538/538L	(1/1)
or Research Methods	.KIN	590	(3)
Statistics for Agriculture	.FMA	575	(4)
or Research Design	.KIN	591	(3)
Advanced Nutrition	.FN	533	(3)
Physiology of Exercise/Laboratory	.KIN	683/683L	(3/1)
Advanced Exercise Testing and Counseling	.KIN	684	(3)
Nutrition in Sports and Exercise	.FN/KIN	685	(4)

#### RESTRICTED ELECTIVES (15- 23 units required)

Sports Medicine	.KIN	455	(4)
Exercise Metabolism and Weight Control	.KIN	456	(3)
Advanced Nutrition I	.FN	433	(4)
Advanced Nutrition II	.FN	434	(4)
Advanced Nutrition III	.FN	435	(3)

Recent Advances in Nutrient Metabolism (may be repeated)	.FN	535	(3)
Seminar	.FN	570	(2-4)
Immunology-Serology/Laboratory	.MIC	415/415L	(3/2)
Hematology/Laboratory	.MIC	444/444L	(3/1)
Endocrinology/Laboratory	.BIO	520/520L	(3/1)
Cellular Immunity and Disease/Laboratory	.BIO	570/570L	(3/1)
Advanced Topics in Biology (as pertinent and with approval)	.BIO	575	(2)
Bioethics	.PHL	433	(4)
Theories of Counseling	.PSY	412	4

### TERMINAL REQUIREMENT

Thesis . . . . .KIN/FN 696 (3-9)

(Core courses must be completed and students must be Advanced to Candidacy prior to enrolling in thesis)

Total units required 45

### GRADUATE COURSE DESCRIPTIONS

See Biological Sciences, Philosophy, and Psychology for other course descriptions.

#### KIN 590 Research Methods (3)

Study the nature of research and the various methods for acquiring information relevant to the profession. 3 lecture discussions.

#### FN 538/538L Research Methods in Nutrition (1,1)

Contemporary research techniques and methods used in the field of nutrition. Interpretation of data in relationship to the nutritional status of humans and experimental animals. 1 lecture discussion; 1 three-hour laboratory. Concurrent enrollment required. Prerequisites: ABM 575 or equivalent.

#### KIN 591 Research Design (3)

Examine the nature and role of applying and interpreting statistical techniques for specific problems related to our professional field. 3 seminars. Prerequisite: KIN 590.

#### FMA 575 Statistics for Agriculture (4)

A summary of statistical tools and techniques used in agriculture. Application of computer to selected statistical techniques. 4 lecture discussions.

#### KIN 683/683L Advanced Physiology of Exercise (3/1)

The physiological and biochemical adjustments made by the body during exercise and changes which result from prolonged periods of intensive physical training. 3 seminars. 1 two-hour laboratory. Prerequisite: KIN 303/303L.

#### KIN 684 Advanced Concepts in Exercise Testing and Counseling (3)

Advanced concepts of graded exercise testing (GXT), interpretation, and counseling. GXT preparation, administration, and evaluation. Modes and purposes of GXT, exercise electrocardiography, energy cost calculation, and principles of exercise prescription. Special considerations for select population groups and case study preparation. 1 three-hour lecture/problem-solving. Prerequisite: KIN 683/683L.

**KIN 685/FN 685 Nutrition in Sports and Exercise (4)**

Knowledge concerning the role of nutrients in optimizing human performance. Assessment of caloric and nutrient requirements associated with exercise. Special consideration is given to gender specific needs of athletes, nutritional ergogenic aids, and eating disorders. 4 seminars. Prerequisites: KIN 683/683L and FN 533.

**KIN 696 Master's Degree Thesis (3)**

Development of a terminal creative research report on a topic selected by the student approved by the department graduate studies committee and submitted to the faculty as evidence of his/her mastery of the principles of the profession. May be scheduled for a maximum of 9 units. Prerequisite: KIN 591, except Sport History. Advancement to Candidacy required.

**FN 696 Master's Degree Thesis (3)**

Compilation of data culminating in the summarizing and reporting, in thesis form, of independent supervised research. May be repeated for a maximum of 9 units. Advancement to Candidacy required.

**KIN 699 Master's Degree Continuation (0)**

Registration or an approved leave of absence is required for any quarter following the final assignment of the grade "SP" until the completion of thesis and final oral examination. The candidate must be enrolled in the university during the quarter in which he/she graduates. Advancement to Candidacy required.

**FN 699 Master's Degree Continuation (0)**

Registration or an approved leave of absence is required for any quarter following the final assignment of the grade "SP" until the completion of thesis and final oral examination. The candidate must be enrolled in the university during the quarter in which he/she graduates. Advancement to Candidacy required.



## AGRICULTURE

### Master of Science in Agriculture

#### Plant Science Option

In the Department of Horticulture, Plant and Soil Science

Daniel G. Hostetler, Chair

Peggy S. McLaughlin, Graduate Coordinator

The Plant Science Option in the Master of Science in Agriculture allows students to develop knowledge and competence in a specialized area of agricultural biology, agronomy, horticulture or soil science through individualized study and research. The program is designed to build upon a strong background in the physical, natural and agricultural sciences. Graduate students may concentrate on enhancing their skills in research methodology and design and statistical analysis, or they may choose to apply their specialized study in an education, management and/or public policy. The Option in Plant Science allows students to pursue the degree under two different tracks. The Research Track will provide students with the opportunity to gain expertise in biological research methodologies as applied to plant, soil and entomological problems. This degree will prepare students for technical and research positions within the industry and/or with the sound scientific grounding necessary for continuing on to a Ph.D. program. The Professional Track provides an opportunity for students who wish to combine graduate courses in the plant, soil and entomological sciences with interdisciplinary preparation in design, business management, communications, public policy or the social sciences. These students normally do not plan to continue on in a research-based Ph.D. program, and would seek employment in the public sector in education, management, or other non-research industry positions.

Students on both the Research Track and the Professional Track will complete a master's thesis.

#### ADMISSION TO THE PROGRAM

An applicant for admission to the Plant Science Option in the M.S. degree program in Agriculture should have a baccalaureate degree in agricultural biology, agronomy, horticulture or soil science, or in a closely related field. Applicants without such a degree will be required to take undergraduate level courses in the Colleges of Agriculture and Science prior to being admitted to the program. A cumulative grade point average of 2.75 overall is required, but at least a 3.0 is preferred in all agriculture and science courses. In addition, three letters of recommendation are required from individuals familiar with the applicant's academic qualifications and potential as a graduate student. All applicants are required to take the Graduate Record Examination General Test. International students seeking admission into the program must present a score of 550 on the TOEFL Exam. An applicant not meeting these standards may be conditionally admitted with the approval of the program's Graduate Admission Committee. The conditional student must comply with the requirements of admission within two quarters.

The student, along with an appointed advisory committee, will develop a program by the end of the second quarter based upon the student's interests and preparation. This will include the selection of a major professor to direct the thesis work. The student's approved program will include required basic core courses, a selection of additional courses in a specialization, electives, independent study, and a thesis. The approved program must be on file by the end of the second quarter of unconditional admission to the program.

Please note that the department has established submission deadlines to allow for sufficient time to consider application packages. Contact the department for these dates.

#### ADVANCEMENT TO CANDIDACY

Admission to the program does not admit a student to candidacy for the degree. Advancement to Candidacy is contingent upon the recommendation of the Graduate Coordinator and the student's advisory committee. A student who has not been admitted to candidacy is not eligible to register for the thesis/project (HPS 696). In order to qualify for Advancement to Candidacy for the Master of Science in Agriculture, Option in Plant Science, a student must: (1) complete at least 24 units of graduate coursework at Cal Poly with a GPA of 3.0 or better, (2) pass the Graduation Writing Test, and (3) with the major professor and Graduate Coordinator.

#### REQUIREMENTS

1. The degree program shall include a minimum of 45 quarter units of which at least 24 units shall be in graduate level courses. Additional coursework may be required to eliminate subject matter deficiencies. Courses at the 300 level may apply toward the fulfillment of degree requirements only with permission of the Graduate Coordinator.
2. A grade point average of 3.0 (B) or better must be maintained in all upper division undergraduate and all graduate courses. No course with a grade lower than "C" (2.0) may apply toward the fulfillment of degree requirements.
3. No more than 13 units of acceptable graduate credit may be transferred from another graduate institution. No more than 13 units taken through Continuing Education may be used on a contract. No more than 13 units of acceptable graduate credit may be petitioned by an undergraduate student. A total limit of 13 transfer and/or Continuing Education and/or units petitioned for graduate credit may be included on a master's contract. The stipulated time limit of 7 years applies to all of the above.
4. The student will develop a program based upon the curriculum outline that follows, in consultation with the major professor and the department Graduate Coordinator and with the approval of the Graduate Studies Analyst.
5. Advancement to Candidacy is required.
6. The candidate must complete a graduate formal thesis and submit at least two final copies for binding in accordance with University regulations.
7. A final oral examination covering the thesis and the candidate's area of specialization must be successfully completed.
8. The candidate must be enrolled in the University during the quarter of graduation.

#### THE CURRICULUM

##### Required courses

Design and Analysis of Experimental Research . . . . .	AVS	545	(4)
Advanced Topics in Plant/Environmental Science . . . . .	HPS	510	(3)
Seminar in Agricultural Biology . . . . .	AGB	550	(3)
and/or			
Seminar in Agronomy . . . . .	AGR	550	(3)
and/or			
Seminar in Horticulture . . . . .	HOR	550	(3)
and/or Seminar in Soil Science . . . . .	SS	550	(3)

Student required to take 3 seminars.....	(9)
Thesis/Project Research .....HPS 694	(1-6)
and Master's Degree Thesis/Project .....HPS 696	(1-6)
Subtotal .....	(18-28)
<b>Elective courses</b>	
To be selected with consent of the student's major professor and graduate committee .....	(17-27)
Total.....	(45)

## GRADUATE COURSE DESCRIPTIONS

### HPS 510 Advanced Topics in the Plant and Environmental Sciences (3)

Advanced study of topics related to agronomy, horticulture, soil science and economic entomology. To include perspectives on plant biotechnology, trends in public policy related to environmental regulation, and advances in plant nutrition and soil management. Recent research in the field will be examined. Reading and reports on papers in the literature. 1 three-hour seminar. Prerequisite: unconditional graduate standing or consent of instructor.

### AGB 550 Seminar in Agricultural Biology (3)

Analysis and discussion of a selected topic in Agricultural Biology based upon examination of the literature, recent research advancements, and exposure to professional issues. May be repeated. 1 three-hour seminar. Prerequisite: consent of instructor.

### AGR 550 Seminar in Agronomy (3)

Analysis and discussion of a selected topic in Agronomy or Soil Science based upon examination of the literature, recent research advancements, and exposure to professional issues. May be repeated. 1 three-hour seminar. Prerequisite: consent of instructor.

### HOR 550 Seminar in Horticulture (3)

Analysis and discussion of a selected topic in Horticulture based upon examination of the literature, recent research advancements, and exposure to professional issues. May be repeated. 1 three-hour seminar. Prerequisite: consent of instructor.

### SS550 Seminar in Soil Science (3)

Analysis and discussion of a selected topic in Soil Science based upon examination of the literature, recent research advancements, and exposure to professional issues. May be repeated for credit. 1 three-hour seminar. Prerequisite: consent of instructor.

### HPS 591 Directed Study (1-2)

Individualized study, research, or readings in a specialized area under the directed of a faculty member. May be repeated for a maximum of 4 units. Students are permitted to take only 1-2 units per quarter.

### HPS 692 Graduate Independent Study (1-4)

Independent study and research on a subject chosen by the student with the consultation, approval, and direction of an advisor. Course may be repeated. Maximum credit: 6 units. Unconditional graduate standing required.

### HPS 694 Thesis/Project Research (1-3)

Research conducted as part of the preparation for writing a thesis or preparing a graduate project. Open only to unconditional graduate students with the approval of the graduate advisor. May be repeated for a maximum of 6 units. Students are permitted to take only 1-3 units per quarter.

### HPS 696 Master's Degree Thesis/Project (1-3)

Compilation, evaluation, interpretation, and presentation in thesis or project form of supervised research. May be repeated for a maximum of 6 units. Students are permitted to take only 1-3 units per quarter.

### HPS 699 Master's Degree Continuation (0)

Registration or an approved leave of absence is required for any quarter following the final assignment of the "SP" grade until the completion of the thesis or project. The candidate must be enrolled in the university during the quarter in which he/she graduates. Advancement to Candidacy required.

## AGRICULTURE

### CAREER MBA

#### Agribusiness Emphasis

A joint program in the College of Business Administration and the Food Marketing and Agribusiness Management/Agricultural Education Department.

Marvin L. Klein, Graduate Program Advisor

The Agribusiness emphasis in the Career MBA program is designed to prepare students for careers in the dynamic and rapidly changing agricultural and food system. Graduates of agricultural disciplines, business schools, and the social sciences will benefit from this program. By combining the broad-based skills provided in the MBA program with the more specialized knowledge of the domestic and world agricultural and food system, graduates will be prepared to accept challenging and exciting positions in the food and fiber industries. The program stresses the areas of agribusiness marketing, commodities and risk management, international agribusiness marketing, and the environment of the agribusiness firm.

#### ADMISSION TO THE PROGRAM

An applicant for admission to the agribusiness emphasis in the Career MBA program must meet the requirements for admission to the MBA program. Selection will be on the basis of evidence of ability to perform at a high academic level. The following criteria are considered: the undergraduate grade point average, scores on the Graduate Management Admissions Test, work experience, letters of recommendation, and the applicant's personal statement or interview. (See Business Administration, Admission to the Program and Requirements.)

#### CURRICULUM

Agribusiness Emphasis

First year (See Graduate Program Advisor)

Career MBA Core

Managerial Account for Decision-Making/ Directed Study . . . . .	.GBA	608/609	(3/1)
Seminar in Organizational Behavior/ Directed Study . . . . .	.GBA	615/616	(3/1)
Management Science Seminar/Directed Study . . . . .	.GBA	628/629	(3/1)
Financial Decision-Making/Directed Study . . . . .	.GBA	645/646	(3/1)
Management Policies and Strategies Practicum/Directed Study . . . . .	.GBA	687/688	(3/1)
Required Courses			
Commodities and Risk Management . . . . .	.FMA	505	(4)

Choose four elective units from the following seminar courses:

Information Systems Seminar/Directed Study . . . . .	.GBA	673/674	(3/1)
or Marketing Seminar/Directed Study . . . . .	.GBA	652/653	
or Management Seminar/Directed Study . . . . .	.GBA	671/672	

Directed elective courses

Environment of Agribusiness Firm . . . . .	.FMA	501	(4)
Agribusiness Marketing . . . . .	.FMA	504	(4)
International Agribusiness Marketing and Development . . . . .	.FMA	530	(4)
Capstone courses			
Directed Study . . . . .	.GBA	691	(4)
Business Research Project . . . . .	.GBA	695	(4)
Total Units . . . . .			(48)

#### GRADUATE COURSE DESCRIPTIONS

(See MBA—College of Business Administration for GBA course descriptions)

#### FMA 501 Environment of the Agribusiness Firm (4)

Overview of macroeconomic and environmental factors influencing agribusiness management. Critical evaluation of U.S. and E.C. domestic and foreign trade policies. Investigates the impacts of social and economic trends on the agribusiness firm. Methodologies for evaluating the external environment will be presented. 4 lecture discussions. Prerequisite: consent of instructor.

#### FMA 504 Agribusiness Marketing (4)

Analysis of agricultural marketing structures and practices. Discussion of managerial approaches to conventional agricultural marketing. Critical examination of revolutionary changes that are moving the system out of atomistic free competition toward monopolistic or oligopolistic competition. 4 lecture discussions. Prerequisite: FMA 501 or consent of instructor.

#### FMA 505 Commodities and Risk Management (4)

Fundamentals of temporal price fluctuations, and risk management strategies through forecasting, futures markets, and options. Econometric and time series modeling of commodity prices will be presented. 4 lecture discussions. Prerequisites: one course from each of the following: GBA 514, FMA 314, OM 314 or FMA 575; FMA 501 or FMA 504; FMA 305 or FRL 432 or consent of instructor.

#### FMA 530 International Agribusiness Marketing and Development (4)

Theoretical and conceptual framework of international agribusiness marketing. Major topics include the basic characteristics of the world market environment, trade regulations in agriculture, and marketing institutions for agricultural products. 4 lecture discussions. Prerequisite: FMA 501 or consent of instructor.

#### FMA 575 Statistics for Agriculture (4)

A summary of statistical tools and techniques used in agriculture. Application of computer to selected statistical techniques. 4 lecture discussions.

## ARCHITECTURE

### MASTER OF ARCHITECTURE

In the Department of Architecture, College of Environmental Design

William Adams, Chair

Kip Dickson, Assistant Chair

Michael Folonis and Hsin-Ming Fung, Graduate Coordinators

The Department of Architecture offers programs of study which lead to the degree, Master of Architecture.

The Master of Architecture as a first professional degree (M. ARCH I) is accredited by the National Architecture Accrediting board.

The M. ARCH I program accepts students from varied academic backgrounds, including non-design disciplines, for a three-years and one-quarter long program.

For students with no previous study in architecture, two years of intensive prerequisite course work precedes the final four quarters of the Master of Architecture program. Students are strongly urged to complete courses in college algebra, trigonometry, and physics prior to beginning this program since these courses are prerequisites to the study of structures and environmental controls. Failure to take these courses in advance may lengthen the program by as much as two quarters.

An introductory summer program in design is offered to prospective Master of Architecture students. Courses in this special program are taught by faculty in the departments of Architecture, Landscape Architecture and Urban and Regional Planning. Students accepted into the M. ARCH I program are strongly encouraged to take this introductory sequence. A portion of the credit achieved in this summer program may be applied to the M. ARCH I program. This program is also available to students who have not yet been accepted into the Master of Architecture program through the College of the Extended University. Further information may be obtained by contacting the Department of Architecture.

Students holding a non-professional bachelor of arts or bachelor of science degree, with a major in architecture, are encouraged to apply for advanced standing within the M. ARCH I graduate program. Normally, two years and one quarter of additional study in this advanced standing program would lead to the Master of Architecture degree.

The final four quarters of the M. ARCH I program require 60 quarter units of academic work. Research in either theory or social responsibility in architecture will culminate in a thesis/project.

Prior to graduation, all students in the M. ARCH I program are required to fulfill 500 hours of work. A minimum of 250 hours of work must be with a registered architect. The remaining 250 hours may be completed with a faculty-approved alternative. This work must be verified by the department's Coordinator of Professional Practice and Cooperative Education.

The M. ARCH II program provides advanced study for students already holding the Bachelor of Architecture degree. The program is best suited to students whose undergraduate work in architecture, or whose subsequent professional work demonstrates the intelligence, curiosity, self-discipline and creativity necessary for graduate work. A minimum of 60 quarter units of academic work, including a culmination thesis/project, must be completed in this program before the Master of Architecture degree is granted.

An area of special concentration shall be arranged through the Department of Architecture. The major focus of the program is on

sustainable/regenerative design of the built environment, including building preservation and adaptive reuse, utilizing courses from the Department as well as those of the Departments of Landscape Architecture and Urban and Regional Planning in the College of Environmental Design, the Center for Regenerative Studies, and the College of Engineering. This independent sequence must be arranged with the prior approval of the graduate coordinator. The area of concentration must be selected no later than the end of the first quarter in the program. The M. ARCH II, second professional degree, is considered to be a teaching as well as an advanced degree. Students in this program may be required to assist in the teaching of the undergraduate students and to share the benefits of advanced study with them through both formal and informal means.

Each year, approximately 30 full- and part-time faculty in the Department of Architecture conduct classes for the more than 400 students, including 50 graduate students, enrolled in its various programs. The department is a member of the Association of Collegiate Schools of Architecture. Most of its faculty hold professional degrees in architecture and are registered architects. Many are also members of the American Institute of Architects, or other professional associations.

The Institute for Environmental Design provides the means for interdisciplinary study of environmental design issues. Please refer to the undergraduate section for information on this program.

### ADMISSION TO THE PROGRAM

For admission to the Master of Architecture program, an applicant must have received a baccalaureate degree and have attained an overall undergraduate grade point average of at least 3.0. An applicant who does not meet these criteria may be admitted on a conditional basis if evidence of compensating qualifications can be furnished. Students may enter the Master of Architecture program in the fall quarter only.

In addition to the standard university application forms and official transcripts of all college work which must be submitted to the university Admissions Office, the Department of Architecture requires the following:

1. Portfolio (BOUND 8 1/2" X 11") illustrating creative or analytic ability in written, graphic, or mathematical form;
2. Statement of purpose or intentions in applying to the program; and
3. Three letters of recommendation from those in a position to assess the applicant's potential for either the profession of architecture or a master's level academic program.

Personal interviews are not required. The Graduate Record Examination (GRE) is recommended but is not required.

Applicants should contact the Department of Architecture for the critical dates in the admission process. January 15 is the usual deadline for all application materials. Applicants will be notified of the decision of the departmental admissions committee by April 15 or as soon thereafter as possible.

Upon admission to the Department of Architecture, the student will meet with the coordinator of the graduate program to prepare a reasonable sequence of course work. The curriculum thus specified may be altered only by written request submitted in accordance with university regulations.

### REQUIREMENTS AND CONDITIONS

1. In the Master of Architecture, First Professional Degree program (M. Arch I), as many as 160 quarter units may be required. For the Master of Architecture Second Professional Degree Program

(M.Arch II), a minimum of 60 quarter units must be completed. In this program, no more than 24 units of 400-level work will be accepted. No work below 300-level will be accepted in either program.

2. All course work must be completed in residency, unless consent is granted by the Graduate Studies Committee for each off-campus course. Title 5 of the California Code of Regulations requires a minimum of 32 units of coursework in residence.
3. No more than 13 units of acceptable graduate credit may be transferred from another graduate institution. No more than 13 units taken through Extended University may be used on a contract. No more than 13 units of acceptable graduate credit may be petitioned by an undergraduate student. A total limit of 13 transfer, or Extended University, or units petitioned for graduate credit may be included on a master's contract. The stipulated time limit of 7 years applies to all of the above.
4. An overall average of "B" (3.0) or better must be maintained in order to receive a graduate degree. The minimum grade in architecture courses which will be accepted for credit toward the degree is "C." Any course in which a lower grade is received must be retaken, but the initial grade will not be removed from the student's record nor from the calculations for the grade point average.
5. A student must be enrolled in a minimum of 6 and a maximum of 18 quarter units of work per quarter. In order to take more than 18 units per quarter, the student must obtain prior approval of the Graduate Coordinator and file a petition in the Records Office.
6. Advancement to Candidacy must be achieved. The Graduation Writing Test (GWT) must be passed prior to advancement.
7. A final project/thesis is required of candidates in both the First (M. ARCH I) and Second (M. ARCH II) Professional Degree programs. A candidate for the M. ARCH I will be required to pursue an interest in theory or social responsibility in architecture. The candidate must submit a written proposal and file a petition outlining the goals, procedures and intentions of his/her independent project, and receive approval for it from the department's Graduate Studies Committee prior to enrolling in the project course. Copies of the proposal must also be submitted to three faculty members, chosen to serve as the candidate's project advisors.
8. Credit will not be awarded for the same course in both the baccalaureate and master's programs in architecture.
9. All class work becomes the property of the department with superior work retained for display and archival use.
10. The candidate must be enrolled in the university during the quarter of graduation.

**PROGRAM FOR THE MASTER OF ARCHITECTURE I**

First Professional Degree

**PREREQUISITE COURSES**

Normally already met by students who hold the Bachelor of Architecture Degree

Structures .....	ARC 321/321A(3/1)
Structures .....	ARC 322/322A(3/1)
Structures .....	ARC 323/323A(3/1)
Environmental Controls .....	ARC 331/331A(3/1)
Environmental Controls .....	ARC 332/332A(3/1)
Building Construction .....	ARC 341,342 (4,4)
Ancient and Medieval Architecture .....	ARC 361/361A(3/1)
Renaissance and Baroque Architecture .....	ARC 362/362A(3/1)

Modern Architecture Since 1750 .....	ARC 363/363A(3/1)
Architectural Practice .....	ARC 471 (4)
Architecture and Computers .....	ARC 474 (4)
Behavioral Factors in Architecture .....	ARC 481 (4)
Introduction to Architectural Design .....	ARC 501/501L (3/3)
Introduction to Architectural Design .....	ARC 502/502L (3/3)
Intermediate Architectural Design .....	ARC 503/503L (3/3)
Architectural Design .....	ARC 504/504L (3/3)
Architectural Design .....	ARC 505/505L (3/3)
Architectural Design .....	ARC 506/506L (3/3)
Approved Electives .....	(12)

TOTAL PREREQUISITE UNITS ..... (100)

**FINAL FOUR QUARTER PROGRAM**

Seismic Design .....	ARC 424/424A (4)
American Architecture .....	ARC 464/464A (3/1)
Advanced Architectural Design .....	ARC 601/601L (3/3)
Advanced Architectural Design .....	ARC 602/602L (3/3)
Social Responsibility in Architecture .....	ARC 652 (4)
or Theory and Literature of Architecture .....	ARC 653
Project/Thesis Research .....	ARC 691 (4)
Project/Thesis Programming .....	ARC 694 (4)
Master's Project .....	ARC 695 (8)
or Master's Thesis .....	ARC 696
Landscape Architecture Elective .....	LA (3-4)
Urban and Regional Planning Elective .....	URP (3-4)
Professional Electives .....	(12-14)

TOTAL FOUR QUARTER PROGRAM ..... (60)

TOTAL UNITS FOR MASTER OF ARCHITECTURE I ..... (160)

**PROGRAM FOR THE MASTER OF ARCHITECTURE II**

Second Professional Degree

Project/Thesis Research .....	ARC 691 (4)
Project/Thesis Programming .....	ARC 694 (4)
Master's Project .....	ARC 695 (8)
or Master's Thesis .....	ARC 696
Professional Electives (must be arranged with prior approval of Graduate Coordinator) .....	(44)

TOTAL UNITS FOR MASTER OF ARCHITECTURE II ..... (60)

**PROFESSIONAL ELECTIVE COURSES**

Energy Conservation .....	ARC 333 (4)
Solar Design .....	ARC 334 (4)
Advanced Structures .....	ARC 425 (4)
Advanced Structures .....	ARC 426 (4)
Architecture and Urbanism .....	ARC 451 (4)
Contemporary Architecture .....	ARC 465 (4)
Topics in Asian Architecture .....	ARC 466 (4)
California Architecture .....	ARC 467 (4)
Latin American Architecture .....	ARC 468 (4)
The Architect and the Development Process .....	ARC 473 (4)
Computer Aided Design in Architecture .....	ARC 475 (4)
Business Development in Architecture .....	ARC 476 (4)
Behavioral Factors in Architecture .....	ARC 482,483 (4,4)
Topics in Design History .....	ARC 567 (4)
Directed Study .....	ARC 591 (2-4)
Directed Study .....	ARC 592 (2-8)
Other electives must receive prior approval of the Graduate Coordinator.	



**GRADUATE COURSE DESCRIPTIONS**

NOTE: For graduate prerequisite course descriptions, see undergraduate section.

**ARC 501/501L Introduction to Architectural Design (3/3)**

Introduction to the fundamental elements of architectural design explored in the abstract. The principles and techniques equip the student for an exploration of real human problems. Emphasis on basic design, graphic communication skills and model-making. For Master of Architecture students only. 3 lecture discussions, 3 three-hour laboratories. Concurrent enrollment required. Prerequisite: Matriculation into the Master of Architecture program.

**ARC 502/502L Introduction to Architectural Design (3/3)**

Using a case study process, a study of general aspects of ecological, human, aesthetic and technological factors as architectural design determinants. 3 lecture discussions, 3 three-hour laboratories. Concurrent enrollment required. Prerequisite: ARC 501/501L.

**ARC 503/503L Intermediate Architectural Design (3/3)**

Procedures and methods related to architectural design application. Emphasis on program development and includes some design detailing. 3 lecture discussions, 3 three-hour laboratories. Concurrent enrollment required. Prerequisite: ARC 502/502L.

**ARC 504/504L Architectural Design (3/3)**

An investigation of materials as well as methods of structure and construction as they become the determinants of design theory. 3 lecture discussions, 3 three-hour laboratories. Concurrent enrollment required. Prerequisites: ARC 503/503L, ARC 341.

**ARC 505/505L Architectural Design (3/3)**

Design of complexes of buildings, with an emphasis on conceptual issues and issues of context. (May be repeated as an addition to the course of study). 3 lecture discussions, 3 three-hour laboratories. Concurrent enrollment required. Prerequisite: ARC 504/504L.

**ARC 506/506L Architectural Design (3/3)**

The design of complex buildings with an emphasis on the inclusion of structural, mechanical, environmental and energy-conserving systems. 3 lecture discussions; 3 three-hour laboratories. Concurrent enrollment required. Prerequisite: ARC 505/505L.

**ARC 567 Topics in Design History (4)**

Non-chronological investigations of the elements, typologies, methods and context of architecture; comparisons of historic and contemporary designs. 2 two-hour lecture discussions. Prerequisite: ARC 363/363A or ARC 464/464A or permission of instructor.

**ARC 591 Directed Study (2-4)**

Directed study on a subject of interest to the student and important to the understanding of architecture. Prerequisite: prior approval of the proposal by the Graduate Studies Committee. This course may be repeated for credit.

**ARC 592 Directed Study (2-8)**

Directed study on a subject of interest to the student and important to the understanding of architecture. Prerequisite: prior approval of the proposal by the Graduate Studies Committee. This course may be repeated for credit.

**ARC 601/601L Advanced Architectural Design (3/3)**

Advanced study of interaction of design methods, user needs, and site constraints explored in design projects. 3 lecture discussions; 3 three-hour laboratories. Concurrent enrollment required. Prerequisite: Matriculation into the Master of Architecture Program II or ARC 506/506L and passage of a comprehensive design examination. Unconditional standing required.

**ARC 602/602L Advanced Architectural Design (3/3)**

An exploration of urban design issues, including research and analysis of the topics associated with mixed use projects. 3 lectures, 3 three-hour laboratories. Concurrent enrollment required. Prerequisite: ARC 601/601L. Unconditional standing required.

**ARC 652 Social Responsibility in Architecture (4)**

Examination of the social context of buildings and architecture, beyond the limited functional and economic needs of clients; the implicit responsibility of buildings and architects to broaden environmental issues, as well as social needs. 2 two-hour seminars. Prerequisite: Admission to the final year of the Master of Architecture program. Unconditional standing required.

**ARC 653 Theory and Literature of Architecture (4)**

Explorations into the polemics, methodologies, and ideals of architecture through a review of its literature; emphasis on texts significant to contemporary practice. 2 two-hour seminars. Prerequisite: Admission to the final year of the Master of Architecture program. Unconditional standing required.

**ARC 691 Project/Thesis Research (4)**

Identification, supporting research, and development of master's project/thesis proposal. 1 four-hour seminar. Prerequisite: Admission to ARC 601/601L. Unconditional standing required.

**ARC 694 Thesis/Project Programming (4)**

Research and programming in support of faculty-approved student's master's project/thesis. 1 four-hour seminar. Prerequisites: ARC 601/601L, ARC 691. Unconditional standing required.

**ARC 695 Master's Degree Project (8)**

Independent and complete design project derived from the work developed in ARC 691 and 694; design development and presentation. Prerequisites: ARC 602/602L, ARC 652 or 653, and ARC 694. Advancement to Candidacy required.

**ARC 696 Master's Degree Thesis (8)**

Independent written thesis project derived from the work of ARC 691 and 694 culminating in a formal presentation and defense. Prerequisites: ARC 602/602L, ARC 652 or 653, and ARC 694. Advancement to Candidacy required.

**ARC 699 Master's Degree Continuation (0)**

Registration or an approved leave of absence is required for any quarter following the final assignment of the grade "SP" until the completion of project or thesis. The candidate must be enrolled in the university during the quarter in which he/she graduates. Advancement to Candidacy required.

## BIOLOGICAL SCIENCES

### MASTER OF SCIENCE IN BIOLOGICAL SCIENCES

In the Department of Biological Sciences, College of Science

Lenard R. Troncale, Chair, Biological Sciences Department  
David J. Moriarty, Graduate Coordinator

The Master of Science degree program in the Biological Sciences enhances the knowledge and competence of the student in the chosen field of specialization and develops potential for continuing self-directed study and research. The curriculum is designed to increase the student's knowledge of the discipline by providing theoretical, technical and practical studies. It also provides students with training in the use of research techniques, as well as familiarity with the critical evaluation of, and the use of scientific literature. Graduate study specializations may be elected in the disciplines of the biological sciences: biology, biotechnology, botany, microbiology and zoology.

#### ADMISSION TO THE PROGRAM

An applicant for admission to this program must have a bachelor's degree with a major in one of the disciplines of the biological sciences or a related field. The minimum requirements for admission are: 24 quarter units in upper division biological sciences, 15 quarter units in chemistry and 12 quarter units in physics and/or mathematics. These courses must be comparable to those required for a baccalaureate major at this university.

A statement of intent indicating the professional goals and research interests should be submitted. Three letters of recommendation should be submitted from individuals qualified to judge the applicant's potential for success in a graduate program. Applicants are encouraged to submit scores on the General Test and/or Subject Test (Biology Subject Test or Biochemistry, Cell/Molecular Biology Subject Test) of the Graduate Record Examination (GRE). These scores are not required, but may assist the faculty in assessing an applicant's preparation for graduate work. Admission is determined by the members of the Graduate Faculty, based on the total academic record of the applicant. Potential applicants are encouraged to contact members of the Graduate Faculty to discuss research interests, available space, and qualifications. The sponsoring Graduate Faculty member will provide initial advising, but it will be the responsibility of the student to secure a thesis advisor. Admission to the program is competitive, and applicants must have a sponsor to be admitted. Therefore, it is important that all applicants develop contacts with the Graduate Faculty.

Deadlines are May 1 for summer, August 1 for fall, November 1 for winter, and February 1 for spring.

The unconditional graduate student with an advisory committee will develop a program in a selected discipline of biology based upon interests and preparation. The student's approved program will include required core courses, a selection of additional formal courses in a specialization, independent study and an appropriate thesis. It will normally constitute 45 to 50 quarter units of credit.

#### REQUIREMENTS

1. The degree program must include a minimum of 45 quarter units; at least 24 units must be in 500-600 level courses.
2. No more than 13 units of acceptable graduate credit may be transferred from another graduate institution. No more than 13 units taken through Extended University may be used on a contract. No more than 13 units of acceptable graduate credit may be petitioned by an undergraduate student.

A total limit of 13 transfer, Extended University, and/or units petitioned for graduate credit may be included on a master's contract. The stipulated time limit of 7 years applies to all of the above.

3. The student must complete the program based upon the curriculum outlined below.
4. A grade point average of 3.0 (B) or better must be maintained in all upper division undergraduate and all graduate classes.
5. The Graduation Writing Test (GWT) must be passed prior to Advancement to Candidacy.
6. Advancement to Candidacy is required.
7. An acceptable thesis must be completed and submitted for binding in accordance with university regulations.
8. A final oral examination must be successfully completed.
9. The candidate must be enrolled in the university during the quarter of graduation.

#### CURRICULUM

##### Required Courses

Seminar in Biology	.....BIO	680	(3)
Presentation of Research Proposal	.....BIO	693	(1)
Thesis Research in Biological Sciences	.....BIO	694	(6)
Master's Degree Thesis	.....BIO	696	(3)

#### COURSE IN SPECIALIZATION

To be selected with consent of the student's thesis committee from 400, 500 and 600-level courses, 32-37 units including at least 11 units of approved 500- and 600-level courses.

Total ..... (45-50)

#### GRADUATE COURSE DESCRIPTIONS

NOTE: For all courses which have both a lecture component and a laboratory component (e.g., BIO 510/510L), both components are co-requisites, and must be taken concurrently.

##### BIO 500 Training in Graduate Research (1-3)

Advanced training in laboratory and analytical techniques under the supervision of a faculty member. Students must register through the department office. Open to postbaccalaureate students. Staff.

##### BIO 510/510L Cytogenetics (2/1)

Nuclear and cytoplasmic structures and phenomena as related to inheritance. 2 lecture discussions, 1 three-hour laboratory. Concurrent enrollment required. Prerequisite: BIO 303. Campbell.

##### BIO 515/515L Plant Biosystematics (3/1)

Theoretical and technical aspects of plant biosystematics; principles and techniques used in the study of relationships within and between plant species; application of experimental techniques to the study of plant diversity. Recommended background courses are: BIO 306, BIO 530 and BOT 343/343L. 3 lecture discussions, 1 three-hour laboratory. Concurrent enrollment required. Prerequisites: BIO 213, BIO 303 and BIO 325/325L or consent of instructor. Clark.

##### BIO 520/520L Endocrinology (3/1)

Study of the endocrine glands and their role in growth development, metabolic regulation and reproduction in animals. 3 lecture discussions,

1 three-hour laboratory. Concurrent enrollment required. Prerequisites: CHM 327/327L and ZOO 424/424L and/or consent of instructor.

### **BIO 521 Renal Physiology (3)**

Elements of epithelial transport function with special reference to the kidney. Current research on renal function will be stressed. 3 lecture discussions. Prerequisite: ZOO 424/424L.

### **BIO 525/525L Ecology of Fungi (2/2)**

Autecology and synecology of fungi in soil, water, atmosphere, living and dead tissues and other environments; saprophytism; commensalism, mutualism and parasitism; methods of collection, isolation and ecological study; some independent study required. 2 lecture discussions, 2 three-hour laboratories. Concurrent enrollment required. Prerequisites: BOT 425/425L and BOT 426/426L; BIO 325/325L or BOT 421/421L recommended; or consent of instructor. Stoner.

### **BIO 526/526L Insect Classification (2/2)**

Aspects of taxonomic procedure and study of classifications of the Class Insecta. Collection, identification and recognition of significant insect families. 2 lecture discussions, 2 three-hour laboratories. Concurrent enrollment required. Prerequisite: ZOO 426/426L or the equivalent. Edmonds.

### **BIO 528 Community Ecology (3)**

Patterns in the diversity, relative abundance and manner in which communities of plant and animal species are assembled. Competition, co-existence strategies and their effect on community structure within the framework of natural selection. 3 lecture discussions. Prerequisite: BIO 325/325L. Moriarty.

### **BIO 530 Mechanisms of Speciation (3)**

Principles and concepts of evolutionary mechanisms in plants and animals. 3 lecture discussions. Prerequisites: BIO 213, BIO 303 and BIO 325/325L. Clark.

### **BIO 532 Tropical Field Biology (2-6)**

A 30-day field trip in Venezuela including study and field problems in tropical ecosystems. Lectures by faculty from Universidad Central de Venezuela, Cal Poly Pomona, and other institutions. Possible visits to institutions and field sites in other tropical countries. Field trip fee required. Recommended: BIO 415/415L and knowledge of Spanish. Prerequisites: Graduate or advanced undergraduate standing, consent of instructors and BIO 485. George, Stewart, Szijj.

### **BIO 534/534L Water Pollution Biology (3/2)**

Effects of pollution on aquatic organisms. Emphasis on experimental investigation in laboratory and field. 3 lecture discussions, 2 three-hour laboratories. Concurrent enrollment required. Prerequisite: consent of instructor. Staff.

### **BIO 535 Advanced Cell Biology (4)**

Molecular, ultrastructural and functional approach to cell biology. 4 lecture discussions. Prerequisites: BIO 435/435L and CHM 327/327L, or consent of instructor. Buckley, Dixon, Troncale.

### **BIO 540 Biogeography (3)**

Principles and concepts of the distribution of plants and animals throughout the world. Origins and dispersal of modern flora and fauna as related to environmental and historical factors. 3 lecture discussions. Prerequisites: BIO 213 and BIO 325/325L. Szijj.

### **BIO 542L Graduate Laboratory (1-3)**

Advanced laboratory experience, individually arranged or concurrent with other graduate courses. May be repeated for a maximum of 10 units. Prerequisite: consent of instructor. Staff.

### **BIO 545/545L Physiology of Plant Disease (3/1)**

Physiology of host-parasite relations, mechanisms of pathogenesis and the bases for resistance and specificity in plant diseases, with special emphasis on diseases caused by fungi and bacteria. 3 lecture discussions, 1 three-hour laboratory. Concurrent enrollment required. Prerequisites: BOT 223, BOT 422/422L and CHM 227/227L. Stoner.

### **BIO 548/548L Advanced Plant Physiology (2/2)**

Selected major aspects of plant water relations, metabolism and growth. Emphasis on experimental investigations. 2 lecture discussions, 2 three-hour laboratories. Concurrent enrollment required. Prerequisite: BOT 422/422L. Staff.

### **BIO 550/550L Plant Growth and Development (2/2)**

Hormonal and environmental control of plant morphogenesis. 2 lecture discussions, 2 three-hour laboratories. Concurrent enrollment required. Prerequisite: BOT 422/422L.

### **BIO 555 Molecular Biology of Development (4)**

Consideration of molecular mechanisms involved in differentiation as they relate to such phenomena as tissue specificity, gene control, morphogenesis, cell specialization. 4 lecture discussions. Prerequisite: consent of instructor. Buckley, Sperry.

### **BIO 560/560L Bacterial Physiology (3/1)**

Physiological characteristics of bacteria with emphasis upon growth, biosynthetic capabilities and regulation of enzyme formation and function. 3 lecture discussions, 1 three-hour laboratory. Concurrent enrollment required. Prerequisites: MIC 300/300L and CHM 327/327L. Staff.

### **BIO 565/565L Animal Tissue Culture (2/2)**

Principles, basic methodology and special applications of animal cell culture. 2 lecture discussions, 2 three-hour laboratories. Concurrent enrollment required. Prerequisite: MIC 201/201L or similar experience in aseptic technique. Buckley, Pal.

### **BIO 570/570L Cellular Immunity and Disease (3/1)**

T-cell mediated immunity; its protective and pathogenic roles; mechanisms of cellular immunity, its importance in infectious disease, transplant rejection, tumor surveillance and autoimmune phenomena. Laboratory provides experience with lymphocyte tissue cultures, lymphocyte immune response in vitro, skin grafting and passive cellular immunity. 3 lecture discussions, 1 three-hour laboratory. Concurrent enrollment required. Prerequisite: MIC 415/415L. Adler.

### **BIO 575 Advanced Topics in Biology (1-4)**

Discussion of advanced topics in biology. Topics selected to correspond with the changes in the field or needs of advanced students. Total credit limited to 6 units. 2 lecture discussions. Staff.

### **BIO 576/576L Advanced Immunology (2/1)**

Principles of immunoglobulin structure and the allotype and other isoantigenic concepts. Laboratory exercises in the fractionation and purification of serum globulins and in their use to study cytoantigens. 2

lecture discussions, 1 three-hour laboratory. Concurrent enrollment required. Prerequisite: MIC 415/415L. Staff.

### **BIO 577/577L Transmission Electron Microscope Techniques (2/3)**

Skills and techniques in transmission electron microscopy, including specimen preparation, operation of the TEM and ancillary equipment and darkroom techniques. Material of interest may be studied by the student. 2 lecture discussions, laboratory, 9 hours by arrangement. Concurrent enrollment required. Prerequisite: BIO 423/423L or consent of instructor. Campbell.

### **BIO 578/578L Scanning Electron Microscope Techniques (2/3)**

Skills and techniques in scanning electron microscopy, including specimen preparation, operation of the SEM and ancillary equipment and darkroom techniques. Material of interest to the student may be studied. 2 lecture discussions, laboratory, 9 hours by arrangement. Concurrent enrollment required. Prerequisite: BIO 423/423L or consent of instructor. Campbell.

### **BIO 579 Recent Advances in Ultrastructure Research (3)**

Current developments in major fields of ultrastructure research. 3 lecture discussions. Prerequisite: consent of instructor. Campbell.

### **BIO 590 Experimental Biology (3)**

Lecture series concerning recent research in selected fields of biology; each series to have a subtitle identifying the field. Total credit limited to 9 units. 3 lecture discussions. Staff.

### **BIO 680 Seminar in Biology (1-3)**

Arrangements to be made with faculty. Topics in disciplines of biology offered according to interests and needs of students. Each seminar to have a subtitle identifying the discipline. 1-3 units per quarter, maximum of 9 units. Unconditional standing required. Staff.

### **BIO 691 Directed Study (1-3)**

Individual research in a specialized area on an advanced topic under the direction of a graduate faculty member. May or may not lead to a thesis. Students must register through the department office. Unconditional standing required. Graduate faculty.

### **BIO 692 Independent Study (1-3)**

Study, research or readings proposed by the student with the consultation and approval and under the supervision of a faculty member, but not leading to a thesis/project. Students must register through the department office. Unconditional standing required. Graduate faculty.

### **BIO 693 Presentation of Research Proposal (1)**

A public oral presentation and discussion of a proposed research plan for the master's thesis. Required for Advancement to Candidacy. Unconditional standing required. Graduate Faculty. This course may be taken on a credit/no credit basis.

### **BIO 694 Thesis Research in the Biological Sciences (1-3)**

Selection and completion of an experimental research project under the supervision of a graduate faculty member, leading to new knowledge as part of the preparation for writing a thesis. Total credit limited to 6 units, but may be taken for more. Unconditional standing required. Graduate faculty.

### **BIO 696 Master's Degree Thesis (1-3)**

Compilation, evaluation, interpretation, and report of research for thesis directed by a committee of graduate faculty members. Completion of approved, bound thesis. Total credit limited to 3 units, but may be taken for more. Advancement to Candidacy required. Prerequisite: BIO 694. Graduate faculty.

### **BIO 699 Master's Degree Continuation (0)**

Registration or an approved leave of absence is required for any quarter following the final assignment of the grade "SP" until the completion of thesis and final oral examination. The candidate must be enrolled in the university during the quarter in which he/she graduates. Advancement to Candidacy required.

## BUSINESS ADMINISTRATION

### Graduate Business Administration Programs

In the College of Business Administration

Eric J. McLaughlin, Director, Graduate Business Programs

Graduate Business Programs Committee:

Eric J. McLaughlin, Chair/Finance, Real Estate, and Law

Fred Gallegos, Computer Information Systems

Richard Hulme, Accounting

Joyce Kupsh, Technology and Operations Management

Bob Schaffer, Marketing Management

Gail Waters, Management and Human Resources

N. Greg Young, Finance, Real Estate, and Law

### MASTER OF BUSINESS ADMINISTRATION

The undergraduate and graduate programs of the College of Business Administration are accredited by the American Assembly of Collegiate Schools of Business (AACSB). AACSB accreditation assures quality and promotes excellence and continuous improvement in undergraduate and graduate education for business administration.

The Master of Business Administration curriculum is designed to provide a two-year program of broad professional development. The objectives are to develop a better understanding of the role of the professional manager and the responsibilities within the firm and society; to assist the student in developing a critical approach to decision-making and the ability to speak and write effectively and professionally; to develop skills in interpersonal relations; to develop a sound theoretical understanding of organizations and a management perspective for considering problems and making decisions from the viewpoint of the entire firm, industry and economy; to develop an increased understanding and awareness of the world in which the individual lives; and to develop the capability of acquiring additional education.

### ADMISSION TO THE PROGRAM AND REQUIREMENTS

After a prospective student has submitted the application for admission to the MBA program to the Office of Admissions, the procedure will be as follows:

1. Admission to the MBA program will be granted upon the recommendation of the College of Business Administration Graduate Programs Director. Selection will be on the basis of evidence of ability to perform at a high academic level. The following criteria are considered: the undergraduate grade-point average, scores on the Graduate Management Admissions Test (GMAT), managerial work experience, letters of recommendation and the applicant's personal statement.
2. A GMAT score of 450 or higher is required for admission to the program.
3. A TOEFL score of 580 or better is required for admission of international students to the program.
4. The Graduate Programs Director of the College of Business Administration will notify applicants of their admission or denial.
5. The Graduate Business Programs Director will serve as advisor to all selected applicants.
6. First-year program courses may be waived if equivalent courses have been successfully completed by the student. Waiver will be granted on recommendation of the Director.

7. No more than 13 units of acceptable graduate credit may be transferred from another AACSB accredited graduate institution. No more than 13 units taken through Extended University may be used on a contract. No more than 13 units of acceptable graduate credit may be petitioned by an undergraduate student. A total limit of 13 transfer, Extended University, and/or units petitioned for graduate credit may be included on a master's contract. The stipulated time limit of 7 years applies to all of the above.
8. An advisory program study worksheet for the guidance of the student will be prepared by the Graduate Business Director when the student is admitted to the MBA degree program. An official degree program will be finalized prior to the completion of the second quarter. It will be approved by the Graduate Business Programs Director and verified by the Graduate Studies Analyst.
9. A grade-point average of 3.0 (B) or better must be maintained in all course work taken to satisfy degree requirements and in all graduate-level course work taken at this university.
10. Students will be required to complete all prerequisites before enrolling in 600-level courses.
11. In order to advance to candidacy for the MBA or MSBA degree, a student must: (a) achieve unconditional standing; (b) complete at least 12 units of graduate coursework at Cal Poly Pomona with a GPA of 3.0 or better; (c) pass the Graduation Writing Test; and, (d) have an approved program of study on file.
12. The candidate must be enrolled in the university during the quarter of graduation.
13. Incoming graduate students to the College of Business Administration are required to have unrestricted access to a Windows laptop computer meeting or exceeding specifications set by the College of Business Administration. Such access may be accomplished by purchase, rental, or other alternative agreed upon by the college and the student. Students may lease or purchase the equipment independently, or from the bookstore through the campus lease/purchase agreement. The college will work closely and confidentially with students requiring financial aid to assure laptop computer access to all graduate students.

### MBA PROGRAM

#### CURRICULUM

#### Prerequisite Courses

First Year

Business Economics . . . . .	EC	521	(4)
Financial Accounting . . . . .	.GBA	510	(4)
Financial/Managerial Accounting . . . . .	.GBA	511	(4)
Managerial Statistics . . . . .	.GBA	514	(4)
Essentials of Marketing Management . . . . .	.GBA	517	(4)
Legal Environment of Business . . . . .	.GBA	530	(4)
Production and Operations Management . . . . .	.GBA	531	(4)
Organizational Management, Principles and Behavior . . . . .	.GBA	535	(4)
Fundamentals of Financial Management . . . . .	.GBA	546	(4)
Management Information Systems . . . . .	.GBA	547	(4)
Elementary Statistics with Applications . . . . .	.STA	120	(4)
Total, First Year. . . . .			(40)

#### Required Courses

Second Year

Managerial Accounting for Decision-Making . . . . .	.GBA	608	(3)
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Directed Study in Managerial Accounting . . . . .	GBA	609	(1)
Seminar in Organizational Behavior . . . . .	GBA	615	(3)
Directed Study in Organizational Behavior . . . . .	GBA	616	(1)
Management Science Seminar . . . . .	GBA	628	(3)
Directed Study in Management Science . . . . .	GBA	629	(1)
Financial Decision-Making . . . . .	GBA	645	(3)
Directed Study in Financial Decision-Making . . . . .	GBA	646	(1)
Marketing Seminar . . . . .	GBA	652	(3)
Directed Study in Marketing Seminar . . . . .	GBA	653	(1)
Management Seminar . . . . .	GBA	671	(3)
Directed Study in Management Seminar . . . . .	GBA	672	(1)
Information Systems Seminar . . . . .	GBA	673	(3)
Directed Study in Information Systems Seminar . . . . .	GBA	674	(1)
Business Research Methods . . . . .	GBA	683	(3)
Directed Study in Business Research Methods . . . . .	GBA	684	(1)
Management Policies and Strategies Practicum . . . . .	GBA	687	(3)
Directed Study in Management Policies and Strategies Practicum . . . . .	GBA	688	(1)
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Sub-total . . . . .			(36)

**Elective Courses-MBA Program**

Select 8 units from the following list:

Information Systems Analysis and Design . . . . .	GBA	522	(4)
Information Systems Implementation and Programming . . . . .	GBA	524	(4)
Automated Office Systems for Managers/Professionals . . . . .	GBA	525	(3)
Directed Study in Automated Office Systems for Managers/Professionals . . . . .	GBA	526	(1)
Organizational Communications . . . . .	GBA	527	(4)
Fundamentals of Contracts and Administration . . . . .	GBA	532	(4)
Analysis of Federal Contracts . . . . .	GBA	552	(4)
Database Design and Processing . . . . .	GBA	554	(4)
Computer-Based Data Communications . . . . .	GBA	557	(4)
Legal Environment of Information Systems . . . . .	GBA	560	(4)
Personnel Management . . . . .	GBA	562	(4)
Executive Development . . . . .	GBA	563	(4)
Creativity and Innovation . . . . .	GBA	564	(4)
Professional Presentations Using Technology . . . . .	GBA	565	(3)
Directed Study in Professional Presentations Using Technology . . . . .	GBA	566	(1)
Venture Creation and Growth . . . . .	GBA	570	(4)
Corporate Entrepreneurship and Renewal . . . . .	GBA	571	(4)
Environmental Issues in Entrepreneurship . . . . .	GBA	573	(4)
Advanced IS Auditing . . . . .	GBA	577	(4)
Security and Privacy of Information Systems . . . . .	GBA	578	(4)
Introduction to Real Estate Analysis and Valuation . . . . .	GBA	580	(4)
Practices and Application of Real Estate Law . . . . .	GBA	583	(4)
Taxes and Business Strategy . . . . .	GBA	591	(3)
Directed Study in Taxes and Business Strategy . . . . .	GBA	592	(1)
Special Topics for Graduate Students . . . . .	GBA	599	(4)
Rapid Application and Development . . . . .	GBA	606	(4)
Financial Markets and Institutions . . . . .	GBA	610	(3)
Directed Studies in Financial Markets and Institutions . . . . .	GBA	611	(1)
Investment Banking . . . . .	GBA	612	(4)
Management-Union Relations . . . . .	GBA	617	(4)
International Business . . . . .	GBA	620	(4)
Federal Government Contract Cases, Appeals and Jurisdiction . . . . .	GBA	630	(4)

Promotion Management . . . . .	GBA	633	(4)
Sales Productivity . . . . .	GBA	634	(4)
Motivation and Marketing Behavior . . . . .	GBA	635	(4)
Project Management . . . . .	GBA	636	(3)
Directed Study in Project Management . . . . .	GBA	637	(1)
Total Quality Management . . . . .	GBA	640	(3)
Directed Study in Total Quality Management . . . . .	GBA	641	(1)
Entrepreneurship Practicum . . . . .	GBA	642	(3)
Directed Study in Entrepreneurship Practicum . . . . .	GBA	643	(1)
Security Analysis and Portfolio Management . . . . .	GBA	647	(3)
Directed Study in Security Analysis and Portfolio Management . . . . .	GBA	648	(1)
Business Forecasting . . . . .	GBA	654	(3)
Directed Study in Business Forecasting . . . . .	GBA	655	(1)
Accounting for Decisions and Control . . . . .	GBA	659	(4)
Human Interaction Skills Laboratory . . . . .	GBA	665	(4)
Organizational Development . . . . .	GBA	667	(4)
Real Estate Finance and Investment . . . . .	GBA	680	(4)
International Real Estate and Real Estate Research . . . . .	GBA	681	(4)
Real Estate Acquisition and Development . . . . .	GBA	682	(4)
Financial Reporting and Communication . . . . .	GBA	689	(4)
Directed Study . . . . .	GBA	691	(1-9)
Independent Study . . . . .	GBA	692	(1-4)
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Sub-total . . . . .			(8)

With consent of the Graduate Business Programs Director up to 8 units of approved 400-level courses in business or economics may be selected as electives.

**Terminal Option**

Choose I or II (4 units)

**Option I**

Business Research Project . . . . .	GBA	695	(4)
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**Option II**

Master's Degree Thesis . . . . .	GBA	696	(4)
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Sub-total . . . . .			(4)
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TOTAL UNITS, Second Year . . . . .			(48)
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**THE CAREER MBA PROGRAM**

The Career MBA Program is designed for students who wish to emphasize a particular area of the curriculum. A set of courses appropriate to the career goal is selected by the student and the appropriate Graduate Faculty Advisor with the approval of the Graduate Business Programs Director.

Admission to the program and other requirements are identical to those of the regular MBA. Students may change to the Career MBA or MBA at any time, but are encouraged to decide early in order to avoid taking courses for which credit cannot be given. Students with an undergraduate business major are, generally, advised not to emphasize the same area in the MBA.

The program consists of 48 units of coursework designed to insure broad competence in management, in technical skills and in human relations as well as in the area of specialization. The curriculum for all emphases

consists of a common core of 24 units, 20 elective units in the area of emphases; and, a terminal option of 4 units. Current curriculum sheets for each emphasis as well as names of the Graduate Faculty Advisors are available in the Graduate Business Administration Office.

## EMPHASES

### Accounting

Provides emphasis on public accounting, management accounting, or internal auditing (with the possibility of preparing for certification); or, in the areas of government and not-for-profit accounting or taxation. Intermediate accounting courses may be required for no graduate credit for some of these tracks, and are recommended for all.

### Contract Management

The newest of the areas of specialization includes coursework which was developed in cooperation with the National Contract Management Association (NCMA). With an emphasis on the defense industry, students explore contract administration, cost/price analysis, federal contract case studies, and procurement in both government (FAR) and private (UCC) sectors.

### Entrepreneurship

For those interested in founding their own business or working effectively in the fast-changing world of growing companies. In addition to the emphasis on start-up companies and small business management, this concentration examines the strategies used in larger corporations to tap the entrepreneurial spirit.

### Finance

Provides specialization in the areas of financial analysis, the management of financial institutions, security analysis, and multinational finance.

### Management and Human Resources

Covers such areas as employee selection, training and development, benefits programs, compensation, legal requirements, and personnel problems in diverse organizations. Prepares individuals for a variety of careers in the human resources field.

### Information Management

For the individual who has earned an undergraduate degree in a non-computer field. Provides an understanding of computer systems as well as the systems development process via the tools and skills necessary to be an intelligent user of computer resources and/or to manage a satellite computer installation within a user department. Not designed for individuals who wish to be programmer/analysts, project leaders, or managers of information systems at the corporate level.

### International Business

Provides knowledge and expertise in international business needed to allow students to work for and/or with multinational firms. Students will be introduced to the global economic environment and the complexities of multinational sources of supply, markets, and funding. Many graduates will apply their business skills to careers in international trade.

### Marketing

Provides for specialization in marketing, the business function that identifies unfulfilled needs and wants, defines and measures their magnitude, determines which target markets the organization can best

serve, decides on appropriate products, services, and programs to serve these markets, and calls upon everyone in the organization to "think and serve the customer." Students who complete this emphasis will develop the skills and knowledge needed to become marketing managers and aid their organizations in achieving marketing objectives.

### Operations Management

Provides basic knowledge for students with career interests in the management of manufacturing and service operations. A broad selection of course offerings permits students to tailor their program in one or more of the following areas: manufacturing (JIT/Kanban, FMS, CIM), project management (PERT/CPM), inventory/materials management (MRP I, MRP II), service operations, quality assurance, purchasing, quantitative methods (simulation modeling, managerial statistics), forecasting, and facilities management.

### Real Estate

Analyzes the various economic, legal, institutional and financial factors affecting the ownership of real estate, practices of real estate law, and related areas. Course offerings aid in preparing students to sit for the California Real Estate Brokers license.

## CURRICULUM

### Prerequisite Courses for the MBA Program

Business Economics . . . . .	EC	521	(4)
Financial Accounting . . . . .	GBA	510	(4)
Financial/Managerial Accounting . . . . .	GBA	511	(4)
Managerial Statistics . . . . .	GBA	514	(4)
Essentials of Marketing Management . . . . .	GBA	517	(4)
Legal Environment of Business . . . . .	GBA	530	(4)
Production and Operations Management . . . . .	GBA	531	(4)
Organizational Management, Principles and Behavior . . . . .	GBA	535	(4)
Fundamentals of Financial Management . . . . .	GBA	546	(4)
Management Information Systems . . . . .	GBA	547	(4)
Elementary Statistics with Applications . . . . .	STA	120	(0)

Total, First Year. . . . . (36-40)

### Core Courses-Career MBA Program

#### Complete all courses (24 units)

Managerial Accounting for Decision-Making . . . . .	GBA	608	(3)
Directed Study in Managerial Accounting . . . . .	GBA	609	(1)
Seminar in Organizational Behavior . . . . .	GBA	615	(3)
Directed Study in Organizational Behavior . . . . .	GBA	616	(1)
Management Science Seminar . . . . .	GBA	628	(3)
Directed Study in Management Science . . . . .	GBA	629	(1)
Financial Decision Making . . . . .	GBA	645	(3)
Directed Study in Financial Decision-Making . . . . .	GBA	646	(1)
Business Research Methods . . . . .	GBA	683	(3)
Directed Study in Business Research Methods . . . . .	GBA	684	(1)
Management Policies and Strategies Practicum . . . . .	GBA	687	(3)
Directed Study in Management Policies and Strategies Practicum . . . . .	GBA	688	(1)

Sub-total. . . . . (24)

### Elective Courses-Career MBA Program

Select 20 units from the following list:

Information Systems Analysis and Design . . . . .	GBA	522	(4)
Information Systems Implementation and Programming . . . . .	GBA	524	(4)
Automated Office Systems . . . . .	GBA	525	(3)
Directed Study in Automated Office Systems . . .	GBA	526	(1)
Organizational Communications . . . . .	GBA	527	(4)
Analysis of Federal Contracts . . . . .	GBA	552	(4)
Database: Design and Processing . . . . .	GBA	554	(4)
Computer-Based Data Communications . . . . .	GBA	557	(4)
Legal Environment of Information Systems . . . .	GBA	560	(4)
Personnel Management . . . . .	GBA	562	(4)
Executive Development . . . . .	GBA	563	(4)
Creativity and Innovation . . . . .	GBA	564	(4)
Professional Presentations Using Technology . . .	GBA	565	(3)
Directed Study in Professional Presentations Using Technology . . . . .	GBA	566	(1)
Venture Creation and Growth . . . . .	GBA	570	(4)
Environmental Issues in Entrepreneurship . . . .	GBA	573	(4)
Advanced IS Auditing . . . . .	GBA	577	(4)
Security and Privacy of Information Systems . . .	GBA	578	(4)
Introduction to Real Estate Analysis and Valuation . . . . .	GBA	580	(4)
Practices and Application of Real Estate Law . .	GBA	583	(4)
Taxes and Business Strategy . . . . .	GBA	591	(3)
Directed Study in Taxes and Business Strategy .	GBA	592	(1)
Special Topics for Graduate Students . . . . .	GBA	599	(4)
Financial Markets and Institutions . . . . .	GBA	610	(3)
Directed Study in Financial Markets and Institutions . . . . .	GBA	611	(1)
Investment Banking . . . . .	GBA	612	(4)
Management-Union Relations . . . . .	GBA	617	(4)
International Business . . . . .	GBA	620	(4)
Business Information Systems . . . . .	GBA	622	(3)
Directed Study in Business Information Systems .	GBA	623	(1)
Management Science Seminar . . . . .	GBA	628	(3)
Directed Study in Management Science . . . . .	GBA	629	(1)
Federal Government Contract Cases, Appeals and Jurisdiction . . . . .	GBA	630	(4)
Promotion Management . . . . .	GBA	633	(4)
Sales Productivity . . . . .	GBA	634	(4)
Motivation and Marketing Behavior . . . . .	GBA	635	(4)
Project Management . . . . .	GBA	636	(3)
Directed Study in Project Management . . . . .	GBA	637	(1)
Total Quality Management . . . . .	GBA	640	(3)
Directed Study in Total Quality Management . .	GBA	641	(1)
Entrepreneurship Practicum . . . . .	GBA	642	(3)
Directed Study in Entrepreneurship Practicum .	GBA	643	(1)
Security Analysis and Portfolio Management . . .	GBA	647	(3)
Directed Study in Security Analysis and Portfolio Management . . . . .	GBA	648	(1)
Marketing Seminar . . . . .	GBA	652	(3)
Directed Study in Marketing Seminar . . . . .	GBA	653	(1)
Business Forecasting . . . . .	GBA	654	(3)
Directed Study in Business Forecasting . . . . .	GBA	655	(1)
Accounting for Decisions and Control . . . . .	GBA	659	(4)
Management Seminar . . . . .	GBA	671	(3)
Directed Study in Management Seminar . . . . .	GBA	672	(1)
Information Systems Seminar . . . . .	GBA	673	(3)
Directed Study in Information Systems . . . . .	GBA	674	(1)
Real Estate Finance and Investment . . . . .	GBA	680	(4)
International Real Estate and Real Estate Research . . . . .	GBA	681	(4)
Real Estate Acquisition and Development . . . .	GBA	682	(4)

Financial Reporting and Communication . . . . .	GBA	689	(4)
Directed Study . . . . .	GBA	691	(1-9)
Independent Study . . . . .	GBA	692	(1-4)
Environment of the Agribusiness Firm . . . . .	ABM	501	(4)
Agribusiness Marketing . . . . .	ABM	504	(4)
Commodities and Risk Management . . . . .	ABM	505	(4)
International Agribusiness Marketing and Development . . . . .	ABM	530	(4)

With the approval of the Graduate Business Programs Director, up to 12 units may be selected from approved 400-, 500-, and 600-level courses such as business or economics.

**Terminal Option**

Choose Option I or II (4 units)

**Option I**

Business Research Project . . . . .	GBA	695	(4)
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**Option II**

Master's Degree Thesis . . . . .	GBA	696	(4)
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Subtotal . . . . .	(4)
Total Units Second Year . . . . .	(48)

**MASTER OF SCIENCE IN BUSINESS ADMINISTRATION**

The College of Business Administration offers a Master of Science in Business Administration for the student with a business degree who wishes to specialize in a concentrated area of coursework. The option in Information Systems Auditing is intended for students who wish to pursue a career in this area. The option in Entrepreneurship, Creativity, and Innovative Management is intended for students who want to start ventures themselves or assist in the ground level development and growth of young firms.

**ADMISSION TO THE PROGRAM**

1. Admission to the MSBA program will be granted upon the recommendation of the College of Business Administration Graduate Programs Director. Selection will be on the basis of evidence of ability to perform at a high academic level. An applicant shall have a bachelor's degree in business from an accredited college or university. The following criteria are considered: the undergraduate grade-point average, scores on the Graduate Management Admissions Test (GMAT), managerial work experience, letters of recommendation, and the applicant's personal statement.
2. A GMAT score of 450 or higher is required for admission to the program.
3. A TOEFL score of 580 or better is required for admission of international students to the program.
4. The Graduate Director of the College of Business Administration will notify applicants of their selection or rejection.
5. An advisory study worksheet will be prepared by the advisor for the program for the guidance of the student. During the second quarter of attendance and prior to the student's advancement to candidacy, an official degree program will be prepared. It will be approved by the Director of Graduate Business Programs and verified by the Graduate Studies Analyst.



**REQUIREMENTS**

1. The degree program must include a minimum of 45 quarter units. No more than 13 units of acceptable graduate credit may be transferred from another AACSB accredited graduate institution. No more than 13 units taken through Extended University may be used on a contract. No more than 13 units of acceptable graduate credit may be petitioned by an undergraduate student.

A total limit of 13 transfer, Extended University, and/or units petitioned for graduate credit may be included on a master's contract. The stipulated time limit of 7 years applies to all of the above.

- 2. A grade-point average of B (3.0) or better must be maintained in all course work taken to satisfy degree requirements and in all graduate-level course work taken at this university.
- 3. Advancement to Candidacy must be achieved.
- 4. The candidate must fulfill the terminal requirement of a comprehensive examination or a business research project.
- 5. The candidate must be enrolled in the university during the quarter of graduation.

**MSBA OPTION IN INFORMATION SYSTEMS AUDITING**

The MSBA option in Information Systems Auditing is intended primarily for individuals with an interest in pursuing a career in IS auditing. The program is for business decision-makers, information systems technical specialists, information systems managers, and professionals in accounting, IS auditing, and other disciplines who wish to develop a better awareness of this field and how it can assist their organization. The objectives of the program are: to develop the ability to plan and conduct audits of the IS function; to develop the capability of reporting to management the findings reached; to prepare students for careers in the IS auditing profession; and to provide the necessary background for doctoral study and continued, self-directed study.

**CURRICULUM**

Due to the technical orientation of the IS Auditing option, a strong background in accounting and information systems is required. Before a student can be advanced to candidacy, deficiencies in any of the subject matter listed below must be removed.

Required for Admission to the Program

Information Systems Analysis and Design . . . . .	.GBA	522	(4)
Information Systems Development . . . . .	.GBA	524	(4)
Managerial Accounting for Decision-Making . . . . .	.GBA	608	(3)
Directed Study in Managerial Accounting . . . . .	.GBA	609	(1)
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Total . . . . .			(12)

The program of study for the MSBA in IS Auditing will consist of 33-36 required units and 9-12 approved elective units.

**Required Courses MSBA Common Core**

Professional Presentations Using Technology . . . . .	.GBA	565	(3)
Directed Study in Professional Presentations . . . . .	.GBA	566	(1)
and Seminar in Organizational Behavior . . . . .	.GBA	615	(3)
or International Business . . . . .	.GBA	620	(4)

Directed Study in Organizational Behavior . . . . .	.GBA	616	(1)
Directed Study . . . . .	.GBA	691	(4)
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Sub-total . . . . .			(12)

**Required Courses in the Option**

Computer-Based Data Communications . . . . .	.GBA	557	(4)
Legal Environment of Information Systems . . . . .	.GBA	560	(4)
Advanced IS Auditing . . . . .	.GBA	577	(4)
Security and Privacy of Information Systems . . . . .	.GBA	578	(4)
Information Systems Seminar . . . . .	.GBA	673	(3)
Directed Study in Information Systems Seminar . . . . .	.GBA	674	(1)
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Sub-total . . . . .			(20)

**Elective Courses**

With the approval of the IS advisor and Graduate Business Programs Director, a minimum of 9-12 units is to be selected from the following list.

Auditing Theory . . . . .	.ACC	419	(4)
Advanced Auditing . . . . .	.ACC	420	(4)
Internal Auditing . . . . .	.ACC	424	(4)
Government and Not-for-Profit Accounting . . . . .	.ACC	426	(4)
Systems Analysis and Design Methodologies . . . . .	.CIS	415	(4)
Wide Area/Voice Network Business . . . . .	.CIS	417	(4)
IS Auditing . . . . .	.CIS	433	(4)
Network Management . . . . .	.CIS	437	(4)
Internships . . . . .	.CIS	441, 447	(4)
Programming Development Project . . . . .	.CIS	466	(4)
Business Economics . . . . .	.EC	521	(4)
Automated Office Systems for Managers/ Professionals . . . . .	.GBA	525	(3)
Directed Study in Automated Office Systems for Managers/Professionals . . . . .	.GBA	526	(1)
Client/Server Computing . . . . .	.GBA	554	(4)
Executive Development . . . . .	.GBA	563	(4)
Management Science . . . . .	.GBA	628	(3)
Directed Study in Management Science . . . . .	.GBA	629	(1)
Advanced Financial Management . . . . .	.GBA	645	(3)
Directed Study in Advanced Financial Management . . . . .	.GBA	646	(1)
Accounting for Decisions and Control . . . . .	.GBA	659	(3)
Directed Study in Accounting for Decisions and Control . . . . .	.GBA	660	(1)
Independent Study . . . . .	.GBA	692	(1-4)
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Sub-total . . . . .			(9-12)

**Terminal Option**

Choose Option I or II

**Option I**

Master's Degree Project . . . . .	.GBA	695	(4)
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**Option II**

Comprehensive Exam . . . . .	.GBA	697	(1)
Total Units for the Degree . . . . .			(45)

**MSBA OPTION IN ENTREPRENEURSHIP, CREATIVITY AND INNOVATIVE MANAGEMENT**

Entrepreneurship is unique in American and international business in that many successful entrepreneurs have no formal education in business. They apply special skills from non-business areas to develop products and services to meet human needs. Moreover, the rate of new business formation increases every year.

This program is designed to attract: (1) individuals with entrepreneurial drives who wish to increase their chances of success as they start a business, (2) practicing entrepreneurs who need help to make their businesses grow, (3) corporate middle managers seeking to act entrepreneurially within their organization, (4) corporate top managers desiring to make their whole organization more receptive to internal innovation, and (5) individuals seeking to increase their personal creativity and innovation.

**ADMISSION REQUIREMENTS**

The MSBA Program in Entrepreneurship, Creativity and Innovative Management (ECIM) at Cal Poly Pomona has different admission criteria from many other programs. Selection will be made on the basis of evidence of ability to perform at a high academic level. Prospective candidates must have earned a bachelor's degree from an accredited college or university, earned a score of 450 or higher on the GMAT test, and have one or more of the following:

- Experience or expertise in an area that has potential for a product/service that will serve as a basis for an entrepreneurial venture, e.g., science, engineering, entertainment, health care, architecture, manufacturing, food industry, retailing, marketing, medicine, electronics, etc.
- Management experience in a small business;
- A tangible product or service idea;
- Management experience in a large organization, with an interest in intrapreneurship as well as business and product development;
- Living experience in a country outside the United States with a desire to act as an entrepreneur in that country;
- Ownership of one business with a desire to grow it or pursue other ventures.

In applying for admission to the program, prospective candidates must complete an application form, provide official transcripts from all colleges and universities previously attended, GMAT score(s), and three letters of reference.

A TOEFL score of 580 or higher is required for admission of international students to the program.

**CURRICULUM**

Due to the unique characteristics and needs of entrepreneurs, a flexible and individual-centered curriculum is available to students in the MSBA ECIM Program. Part of each student's program will be customized, under faculty guidance, to meet individual needs.

Business Economics . . . . .	EC	521	(4)
Financial Accounting . . . . .	GBA	510	(4)
Financial/Managerial Accounting . . . . .	GBA	511	(4)
Managerial Statistics . . . . .	GBA	514*	
Managerial Statistics . . . . .	GBA	514	(4)
Essentials of Marketing Management . . . . .	GBA	517	(4)
Legal Environment of Business . . . . .	GBA	530	(4)
Productions and Operations Management . . . . .	GBA	531	(4)
Organizational Management Principles and Behavior . . . . .	GBA	535	

Fundamentals of Financial Management . . . . .	GBA	546	(4)
Management Information Systems . . . . .	GBA	547	(4)

Note: prerequisites may be waived based upon demonstrable experience or equivalent upper-division courses — see graduate advisor.

**Course Requirements and Electives**

**A. Entrepreneurship Core Courses (12 units)**

Select 3 courses from the following:

Venture Creation and Growth . . . . .	GBA	570	(4)
Corporate Entrepreneurship and Renewal . . . . .	GBA	571	(4)
Environmental Issues in Entrepreneurship . . . . .	GBA	573	(4)
Entrepreneurship Practicum . . . . .	GBA	642	(3)
Directed Study in Entrepreneurship Practicum . . . . .	GBA	643	(1)

**B. Creativity (4 units)**

Creativity and Innovation . . . . .	GBA	564	(4)
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Note: See Entrepreneurship graduate advisors for additional course offerings.

**C. Innovative Management (8 units)**

Select 2 courses from the following:

Organizational Management, Principles and Behavior . . . . .	GBA	535	(4)
Executive Development . . . . .	GBA	563	(4)
Emerging Issues in Managing in a Global Economy . . . . .	GBA	605	(4)
Seminar in Organizational Behavior . . . . .	GBA	615	(3)
Directed Study in Organizational Behavior . . . . .	GBA	616	(1)
Organizational Development . . . . .	GBA	667	(4)

**D. Strategic and Futures Studies (8 units)**

Select 2 courses from the following:

Entrepreneurship Practicum . . . . .	GBA	642	(4)
Directed Study in Entre Practicum . . . . .	GBA	643	(1)
Management Seminar . . . . .	GBA	671	(3)
Directed Study in Management Seminar . . . . .	GBA	672	(1)
Strategic Management . . . . .	GBA	687	(4)
Forecasting Industry Evolution . . . . .	GBA	599	(3)

Note: GBA 642 can be taken either as an Entrepreneurship core course or as a Strategic and Futures Studies course

**E. Electives (12 units)**

Students are to select courses that will meet their personal educational objectives in consultation with a graduate entrepreneurship advisor.

**Terminal Option (4 units)**

(Select either course)

Business Research Project . . . . .	GBA	695	(4)
Master's Degree Thesis . . . . .	GBA	696	(4)
Total Contract Units . . . . .			(48)

**GRADUATE COURSE DESCRIPTIONS**

**GBA 510 Financial Accounting (4)**

Accounting principles used in the collection, interpretation, and use of financial data from the standpoints of creditors, investors, and management. 4 lecture discussions.

**GBA 511 Financial/Managerial Accounting (4)**

Accounting principles used in the collection, interpretation, and use of financial data from the standpoints of creditors, investors, and management. Study of cost concepts, production cost analysis and cost-volume-profit analysis. 4 lecture discussions. Prerequisite: GBA 510 or equivalent.

**GBA 514 Managerial Statistics (4)**

Decision-making using classical techniques, non-parametric tests, Bayesian analysis, utility theory, index numbers, and time-series analysis. Sampling and sampling distributions, estimation, hypothesis-testing, variance analysis, regression, correlation and multiple regression. 4 lecture discussions. Prerequisite: STA 120, equivalent, or consent of instructor.

**GBA 517 Essentials of Marketing Management (4)**

Development of marketing strategy to identify and serve the needs of an organization's markets and publics. Concepts relating to the analysis, planning, implementation and control of marketing strategy involving product, promotion, pricing and distribution decisions made within an external environmental context. 4 lecture discussions.

**GBA 522 Information Systems Analysis and Design (4)**

Introduction to object-oriented analysis and design of computer information systems. The system life cycle and its business environment. Case studies using event analysis, data dictionary, normalization and data modules. Class hierarchies, structures, and collaboration of objects. User/computer interface design. 4 lectures/problem-solving.

**GBA 524 Information Systems Development (4)**

Introduction to computer programming. Use of event-driven programming language to develop interactive business information systems. 4 lectures/problem-solving.

**GBA 525 Automated Office Systems for Managers/Professionals (3)**

Application of electronic office support systems for increased productivity of manager/professionals. Topics include office automation, information processing, copy processing/reprographics, electronic storage and records management, telecommunications, ergonomics and human factors of implementing change. 3 lectures/problem-solving. Concurrent enrollment in GBA 526 required.

**GBA 526 Directed Study in Automated Office Systems for Managers and Professionals (1)**

Independent use of computer applications software such as word processing, spreadsheet, database, graphics/draw, desktop publishing, desktop presentations, expert systems, and other special projects. Development of computer-generated work for written and oral presentation in the area of automated office systems. 1 seminar. Concurrent enrollment in GBA 525 required.

**GBA 527 Organizational Communications (4)**

Developing communication skills in the transmission and reception of written and oral information; becoming familiar with organizational literature; practicing communication skills in small groups; reviewing writing practices and procedures and the approved style manual. 4 lecture discussions.

**GBA 530 Legal Environment of Business (4)**

Analysis of the essential legal aspects of the business environment dealing with contracts, business-related torts, agency, employment law, and corporations. Function and operation of the courts and administrative agencies. Risk analysis and preventative law approach. 4 lecture discussions.

**GBA 531 Production and Operations Management (4)**

Introduction to fundamental concepts of production and operations management. Use of quantitative methods, forecasting, resource allocation, decision theory, capacity planning, project management, inventory and quality control. 4 lectures/problem-solving. Prerequisite: GBA 514.

**GBA 532 Fundamentals of Contracts and Administration (4)**

A study of the procedures/applications associated with Federal Acquisition Regulations (FAR). In-depth approach at operational level. Sets pace for employment of FAR, concept formation, contract life and program's successful completion. 4 lectures/problem-solving.

**GBA 535 Organizational Management, Principles and Behavior (4)**

Integration of management functions and behavioral processes as they relate to the operation of total enterprise. 4 lecture discussions, case studies, experiential exercises.

**GBA 546 Fundamentals of Financial Management (4)**

Theoretical and conceptual framework for financial decision-making stressing analytical and quantitative techniques. Analysis of controversial and sophisticated methods of allocating resources and raising funds both internally and externally within the corporate context. 4 lecture discussions. Prerequisites: GBA 510, GBA 514, and EC 521 and computer proficiency.

**GBA 547 Management Information Systems (4)**

Management and development of information systems in modern business and the public sector from the customer and the MIS perspective. Information as a strategic asset. Acquisition, analysis, integration, presentation of internal and external information. Information management in international and multinational enterprises. Ethical, social impacts. 4 lectures/problem-solving.

**GBA 552 Analysis of Federal Contracts (4)**

A study of problems related to federal contracts' categories, either price contract or cost contract. Examines policies/procedures of Federal Acquisition Regulations (FAR) price/cost regulations. Includes DOD/DFAS (variations of FAR) applications, influence and advances price/cost policy/theory. 4 lectures/problem-solving.

**GBA 554 Client Server Computing (4)**

Introduction to client/server computing environments. Relational database concepts, data modeling and database design. Distributed database and processing techniques. 4 lectures/problem-solving.

**GBA 557 Computer-Based Data Communications (4)**

Introduction to the use of computers to support data communications. Information systems design issues related to hardware, software, media, networks and protocols. 4 lectures/problem-solving. Prerequisite: GBA 522.

**GBA 560 Legal Environment of Information Systems (4)**

Fundamentals and intermediate knowledge of the legal environment concerning IS. Typical legal problems (private and public sector) arising from the acquisition, use and control of IS. 4 lecture discussions. Prerequisites: CIS 433 and GBA 530, or equivalent experience.

**GBA 562 Personnel Management (4)**

Analytical and descriptive overview of all the main sub-fields within personnel (human resources) management. Typical personnel problems of diverse organizations and their solutions, using contemporary techniques in accordance with legal requirements. 4 lectures/problem-solving. Prerequisite: GBA 535.

**GBA 563 Executive Development (4)**

Analysis of the factors endemic to the successful executive and how these skills and traits can be acquired. 4 seminars.

**GBA 564 Creativity and Innovation (4)**

Understanding and applying creativity to entrepreneurship. Developing individual and group creativity skills. Applying creative thinking to spot venture opportunities, recognize consumer trends and find unique niches, find innovative sources of financing, market new inventions. Technology transfer-emphasis on California. 4 seminars.

**GBA 565 Professional Presentations Using Technology (3)**

Course material demonstrates how proven, effective techniques can blend with new technology of computer-generated graphics to create powerful presentations. 3 lectures/problem-solving. Concurrent enrollment in GBA 566 required.

**GBA 566 Directed Study in Professional Presentations Using Technology (1)**

Independent use of computer application software to design and develop professional presentations, including computer-generated visuals and technology. 1 seminar. Concurrent enrollment in GBA 565 required.

**GBA 570 Venture Creation and Growth (4)**

A study of entrepreneurship as it relates to the founding of new companies, leveraged buyouts, divisional spinoffs, and growth from small to medium size sales volume. Examines managerial strategies and creative corporate structuring that taps the entrepreneurial spirit. 4 lecture discussions.

**GBA 571 Corporate Entrepreneurship and Renewal (4)**

Business plans. Creation of management team. Negotiating and structuring new venture deals. Harvesting or bankruptcy of the new venture. Management problems unique to small and medium-sized firms undergoing rapid growth. 4 lectures/problem-solving.

**GBA 573 Environmental Issues in Entrepreneurship (4)**

The relationship of entrepreneurial organizations, social issues and government regulation. Values, opportunities, goals and personal ethics of the entrepreneur. Government regulatory agencies and their impact on smaller firms. Regulatory issues pertaining to California ventures. Problems of businesses leaving California. 4 seminars.

**GBA 577 Advanced IS Auditing (4)**

Hands-on experience in applying IS Auditing techniques and methods. Fundamentals of advanced concepts in IS Auditing. 4 lecture discussions and projects. Prerequisites: CIS 433, GBA 522 and GBA 524 or equivalent experience.

**GBA 578 Security and Privacy of Information Systems (4)**

Practical case-study approach to solving security problems peculiar to the commercial data systems environment. 4 lecture discussions. Prerequisites: CIS 433 and GBA 557, or equivalent experience.

**GBA 580 Introduction to Real Estate Analysis and Valuation (4)**

Analysis of the economic, financial, institutional, and legal factors affecting the ownership, use, development and valuation of real estate. Qualifies students for the California Real Estate Broker License Examination. 4 lectures/problem-solving.

**GBA 583 Practices and Application of Real Estate Law (4)**

Critical analysis of common and statutory law related to California Real Estate Transactions. Guest lectures by practitioners on responsibilities and liabilities of real estate operations. Qualifies students for Real Estate Brokers License Examination. Not available for credit for students with courses in Real Estate Law and Practices. 4 lectures/problem-solving. Prerequisites: GBA 530 and GBA 580 or equivalents.

**GBA 591 Taxes and Business Strategy (3)**

A practical course on how to integrate regulatory costs (in particular, taxes), into strategic business decisions. Topics include consideration of sources of tax law, communication of tax concepts, tax rule uncertainty, implicit taxes, and international tax issues. 3 lecture discussions. Concurrent enrollment in GBA 592 required.

**GBA 592 Directed Study in Taxes and Business Strategy (1)**

Investigation of the impact of taxes on strategic business decision-making under the supervision of a faculty member. 1 seminar. Concurrent enrollment in GBA 591 required.

**GBA 599/599A/599L Special Topics for Graduate Students (1-4)**

Lecture-discussions of selected topics comprising new or experimental courses not otherwise offered. Each offering identified in the current schedule and on the student's transcript. No limitation on repeats. Prerequisite: consent of instructor.

**GBA 606 Rapid Application Development**

Introduction to techniques used to rapidly develop business information systems. Emphasis on JAD and Evolutionary Prototyping. 4 lectures/problem-solving. Prerequisite GBA 554.

**GBA 608 Managerial Accounting for Decision-Making (3)**

Use of accounting information for planning and control. Special attention to managerial uses of budgeting and cost data for decision-making purposes. 3 lecture discussions. Concurrent enrollment in GBA 609 required. Prerequisite: GBA 511 or equivalent.

**GBA 609 Directed Study in Managerial Accounting (1)**

Independent investigation of selected problems in management accounting under the supervision of a faculty member. Individual conferences with the instructor to be arranged. 1 seminar. Concurrent enrollment in GBA 608 required.

**GBA 610 Financial Markets and Institutions (3)**

The structure and role of the financial system, interest rates, security markets, derivative security markets, government influence on financial markets, commercial banking, and nonbank financial institutions. 3 lectures/problem-solving. Concurrent enrollment in GBA 611 required. Prerequisites: GBA 546. Unconditional standing required.

**GBA 611 Directed Study in Financial Markets and Institutions (1)**

Independent investigation of selected topics in financial markets and institutions, under the direction of a faculty member. 1 seminar. Concurrent enrollment in GBA 610 required. Unconditional standing required.

**GBA 615 Seminar in Organizational Behavior (3)**

Human processes employed in accomplishing work tasks and creating employee satisfaction within the organization. Group experiences whereby students test their interpersonal skills in the organizational environment. Group activities; 3 lecture discussions. Concurrent enrollment in GBA 616 required. Prerequisites: Completion of all MBA prerequisite courses and microcomputer proficiency. Unconditional standing required.

**GBA 616 Directed Study in Organizational Behavior (1)**

Independent investigation of selected problems in organizational behavior under the direction of a faculty member. 1 seminar. Concurrent enrollment in GBA 615 required. Unconditional standing required.

**GBA 617 Management-Union Relations (4)**

The evolving interaction of unions and management within organizations. In-depth look at productivity, quality of working life, and components of our rapidly changing work culture. The future of participative management, legislation, collective-bargaining, and arbitration. 4 lecture discussions. Unconditional standing required.

**GBA 620 International Business (4)**

Survey of social, economic, and political factors governing conduct of business abroad. Analysis of successful and unsuccessful methods of international managers and their staffs. 4 lecture discussions. Unconditional standing required.

**GBA 622 Business Information Systems (3)**

Conceptual foundations of information systems and their use in organizations. Study of data/information flow between functional subsystems and the interdependencies involved in an integrated system. Information planning and system development strategies. System security and controls. 3 lectures/problem-solving. Concurrent enrollment in GBA 623 required. Prerequisites: GBA 554 and GBA 557. Unconditional standing required.

**GBA 623 Directed Study in Business Information Systems (1)**

Independent investigation of advanced topics in business information systems. Individual conferences with the instructor to be arranged. 1 seminar. Concurrent enrollment in GBA 622 required. Unconditional standing required.

**GBA 628 Management Science Seminar (3)**

Quantitative theory and techniques. Linear, integer, non-linear, and dynamic programming, transportation and assignment algorithms, replacement problems, game theory and Markov processes. Introduction to computer solutions. 3 lectures/problem-solving. Concurrent enrollment in GBA 629 required. Prerequisites: Completion of all MBA prerequisite courses and microcomputer proficiency. Unconditional standing required.

**GBA 629 Directed Study in Management Science (1)**

Independent investigation of advanced topics in management science under the direction of a faculty member. 1 seminar. Concurrent enrollment in GBA 628 required. Unconditional standing required.

**GBA 630 Federal Government Contract Cases, Appeals and Jurisdiction (4)**

Study and criticism of federal contracts. Study of important statutes which are framed and directed only at government contracts. 4 lectures/problem-solving. Unconditional standing required.

**GBA 633 Promotion Management (4)**

Advertising management as related to entire communication effort of the organization. Emphasis on communication theory, advertising, customer analysis, communicative goals, positioning, personal selling, sales promotion, public relations, publicity, media planning, and budgeting. Cases. Design of promotion plan. 4 lectures/problem-solving. Unconditional standing required.

**GBA 634 Sales Productivity (4)**

Analytical and descriptive overview of successful productivity theory models used in contemporary business to business selling and sales management. 4 lecture discussions. Unconditional standing required.

**GBA 635 Motivation and Market Behavior (4)**

Theory and application of the fundamentals of human behavior that affect buying decisions: perception, learning, social and cultural factors. Models of consumer behavior. Selected applications including diffusion of innovation, opinion leadership, marketing communications. Applications to industrial markets and institutional markets. 4 lectures/problem-solving. Prerequisite: GBA 517. Unconditional standing required.

**GBA 636 Project Management (3)**

Planning, scheduling, resource allocation, coordination and control of the activities using bar charts, networks, critical path analysis, resource leveling, and cost-expediting. Computer usage and comparison of microcomputer software for project management. 3 lectures/problem-solving. Concurrent enrollment in GBA 637 required. Prerequisites: Microcomputer proficiency and GBA 531. Unconditional standing required.

**GBA 637 Directed Study in Project Management (1)**

Independent use of project management methods for planning, scheduling, resource allocation, coordination and control of the activities of a project under the direction of a faculty member. 1 seminar. Concurrent enrollment in GBA 636 required. Prerequisite: GBA 531. Unconditional standing required.

**GBA 640 Total Quality Management (3)**

Fundamental concepts of Total Quality Management (TQM). Topics include quality management philosophies, planning, teamwork, costs, continuous improvement for production and service systems, audits, standards, awards, inspection and metrology, product and process design, reliability, statistical process control, and acceptance sampling. 3 seminar-discussions. Concurrent enrollment in GBA 641 required. Unconditional standing required.

**GBA 641 Directed Study in Total Quality Management (1)**

Independent investigations to develop a plan for implementing TQM in business. 1 seminar. Concurrent enrollment in GBA 640 required. Unconditional standing required.

**GBA 642 Entrepreneurship Practicum (3)**

Case and field studies of entrepreneurial management. Independent research of selected problems in entrepreneurship under faculty

direction. Comparative case studies of entrepreneurship in different cultures. Focus on applying concepts from GBA 570 and 571 to contemporary Southern California. 3 supervision. Concurrent enrollment in GBA 643. Prerequisites: GBA 570 and 571. Unconditional standing required.

#### **GBA 643 Directed Study in Entrepreneurship Practicum (1)**

Independent investigation of advanced topics in entrepreneurship and corporate renewal under the direction of a faculty member. Individual faculty supervision of case study, business plan or feasibility study will provide an integrative and practical learning experience. 1 seminar. Concurrent enrollment in GBA 642. Unconditional standing required.

#### **GBA 645 Financial Decision-Making (3)**

A seminar course in finance, utilizing comprehensive cases to simulate the role of the financial manager. Concurrent enrollment in GBA 646 required. 3 lectures/problem-solving. Prerequisites: Completion of all MBA prerequisite courses and microcomputer proficiency. Unconditional standing required.

#### **GBA 646 Directed Study in Financial Decision Making (1)**

Independent investigation of selected problems in Advanced Financial Management under the direction of a faculty member. 1 seminar. Concurrent enrollment in GBA 645 required. Unconditional standing required.

#### **GBA 647 Security Analysis and Portfolio Management (3)**

The three major types of investment analysis: fundamental, technical and random walk, with emphasis on the fundamental approach to valuation and stock selection. Portfolio analysis, composition, selection, revision and performance. Two-parameter, risk and return models, such as the capital asset pricing model and the capital market line. 3 seminars. Concurrent enrollment in GBA 648 required. Prerequisites: Completion of all MBA prerequisite courses, microcomputer proficiency, GBA 546 and EC 521. Unconditional standing required.

#### **GBA 648 Directed Study in Security and Portfolio Management (1)**

Independent investigation of investments under the direction of a faculty member. The student is expected to either comprehensively examine and evaluate a company or manage a hypothetical portfolio. 1 seminar. Concurrent enrollment in GBA 647 required. Unconditional standing required.

#### **GBA 652 Marketing Seminar (3)**

Marketing decision-making. Application of marketing concepts and implementation of effective marketing programs. Analysis of marketing decision-making techniques. Present and future marketing trends. 3 lecture discussions. Concurrent enrollment in GBA 653 required. Prerequisite: completion of all MBA prerequisite courses and microcomputer proficiency. Unconditional standing required.

#### **GBA 653 Directed Study in Marketing Seminar (1)**

Independent investigation of selected problems in marketing under the direction of a graduate member. Unconditional standing required. 1 seminar. Concurrent enrollment in GBA 652 required. Unconditional standing required.

#### **GBA 654 Business Forecasting (3)**

Forecasting techniques. Principles and methods. Evaluation of reliability of existing forecasting techniques. Emphasis on their application and interpretation of results. Numerous computer applications in modeling

and forecasting. 3 lectures/problem-solving. Concurrent enrollment in GBA 655 required. Prerequisites: all MBA prerequisite courses and microcomputer proficiency. Unconditional standing required.

#### **GBA 655 Directed Study in Business Forecasting (1)**

Independent investigation of advanced topics in business forecasting under the direction of a faculty member. 1 seminar. Concurrent enrollment in GBA 654 required. Unconditional standing required.

#### **GBA 659 Accounting for Decisions and Control (4)**

Accounting information systems for management control in business and not-for-profit organizations, in-depth analysis of case problems covering development and use of accounting data and issues of budgeting, performance evaluation and control. 4 lectures/problem-solving. Prerequisite: GBA 608/609 or equivalent. Unconditional standing required.

#### **GBA 665 Human Interaction Skills Laboratory (4)**

Knowledge and skills in interpersonal relations and working groups. Helping skills, understanding group process including unconscious dimensions of leadership, sexism, racism. Sensitivity training and laboratory methods fostering authentic participant involvement. 4 lectures/problem-solving. Prerequisites: GBA 615 and GBA 616. Unconditional standing required.

#### **GBA 667 Organizational Development (4)**

Initiation and management of organizational efforts at planned improvement. Reviews quality of work life, productivity and quality improvement thrusts, behavioral science perspectives on organizational development. Survey of basic methods; review of domestic and global literature. 4 lectures/problem-solving. Prerequisites: GBA 615 and GBA 616. Unconditional standing required.

#### **GBA 671 Management Seminar (3)**

The development and evaluation of alternative corporate strategies drawing upon the functional areas within business and the outside environmental factors which affect business. 3 seminars. Completion of all MBA prerequisite courses and microcomputer proficiency. Concurrent enrollment with GBA 672 required. Prerequisites: GBA 561 and all required 500-level courses. Unconditional standing required.

#### **GBA 672 Directed Study in Management Seminar (1)**

Independent investigation of selected problems in management under the direction of a faculty member. 1 seminar. Concurrent enrollment with GBA 671 is required. Unconditional standing required.

#### **GBA 673 Information Systems Seminar (3)**

A managerial perspective of the changing issues and problems of computer-based information systems in business organizations. 3 lectures/problem-solving. Concurrent enrollment in GBA 674 required. Prerequisite: completion of all MBA prerequisite courses and microcomputer proficiency. Unconditional standing required.

#### **GBA 674 Directed Study in Information Systems (1)**

Independent investigation of selected problems in management information systems under the direction of a faculty member. 1 seminar. Concurrent enrollment with GBA 673 required. Unconditional standing required.

#### **GBA 680 Real Estate Finance and Investment (4)**

Trends in real estate investment opportunities. Current theories and techniques applied to real estate financing, acquisition, real estate

mortgage markets, mortgage banking, and brokerage/investment strategies. Partial qualification for the California Real Estate Brokers License Examination. Available for credit for students with FRL 486 only by petition. 4 lectures/problem-solving. Prerequisites: GBA 546 and GBA 580 or equivalents. Unconditional standing required.

#### **GBA 681 International Real Estate and Real Estate Research (4)**

Problems and methods of acquiring, financing, transferring, and managing real estate in foreign countries, and with foreign owned and operated real estate entities in the United States. Market analysis techniques for foreign and domestic investment properties. 4 lectures/problem-solving. Prerequisites: GBA 546, GBA 580, and GBA 583 or equivalents. Unconditional standing required.

#### **GBA 682 Real Estate Acquisition and Development (4)**

Review and application of methods and processes for acquisition and development of investment real estate, including search, negotiation, financial analysis, market analysis, building design, construction, property management and marketing. Partial qualification for the California Real Estate Brokers License Examination. Available for credit for students with FRL 490 only by petition. 4 lectures/problem-solving. Unconditional standing required.

#### **GBA 683 Business Research Methods (3)**

Identification and investigation of business problems. Stating hypotheses, problem statements, defining and collecting data, and selecting appropriate analysis techniques. Examination of types of business research (ex post facto, laboratory, field, delphi or survey) and limitations for inference. 3 lectures/problem-solving. Concurrent enrollment in GBA 601 required. Unconditional standing required. Prerequisites: Completion of all MBA prerequisite courses and microcomputer proficiency.

#### **GBA 684 Directed Study in Business Research Methods (1)**

Development of hypotheses, problem statement and bibliography for business problems under the direction of a faculty member. 1 seminar. Concurrent enrollment in GBA 600 required. Unconditional standing required.

#### **GBA 685 MSBA Option Project (4)**

Synthesis and integration of MSBA Option concepts and techniques to a realistic business problem. Application of technical, managerial communications, and interpersonal skills in a group environment. 4 supervision. Prerequisites: GBA 577, GBA 578, GBA 615, GBA 616, and GBA 622, 623. Unconditional standing required.

#### **GBA 687 Management Policies and Strategies Practicum (3)**

A capstone course on decision-making at the strategic management level. Cases and assigned readings utilized to focus on the various functional areas of business. Topics include consideration of business ethics and international issues. 3 seminars. Concurrent enrollment in GBA 688 required. Prerequisites: Completion of MBA core courses or consent of instructor and microcomputer proficiency. Unconditional standing required.

#### **GBA 688 Directed Study in Management Policies and Strategies (1)**

Investigation in the overall operation of a business organization based on a computerized simulation program under the supervision of a faculty member. The program requires participants to make strategic

decisions which involve the various functional areas of business. 1 seminar. Concurrent enrollment in GBA 687 required. Unconditional standing required.

#### **GBA 689 Financial Reporting and Communication (4)**

Alternative accounting principles and their effects on reported results. Analysis of information in the primary financial statements and evaluation of financial position and results of operation. Evaluating the liquidity, stability, profitability and growth potential of business entities. 4 lecture discussions. Prerequisite: GBA 608 or equivalent. Unconditional standing required.

#### **GBA 691 Directed Study (1-9)**

Independent, directed study of advanced topics in business. Class meetings and individual conferences with the instructor to be arranged. Total credit limited to 9 units. Precedes enrollment in GBA 695, GBA 696, or GBA 697. Prerequisites: For MSBA in IS Auditing candidates, GBA 577 and GBA 578. Unconditional standing required.

#### **GBA 692 Independent Study (1-4)**

Individual investigation or original study to be conducted in a field of interest selected by the student with approval of the instructor. Intensive personal research under initiative of the student with general guidance and advice from the instructor. Study is not to be part of final research project. Total credit limited to 4 units. Unconditional standing required.

#### **GBA 695 Business Research Project (2-4)**

A written research project concerning a significant problem in the field of business. Directed by a committee of graduate faculty members. Total credit limited to 4 units. Prerequisites: GBA 683 and GBA 684 for MBA candidates and approved committee form on file in Business Graduate Office; GBA 691 required for MSBA candidates. Advancement to Candidacy required.

#### **GBA 696 Master's Degree Thesis (2-4)**

A formal thesis concerning a significant problem in the field of business. Directed by a committee of graduate faculty members. Total credit limited to 4 units. Prerequisites: GBA 683 and GBA 684 for MBA candidates and approved committee form on file in Business Graduate Office. Advancement to Candidacy required.

#### **GBA 697 Comprehensive Examination (1)**

An examination on the subject areas of the candidate's coursework listed on the degree program. May be taken no more than two times. Failure to complete exam satisfactorily the second time will result in termination from the program. Candidates must register through the MSBA in IS Auditing advisor. Advancement to Candidacy required.

#### **GBA 699 Master's Degree Continuation (0)**

Registration or an approved leave of absence is required for any quarter following the final assignment of the grade "SP" until the completion of thesis, project or comprehensive examination. The candidate must be enrolled in the university during the quarter in which he/she graduates. Advancement to Candidacy required.

## CHEMISTRY

### MASTER OF SCIENCE IN CHEMISTRY

In the Department of Chemistry, College of Science

Keith A. Howard, Chair  
Michael Keith, Graduate Coordinator

The Master of Science degree in Chemistry provides a comprehensive understanding of the principles of chemistry and application in detail to advanced problems. This understanding will be gained through course work, seminar, independent study and research. The program is designed to provide the student with the necessary skills and techniques to reach the applicant's particular objective, whether it be for a successful career in teaching or industry or to pursue further graduate work. The student in this program may pursue one of several fields of specialization which include analytical, inorganic, organic, physical chemistry and biochemistry.

### ADMISSION TO THE PROGRAM

An applicant for admission to the graduate program in chemistry must have received a baccalaureate degree in chemistry or in a related discipline, including at least 36 quarter units of chemistry courses. An applicant lacking these qualifications may be admitted subject to a review of the student's academic background by the departmental graduate program committee. Admission to the program requires an undergraduate grade point average of 2.5 and an average of 3.0 in chemistry courses. A limited number of students not meeting these requirements may be admitted on a conditional basis if facilities permit. Such students must meet requirements stipulated in the statement of conditional admission within the time limit specified, to remain in the university.

Each selected applicant, with an advisory committee, will design a program in the selected area of specialization based upon interests, preparation and performance on a departmental placement examination. The program will include required courses, selection of courses in an area of specialization, independent study and a thesis. It will normally constitute 45 to 50 quarter units of credit.

### REQUIREMENTS

1. The degree program must include a minimum of 45 quarter units. At least 24 units must be taken in 500-600 level courses.
2. No more than 13 units of acceptable graduate credit may be transferred from another graduate institution. No more than 13 units taken through Extended University may be used on a contract. No more than 13 units of acceptable graduate credit may be petitioned by an undergraduate student. A total limit of 13 transfer, Extended University, and/or units petitioned for graduate credit may be included on a master's contract. The stipulated time limit of 7 years applies to all of the above.
3. The student must complete his program based upon the curriculum outlined below.
4. The student must demonstrate a reading knowledge of a modern foreign language or proficiency in a computer programming language acceptable to the chemistry department.
5. A grade point average of 3.0 (B) or better must be maintained in all upper division undergraduate and all graduate courses.
6. Advancement to Candidacy must be achieved. Satisfaction of the Graduation Writing Test (GWT) requirement is necessary before advancement.

7. An acceptable thesis must be completed and the necessary copies submitted in accordance with university regulations.
8. An examination in defense of the thesis must be successfully completed.
9. The candidate must be enrolled in the university during the quarter of graduation.

### CURRICULUM

#### Required Courses

Seminar in Chemistry	.....CHM	550	3
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(Student must enroll for 1 unit of seminar during 3 separate quarters)

Thesis Research in Chemistry	.....CHM	694	0-6
Master's Degree Thesis	.....CHM	696	3-9

(Total of 9 units with 3 or more from CHM 696 required.)

Courses in an area of Specialization	.....		8
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Select 6 units in an area of specialization, to be selected from CHM 522, 523 (theoretical); CHM 541, 542, 543 (organic); CHM 553, 554 (physical); CHM 561, 562 (biochemistry); CHM 571, 572 (inorganic) or CHM 581, 582, 583 (analytical). Each of these courses requires a concurrent enrollment in 1 unit of CHM 513, Independent Study.

Approved electives	.....		25
Total minimum	.....		45

### GRADUATE COURSE DESCRIPTIONS

The notations F, W, Sp, Su and even or odd indicate which quarter(s) of even or odd numbered calendar years the course is normally offered. Courses not designated "even" or "odd" are offered each year.

#### CHM 513 Independent Study in Advanced Chemistry (1) F, W, Sp

Reading and reports on papers in the literature, solving of assigned problems. Minimum of 60 hours total time. Concurrent: any of CHM 522, 523, 541, 542, 543, 553, 554, 561, 562, 571, 572, 581, 582, 583. May be repeated for a maximum of 7 units.

#### CHM 522, 523 Advances in Chemical Physics (3)(3) W, Sp, odd years, respectively

Application of quantum chemistry to problems of atomic and molecular structure; molecular orbital and valence bond theories. Theory of transition moments and application to IR, UV, RAMAN and spin resonance spectroscopy. Applications of reaction dynamics. 3 lecture discussions. Concurrent: CHM 513. Prerequisite: CHM 419 or consent of instructor.

#### CHM 531 Solution and Relaxation Kinetics (3) Sp, even years

The main focus will be on the application of relaxation kinetics to the study and analysis of relatively complex multi-step reactions in solution. Treatment will unify practical and theoretical considerations with respect to experimental design, instrumentation, limitations and relationship to conventional kinetic methods. Specific topics will include: spectrophotometric detection of intermediate, reversible and non-reversible systems, introduction to normal mode analysis, amplitude effects and detailed analysis of representative examples from the recent literature and research in progress. 3 lectures/problem-solving. Prerequisite: CHM 305 or 313 or consent of instructor.



**CHM 541, 542, 543 Selected Topics in Organic Chemistry (3) (3) (3) F, W, Sp, respectively**

Recent advances in topics of interest in the area of organic chemistry, for example, reaction mechanism, synthesis, spectroscopy, polymers, heterocycles, natural products as well as physical organic, organometallic, bio-organic, industrial and photochemistries. Each course may be repeated once for credit. 3 lecture discussions. Concurrent: CHM 513.

**CHM 544 Special Topics in Organic Chemistry (3) Sp, even years**

Selected topics in organic chemistry. Course may be repeated once for credit. 3 lecture discussions. Concurrent: CHM 513.

**CHM 550 Seminar in Chemistry (1) F, W, Sp**

Special study in selected areas of chemistry. May be repeated for a maximum of 3 units. 1 seminar.

**CHM 553, 554 Advances in Physical Chemistry (3)(3) F, odd years; W, even years, respectively**

Selected topics from advanced physical chemistry such as statistical mechanics, electrochemistry kinetics and solution chemistry. 3 lecture discussions. Concurrent: CHM 513.

**CHM 561, 562 Selected Topics in Biochemistry (3)(3) W, Sp respectively**

Basic principles as applied to topics of biochemical interest, such as: cellular energetics and kinetics, analysis of the structure and function of proteins and other macromolecules, feedback control metabolism, trace nutrients, biochemistry of membranes, marine biochemistry, biochemical genetics and biochemical evolution. Each course may be repeated once for credit. 3 lecture discussions. Concurrent: CHM 513.

**CHM 565 Biochemical Mechanisms (3) F, odd years**

General mechanistic principles of organic and inorganic chemistry as they relate to biochemistry. 3 lecture discussions.

**CHM 567 Advanced Clinical Chemistry (3) Sp, odd years**

Chemical basis of recent advances in analytical methods and techniques, basis of new instrumentation, treatment of data and interpretations of clinical analyses. 3 lecture discussions.

**CHM 571, 572 Advances in Inorganic Chemistry (3)(3) W, Sp, even years, respectively**

Selected topics in advanced inorganic chemistry such as physical methods of inorganic chemistry, reaction mechanisms, organometallic chemistry and applications of group theory. 3 lecture discussions. Concurrent: CHM 513.

**CHM 581, 582, 583 Advances in Analytical Chemistry (3)(3)(3) F, W, Sp, respectively**

Selected topics in modern analytical chemistry. Each course may be repeated once for credit. 3 lecture discussions. Concurrent: CHM 513.

**CHM 691 Directed Study (1-3) F, W, Sp, Su**

Independent study in an area chosen by the student under the supervision and direction of a graduate faculty member. Total credit limited to 3 units. Unconditional standing required.

**CHM 694 Thesis Research in Chemistry (1-3) F, W, Sp, Su**

Research in area of specialization conducted as part of the preparation for writing a thesis under the direction of a graduate faculty member. Total credit limited to 6 units. Unconditional standing required.

**CHM 696 Master's Degree Thesis (1-3) F, W, Sp, Su**

Compilation, evaluation, interpretation and report of research for thesis. (3 units minimum.) Total credit limited to 9 units. Advancement to Candidacy required.

**CHM 699 Master's Degree Continuation (0)**

Registration or an approved leave of absence is required for any quarter following the final assignment of the grade SP until the completion of thesis and final oral examination. The candidate must be enrolled in the university during the quarter in which he/she graduates. Advancement to Candidacy required.

## COMPUTER SCIENCE

### MASTER OF SCIENCE IN COMPUTER SCIENCE

In the Department of Computer Science, College of Science

Mandayam Srinivas, Chair

H. Norton Riley, Coordinator, Graduate Program

The Master of Science program in Computer Science provides an opportunity for students to enhance their understanding of the principal hardware and software themes. Students will also learn how to analyze and formulate solutions for many advanced problems which occur in computer systems. The program stresses technical competence and encourages the student in independent work and judgment.

#### ADMISSION TO THE PROGRAM

For admission as an unconditional graduate student, the applicant should have completed, with a 3.0 (B) average or better, coursework equivalent to the following:

- a. CS 365 Computer Organization
- b. CS 420 Artificial Intelligence
- c. CS 431 Operating Systems
- d. CS 440 Compiler Design
- e. MAT 208 Linear Algebra
- f. MAT 214 Calculus of Several Variables I
- g. STA 326 Statistical Methods for Computer Scientists

Applicants with a deficiency in any of these areas may be admitted with conditional standing and must satisfactorily complete a prescribed set of courses before becoming eligible for unconditional graduate standing.

In addition, unconditional status requires that the student has scored at or above the 50th percentile on the Graduate Record Examination (GRE) Subject Test in Computer Science.

Conditional students are expected to have a computer science background equivalent to that of undergraduate seniors. In particular, conditional admission requires successful completion of courses equivalent to the following:

- a. CS 210 Computer Logic
- b. CS 241 Data Structures and Algorithms II
- c. CS 264 Assembly Language Programming
- d. CS 310 Automata Theory and Formal Languages
- e. MAT 214 Calculus of Several Variables I

All international students (conditional and unconditional) must have passed the TOEFL exam with a score of 550 or above.

All graduate students must meet with their graduate advisor or committee and prepare a study list which will define all courses and other requirements to be completed for the degree.

#### REQUIREMENTS

Students are urged to know the general scholastic requirements described in the "Graduate Studies" section of the catalog.

No more than 13 units of acceptable graduate credit may be transferred from another graduate institution. No more than 13 units taken through

Extended University may be used on a contract. No more than 13 units of acceptable graduate credit may be petitioned by an undergraduate student.

A total limit of 13 transfer, Extended University, and/or units petitioned for graduate credit may be included on a master's contract. The stipulated time limit of 7 years applies to all of the above. A grade point average of 3.0 (B) or better must be maintained in all upper-division undergraduate and all graduate courses.

Admission to the program does not admit a student to candidacy for a degree. Advancement to Candidacy is granted to an unconditional student, having passed the Graduation Writing Test (GWT) and upon the recommendation of his/her faculty advisor, and implies a readiness to attempt thesis. The candidate must be enrolled during the quarter of graduation.

#### CURRICULUM

##### Required Courses

Advanced Algorithm Design and Analysis . . . . .	CS 530	4
Computability and Complexity Theory . . . . .	CS 531	4
Graduate Seminar . . . . .	CS 664	2
Directed Study . . . . .	CS 691	1-3
Master's Degree Thesis . . . . .	CS 696	4

One of the following courses:

Automated Reasoning . . . . .	CS 515	4
Natural Language Processing . . . . .	CS 517	4
Computer Vision . . . . .	CS 519	4
Robotics . . . . .	CS 521	4
Expert Systems . . . . .	CS 523	4

One of the following courses:

Advanced Computer Organization . . . . .	CS 525	4
Computer Networking and Distributed Computing . . . . .	CS 565	4

##### Electives

Computer Science graduate level offerings or other courses approved by the Computer Science Graduate Committee. . . . . 20

Total Units . . . . . 45

#### GRADUATE COURSE DESCRIPTIONS

Graduate courses presume that students have been admitted unconditionally to the program.

##### CS 510 Computer-Assisted Instruction (4)

General techniques for designing computer systems to provide individualized instruction. Program structure, instruction layout, scoring systems and data organization methods. Existing CAI packages and development of new packages. Hardware requirements for audio-visual effects. 4 lectures/problem-solving. Prerequisite: competence in programming and data structures.

##### CS 515 Automated Reasoning (4)

Logical foundations, logical representation of knowledge, unification, theorem proving, deductive databases, logic programming, program verification and synthesis, nonstandard logics, epistemic logic, temporal logic. 4 lectures/problem-solving. Prerequisites: CS 352 and PHL 202 or consent of instructor.

**CS 517 Natural Language Processing (4)**

Grammatical structure and parsing of natural language, representations of meanings (semantics), story understanding and generation, applications. 4 lectures/problem-solving. Prerequisites: CS 352, CS 420 and PHL 202 or consent of instructor.

**CS 519 Computer Vision (4)**

Representation of images, image data acquisition, methods of object recognition, representation of visual knowledge, boundary detection, texture, motion, the problem of occlusion, applications. 4 lectures/problem-solving. Prerequisite: CS 420 or consent of instructor.

**CS 521 Robotics (4)**

Robot programming, languages and simulation. Origins and taxonomy of robots. Case study in robot architecture, hardware and software. Homogeneous transformations. Kinematic equations and their solution. Elementary digital control. 4 lectures/problem-solving. Prerequisite: competence in programming and data structures.

**CS 523 Expert Systems (4)**

Expert systems construction. Knowledge representation, utilization and acquisition. Rule-based systems, fuzzy logic, knowledge engineering. 4 lectures/problem-solving. Prerequisite: CS 420 or consent of instructor.

**CS 525 Advanced Computer Organization (4)**

Principles and concepts of computer architecture and organization. Pipelining and parallelism, multi-processor and distributed processing systems. Historical developments, architectural tradeoffs and innovations. Case studies. 4 lectures/problem-solving. Prerequisite: CS 365 or consent of instructor.

**CS 530 Advanced Algorithm Design and Analysis (4)**

Classic designs: greedy; divide-and-conquer; dynamic programming; branch-and-bound. Complexity analysis: asymptotic notation; average, worst-case and amortized analyses; lower bounds. Classic problems and algorithms. 4 lectures/problem-solving. Prerequisite: competence in algorithms and data structures.

**CS 531 Computability and Complexity Theory (4)**

Formalizing problems and algorithms. Characterizations and properties of computability classes, undecidability. Complexity classes. NP-complete problems, proof of NP-completeness. 4 lectures/problem-solving. Prerequisite: CS 310 or consent of instructor.

**CS 535 Parallel Algorithms (4)**

Design and analysis of algorithms for parallel computers. Basic techniques, classic problems. Models of parallel computation, parallel hardware, software issues involved in parallel programming. Parallel complexity classes. 4 lectures/problem-solving. Prerequisite: CS 530 or consent of instructor.

**CS 540 Topics in Compiler Design (4)**

Code and loop optimization. Data flow analysis. Syntax-directed translation. 4 lectures/problem-solving. Prerequisites: CS 408 and CS 440 or consent of instructor.

**CS 541 Programming Language Semantics (4)**

Operational, denotational and axiomatic semantics of programming languages. Vienna definition language, w-grammars, LISP definition. 4 lectures/problem-solving. Prerequisite: CS 408 or consent of instructor.

**CS 545 Parallel Computing Environments**

Current issues in parallel computer systems. Parallel architectures. Parallel programming languages and environments. Parallel operating systems and parallelizing compiler essentials. 4 lectures/problem-solving. Prerequisites: CS 365, CS 431, and CS 440 or consent of instructor.

**CS 555 Computer Image Processing (4)**

Digital picture processing. Mathematical preliminaries for image processing. Visual perception. Digitization and compression. Image enhancement, restoration and reconstruction. 4 lectures/problem-solving. Prerequisites: MAT 214 and CS 445 or consent of instructor.

**CS 565 Computer Networking and Distributed Computing (4)**

Modeling and quantitative approaches to computer networks, teleprocessing and distributed computing. Statistical multiplexing and packet switching, buffering, front-end processing, network structures and distribution of control hardware, data and software. 4 lectures/problem-solving. Prerequisite: CS 405 or consent of instructor.

**CS 570 Human Computer Interaction (4)**

Principles of human factors, computer technology, and their interactions. Theory and practice of user interface design and evaluation. Special topics such as graphical user interfaces, graphics programming, multi-sensory systems, and computer-supported cooperative work. Prerequisite: Consent of instructor.

**CS 580 Software Engineering Metrics and Models (4)**

The role of metrics and models in software development. Product metrics, process metrics, models and empirical validation. Measurement and analysis, implementation of a metrics program. 4 lectures/problem-solving. Prerequisites: STA 326 and CS 480, or consent of instructor.

**CS 585 Software Verification and Validation (4)**

Techniques for evaluating software quality and integrity. Quality assessment, proof of correctness, testing methods. 4 lectures/problem-solving. Prerequisite: CS 480 or consent of instructor.

**CS 599/599A/599L Special Topics for Graduate Students (1-4)**

Group study of a selected topic, the title to be specified in advance. Instruction by lecture, activity, laboratory or combination. Prerequisite: consent of instructor.

**CS 664 Graduate Seminar (2)**

Topics chosen according to the interests and needs of the students. May be repeated for a maximum of 4 units. Unconditional standing required.

**CS 691 Directed Study (1-3)**

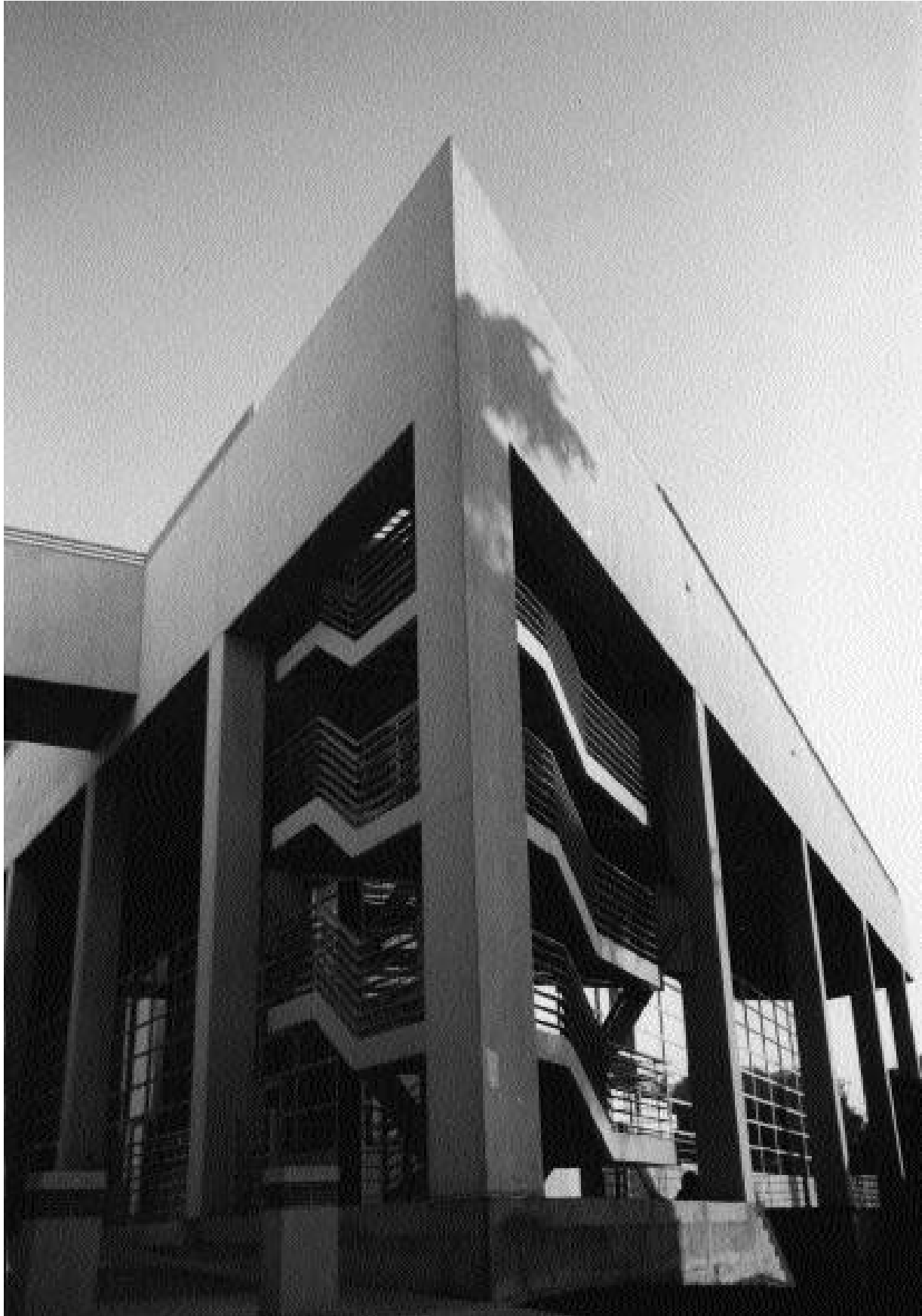
Individual study program under supervision of master's thesis advisor. Presentation of proposal for thesis in acceptable written form. Must be repeated as appropriate. Total credit, 3 units. Credit assigned upon acceptance of proposal by thesis committee. Open only to unconditional students with approval of thesis advisor.

**CS 696 Master's Degree Thesis (1-4)**

Independent investigation intended to be an extension of an existing body of knowledge. Reporting of research results in an oral presentation and acceptable written form. Must be repeated as appropriate. Prerequisite: CS 691. Credit assigned upon successful completion of thesis and oral presentation. Total credit, 4 units. Advancement to Candidacy and approval of thesis committee required.

**CS 699 Master's Degree Continuation (0)**

Registration or an approved leave of absence is required for any quarter following the final assignment of the grade "SP" until the completion of thesis. The candidate must be enrolled in the university during the quarter in which he/she graduates. Open only to candidates with approval of the thesis committee. Advancement to Candidacy required.



## ECONOMICS

### MASTER OF SCIENCE IN ECONOMICS

In the Department of Economics, College of Letters, Arts, and Social Sciences

Maureen Burton, Chair  
Franklin Y. Ho, Graduate Coordinator

The goals of the Master of Science program in Economics are: (1) the preparation of economists qualified for immediate employment by business and government; (2) the preparation of economists for research positions in fields such as public administration, labor organization, finance, insurance and marketing; (3) the preparation of teachers of economics at the secondary school and community college level; (4) the enhancing of the competence of those students who wish to pursue advanced graduate work in economics. Graduate study specialization may be elected in the following economic areas: financial, environmental and resources, and economic analysis.

### ADMISSION TO THE PROGRAM

An applicant for admission to this program must hold a bachelor's degree from an accredited college or university and satisfy university and departmental requirements for admission to graduate study. An applicant who holds a bachelor's degree in a field other than economics or who does not meet admission criteria may apply for admission as a conditional graduate student. The conditions will be stated in writing at the time of admission and will specify the amount of time allowed to meet entrance conditions. In undergraduate work, the applicant must have maintained a grade point average of 3.0 (B) or better in economics courses and a grade point average of 2.7 overall. Admission to the graduate program in economics requires that the applicant be accepted by the Department of Economics.

### REQUIREMENTS

A minimum of 45 quarter units is required for the Master of Science degree in Economics. Each student must take 16 units of required core courses. Courses for the balance of the 45 quarter units are selected by the individual student in the area of interest or specialization with the advice and consent of appropriate faculty advisor(s).

No more than 13 units of acceptable graduate credit may be transferred from another graduate institution. No more than 13 units taken through Extended University may be used on a contract. No more than 13 units of acceptable graduate credit may be petitioned by an undergraduate student.

A total limit of 13 transfer, Extended University, and/or units petitioned for graduate credit may be included on a master's contract. The stipulated time limit of 7 years applies to all of the above.

A maximum of 16 units may be taken in approved upper-division (300- or 400-level) courses. A grade point average of 3.0 (B) or better must be maintained in all upper-division undergraduate and all graduate work.

The Graduation Writing Test (GWT) must have been passed prior to Advancement to Candidacy.

To attain Advancement to Candidacy for the degree, each student shall indicate in writing the decision as to the manner of fulfilling the terminal requirement. The candidate will satisfy the culminating experience with either a thesis or a comprehensive examination.

The candidate must be enrolled in the university during the quarter of graduation.

### CURRICULUM

The Department of Economics offers the Master of Science degree in Economics with the following options.

- Financial Economics
- Environmental and Natural Resource Economics
- Economic Analysis

The Financial Economics Option provides students with a background that leads to opportunities in the private sector financial and non-financial institutions, government regulatory agencies, and research institutes. This option integrates extensive campus-wide resources and provides an interdisciplinary focus.

The Environmental and Natural Resource Option utilizes campus-wide resources to provide students with a program unique to Cal Poly Pomona and the Southern California Region. Environmental and natural resource economics is a growing research area. In recent years, Cal Poly Pomona started Landlab and has a research agreement with the South Coast Air Quality Management District.

The Economic Analysis Option emphasizes analytic techniques and methods (both quantitative and qualitative) with applications to various specialized areas. This option prepares students to pursue Ph.D. work in economics or to hold research, administrative, and teaching positions in the public and private sectors.

### REQUIRED CORE COURSES FOR ALL OPTIONS (except Economics Education)

Microeconomic Analysis . . . . .	EC	550	(4)
Macroeconomic Analysis . . . . .	EC	551	(4)
Econometrics . . . . .	EC	552, 553	(4,4)
Terminal Requirement . . . . .			(1-5)
Thesis . . . . .	EC	696	(2-5)
or Comprehensive Examination . . . . .	EC	697	(1)*

\*Students electing this option will include 4 additional units of electives in their programs.

Total . . . . . (17-21)

### FINANCIAL ECONOMICS OPTION

Field of Specialization

    Money and Capital Markets . . . . . EC 656,657 (4,4)

Electives from the list below . . . . . (16-20)

Before taking a course, students must meet the prerequisites of the selected courses or obtain permission from the instructor of the course. Students should consult their advisor before selecting courses.

International Finance and Open Economy			
Macroeconomics . . . . .	EC	405	(4)
Introduction to Mathematical Economics . . . . .	EC	406	(4)
Introductory Econometric Methods . . . . .	EC	421	(4)
Economics of Capital Markets . . . . .	EC	450	(4)
Economics of International Finance . . . . .	EC	654	(4)
Directed Study . . . . .	EC	691	(1-4)
Fundamentals of Financial Management . . . . .	GBA	546	(4)
Investment Banking . . . . .	GBA	612	(4)
Security Analysis and Portfolio Management . . . . .	GBA	647	(3)
Directed Study in Security and			
Portfolio Management . . . . .	GBA	648	(1)
(Concurrent enrollment in GBA 647 is required to take GBA 648)			

Legal Implications of Financial Transactions . . . . .	FRL	403	(4)
Security Options . . . . .	FRL	431	(4)
Futures Markets: Financial			
Instruments and Commodities . . . . .	FRL	432	(4)
Multinational Financial Management . . . . .	FRL	453	(4)
Commercial Banking . . . . .	FRL	460	(4)

**Summary:**

Total Core Courses . . . . .	(17-21)
Field of Specialization . . . . .	(8)
Electives . . . . .	(16-20)
Total Degree Requirement . . . . .	(45)

**ENVIRONMENTAL AND NATURAL RESOURCE ECONOMICS OPTION**

Field of Specialization

Seminar in Environmental Economics . . . . .	EC	530	(4)
Seminar in Natural Resource Economics . . . . .	EC	531	(4)

Electives from the list below. . . . . (16-20)  
 Before taking a course students must meet the prerequisites of the selected course or obtain permission from the instructor of the course. Students should consult their advisor before selecting courses.

Introduction to Mathematical Economics . . . . .	EC	406	(4)
Seminar in Land Economics . . . . .	EC	419	(4)
Introductory Econometric Methods . . . . .	EC	421	(4)
Seminar in Natural Resource Economics . . . . .	EC	429	(4)
Seminar in Environmental Economics . . . . .	EC	435	(4)
Seminar in Air Resource Economics . . . . .	EC	436	(4)
Seminar in Waste Management Economics . . . . .	EC	438	(4)
Seminar in Water Resource Economics . . . . .	EC	439	(4)
Agricultural Water Resource Management . . . . .	ABM	450	(4)
Air Pollution Control . . . . .	ARO	418	(4)
Water Pollution Biology . . . . .	BIO	420	(3)
Air Pollution Problems . . . . .	CHM	460	(4)
Solid Waste Management . . . . .	CE	457	(4)
Pollution Abatement and Hazardous			
Materials Management/Laboratory . . . . .	CHE	432/433	(3/1)
Unit Processes in Waste and			
Waste Water Treatment . . . . .	EGR	567	(3)
Biological Unit Process in Waste			
Water Treatment . . . . .	EGR	568	(4)
The Urban Landscape . . . . .	LA	423/423L	(2,1)
Environmental Factors in Regional Planning . . . . .	URP	487	(4)
The Economic, Social and Environmental			
Context for Planning . . . . .	URP	505	(4)
Urban and Regional Planning Theory			
and Practice . . . . .	URP	512/512A	(4)
Evolution of the Planning Process . . . . .	URP	513	(4)
Policy Analysis, Implementation and Evaluation . . . . .	URP	523	(4)
Urban Housing and Community Development . . . . .	URP	534/534A	(4)
Urban Transportation and Circulation System . . . . .	URP	636/636L	(4)
Environmental Policy for Planning . . . . .	URP	637	(4)
Land Use Planning and Design . . . . .	URP	638	(4)
Social and Political Planning . . . . .	URP	651	(4)
Sustainable Communities . . . . .	ENV	450	(4)
Urban Forestry . . . . .	HOR	420/420L	(4)
Environmentally Sustainable Agriculture . . . . .	AGR	437/437L	(4)
Environmental Toxicology . . . . .	AGB	411	(4)
Directed Study . . . . .	EC	691	(1-4)

**Summary:**

Total Core Courses . . . . .	(17-21)
Field of Specialization . . . . .	(8)
Electives . . . . .	(16-20)
Total Degree Requirement . . . . .	(45)

**ECONOMIC ANALYSIS OPTION**

Field of Specialization . . . . . (8)  
 Field of specialization courses should be chosen from the approved list after explicit consultation with advisor.

Electives from the list below. . . . . (16-20)  
 Before taking a course, students must meet the prerequisites of the selected courses or obtain permission from the instructor of the course. Students should consult their advisor before selecting courses.

International Trade Theory and Policy . . . . .	EC	404	(4)
International Finance and Open Economy			
Macroeconomics . . . . .	EC	405	(4)
Introduction to Mathematical Economics . . . . .	EC	406	(4)
History of Economic Thought . . . . .	EC	407	(4)
Economic History of U.S. . . . .	EC	409	(4)
Public Finance . . . . .	EC	410	(4)
Economic Development . . . . .	EC	411	(4)
Comparative Economic Systems . . . . .	EC	412	(4)
Economic History of Europe . . . . .	EC	413	(4)
Labor Economics . . . . .	EC	414	(4)
Seminar in Land Economics . . . . .	EC	419	(4)
Introductory Econometric Methods . . . . .	EC	421	(4)
Economic Forecasting . . . . .	EC	422	(4)
Economic Programming and Optimization			
Analysis . . . . .	EC	423	(4)
Economic Planning . . . . .	EC	426	(4)
Seminar in Natural Resource Economics . . . . .	EC	429	(4)
Seminar in Urban Economics . . . . .	EC	432	(4)
Economics of Transportation . . . . .	EC	433	(4)
Seminar in Environmental Economics . . . . .	EC	435	(4)
Seminar in Air Resource Economics . . . . .	EC	436	(4)
Economics of Poverty and Discrimination . . . . .	EC	437	(4)
Seminar in Waste Management Economics . . . . .	EC	438	(4)
Seminar in Water Resource Economics . . . . .	EC	439	(4)
Industrial Organization . . . . .	EC	440	(4)
American Industry . . . . .	EC	441	(4)
Money and of Capital Markets . . . . .	EC	450	(4)
Seminar in Environmental Economics . . . . .	EC	530	(4)
Seminar in Natural Resource Economics . . . . .	EC	531	(4)
Managerial Economics and Operations Analysis . . . . .	EC	560	(4)
Economics of International Finance . . . . .	EC	654	(4)
Economics of International Trade . . . . .	EC	655	(4)
Economics of Capital Markets . . . . .	EC	656, 657	(4, 4)
Seminar in Transportation Economics . . . . .	EC	659	(4)
Public Finance . . . . .	EC	660	(4)
Economic Development . . . . .	EC	665	(4)
Economic Planning . . . . .	EC	666	(4)
Directed Study . . . . .	EC	691	(1-4)

**Summary:**

Total Core Courses . . . . .	(17-21)
Field of Specialization . . . . .	(8)
Electives . . . . .	(16-20)
Total Degree Requirement . . . . .	(45)

**ECONOMICS EDUCATION OPTION**

Required Core Courses . . . . .	(32)
Intermediate Microeconomic Theory . . . . .	EC 401 (4)

Intermediate Macroeconomic Theory . . . . .	EC	402	(4)
Money and Banking . . . . .	EC	408	(4)
Microeconomic Analysis . . . . .	EC	550	( )
Macroeconomic Analysis . . . . .	EC	551	(4)
Computer Applications in Economics . . . . .	EC	520	(3,1)
Tests, Measurements and Evaluations . . . . .	GED	532	(4)
Seminar in Educational Issues . . . . .	GED	550	(4)

Field of Specialization			
Curricula and Methods for Teaching Economics .EC		501	(4)

Directed Elective			
Student must take either:			
History of Economic Thought . . . . .	EC	407	(4)
Economic History of the United States . . . . .	EC	409	( )

Elective. . . . .			(4)
Student may take any 4-unit 500 or 600 level economics course.			

Capstone Project			
Directed Study . . . . .	EC	691	(5)

**Summary:**

Total Core Courses. . . . .			(28)
Field of Specialization. . . . .			(4)
Directed Elective. . . . .			(4)
Elective. . . . .			(4)
Capstone Project . . . . .			(5)
Total Degree Requirements . . . . .			(45)

**GRADUATE COURSE DESCRIPTIONS****EC 520/520A Computer Applications in Economics (3/1)**

Use of several types of software to analyze economic relationships. Data acquisition alternatives, descriptive statistics and graphical displays, sampling designs, hypothesis testing, regression techniques, forecasting, model building and simulation analysis. Selected computer applications for teaching economics. 3 hours lecture/problem-solving, 2 hours activity. Prerequisites: EC 401 and EC 402. EC 321/EC 321A recommended.

**EC 521 Business Economics (4)**

The role of business firms in the resources allocation process. The behavior and decision-making process of firms in a variety of market structures. New approaches in the theory of the firm. 4 seminars. Prerequisites: Graduate standing and an elementary knowledge of economics. For non-economics students only.

**EC 530 Advanced Seminar in Environmental Economics (4)**

Advanced topics in environmental economic analysis. Theory of market failure and externalities in pollution of common property. Benefit-cost, cost effectiveness, impact analysis, and other applied quantitative methods of environmental valuation. Air, water, and hazardous waste policy alternatives. International pollution control and assessment. 4 seminars. Prerequisites: EC 401 and EC 406.

**EC 531 Advanced Seminar in Natural Resource Economics (4)**

Advanced topics in resource economic analysis. Theories of renewable vs exhaustible resource usage. Policy efforts to guide optimal utilization of resources. Multiple use, intertemporal consistency issues in resource

management. Quantitative models of resource demand, supply and scarcity. International natural resource policies. 4 seminars. Prerequisites: EC 401 and EC 406.

**EC 550 Microeconomic Analysis (4)**

Analysis of the resources allocation systems and behavior of producing and consuming units. 4 lecture discussions. Prerequisites: Elementary calculus and linear algebra (equivalent to EC 406) and EC 401 and EC 402 or equivalent.

**EC 551 Macroeconomic Analysis (4)**

Analysis of aggregate national economic activities. 4 lecture discussions. Prerequisites: Elementary calculus and linear algebra (equivalent to EC 406) and EC 403 or equivalent.

**EC 552, 553 Econometrics (4)(4)**

Specification and statistical inference in econometric models; estimation, verification and prediction of economic variables; recent empirical studies, advanced topics in econometrics. 4 lecture/discussions. Prerequisites: Calculus, matrix algebra, EC 401, EC 402, EC 403, EC 321/321A, and EC 322/322A or equivalent.

**EC 560 Managerial Economics and Operations Analysis (4)**

Advanced topics and new developments in managerial economics and operations research. 4 lecture discussions. Prerequisites: EC 401, MAT 125, EC 321, and EC 322 or equivalent.

**EC 654 Economics of International Finance (4)**

Advanced topics in international liquidity and finance theory. Problems of international monetary system. Balance of payments theory and practices; theory of exchange rates and mechanism of international adjustment. 4 lecture discussions. Prerequisites: EC 401, EC 403, EC 408, and EC 405. Unconditional standing required.

**EC 655 Economics of International Trade (4)**

Advanced topics in international trade. Theory of exchange; tariffs and other trade barriers. Problems of international competition and cooperation. 4 lecture discussions. Prerequisites: EC 401, EC 403 and EC 404. Unconditional standing required.

**EC 656, 657 Money and Capital Markets (4)(4)**

Topics in monetary and capital theory. Liquidity creation, financial intermediation and capital formation. Development of capital policy. 4 lecture discussions. Unconditional standing required. Prerequisites: EC 408, EC 401 and EC 403.

**EC 659 Seminar in Transportation Economics (4)**

Demand and supply of transportation; transport cost and price analysis; transportation regulation—past, present, and proposed. Economic aspects and evaluation of public and private modes of transportation—domestic and international. Economic analysis of future directions for transportation systems. 4 seminars. Prerequisites: EC 550 or consent of instructor. Unconditional standing required

**EC 660 Public Finance (4)**

Government taxation and expenditure. The fiscal decision process and fiscal choice theory. Government budgeting and cost benefit analysis. 4 lecture discussions. Prerequisite: consent of instructor. Unconditional standing required.

**EC 665 Economic Development (4)**

Advanced topics in economic development. Historical analysis of causes and consequences of economic development. Special attention to the problems of developing and underdeveloped nations. 4 lecture discussions. Prerequisite: EC 411 or equivalent. Unconditional standing required.

**EC 666 Economic Planning (4)**

Public policies, principles, and standards of taxation and expenditures, budgeting, public goods, income redistribution, regulation, and development. Examine the equity and efficiency of public policy and assess the fiscal impact. 4 hours lecture/discussion. Prerequisites: PLS 314, PLS 416.

**EC 691 Directed Study (1-4)**

Independent study in an area chosen by the student under the supervision and direction of a graduate faculty member. Maximum credit, 6 units. Unconditional standing required.

**EC 696 Master's Degree Thesis (1-3)**

Independent research and study under the supervision of the faculty. Reporting the research results in the approved form. Maximum credit, 5 units. Advancement to Candidacy required.

**EC 697 Comprehensive Examination (1)**

Preparation for and completion of the written comprehensive examination. May be taken no more than two times. Failure to complete the exam satisfactorily the second time will result in termination from the program. Advancement to Candidacy required. CR/NC.

**EC 699 Master's Degree Continuation (0)**

Registration or an approved leave of absence is required for any quarter following the final assignment of the "SP" grade until the completion of the thesis. The candidate must be enrolled in the university during the quarter in which he/she graduates. Advancement to Candidacy required.



## EDUCATION

### MASTER OF ARTS IN EDUCATION

In the Department of Education

Richard De Novellis, Interim Chair, Department of Education  
Jane S. McGraw, Graduate Coordinator

Barbara Bromley  
Gloria Johannessen  
Constance Lim  
Shahnaz Lotfipour  
Doreen Nelson

The mission of the Master of Arts in Education program includes the following: (1) development of superior teachers in an area of specialization; (2) enhancement of the competence of those students who desire to pursue advanced graduate study in education; (3) preparation of teachers for leadership and research in an area of specialization; (4) preparation of educators for research and consulting in business and industry; and (5) development of lifelong learners with potential for self-directed study and research. Admission to the program is granted to qualified applicants who hold a California teaching credential or its equivalent, and to students who have been admitted to the university's specialist credential program. Study for the master of arts is a continuation at a higher level of the university's undergraduate programs that lead to teaching credentials. Post baccalaureate students who are working on specialist credentials are encouraged to work concurrently on the master's degree.

### ADMISSION TO THE PROGRAM

An applicant for this program must have a valid teaching credential or have been admitted to a specialist credential program at this university and hold a bachelor's degree from an accredited institution. Graduates of foreign universities are exempt from credential requirements. No teaching credential is required for students applying to the Educational Multimedia option or the certificate programs in Educational Multimedia and Computers in Education. Students entering the master's program may be admitted with a conditional status with the consent of the Graduate Coordinator.

All applicants for admission to the program are required to take the Graduate Record Examination General Test and, optionally, the Subject Education Test. In addition, international students are required to take the TOEFL examination.

Applicants who do not meet the minimum grade point average of 3.0 overall grade point average in their undergraduate work or 3.0 for graduate work, but who show compensating strengths, may be admitted conditionally. A student with conditional status is provided a written statement of entrance conditions, including the time within which the conditions are to be met. If the conditions are not satisfied within the specified time, the student will be denied further enrollment in the program.

A student who is pursuing a baccalaureate degree from this university and who plans to continue in graduate study will need to apply for admission to the Master of Arts in Education program during the final quarter of the senior year to be considered for programs that do not require a teaching credential as a prerequisite for admittance. Applications should be submitted to the Office of Admissions.

Each M.A. student will complete a preliminary contract for a formal degree program in consultation with the Chair of the Department of Graduate Coordinator or Program Coordinator at the time of admission.

### REQUIREMENTS

1. A minimum of 45 quarter units of acceptable graduate level work must be completed in the program; at least 24 quarter units must be at the 500 to 600 level (graduate). All 400-level courses credit will be specified by the Department of Education. Methods courses and student teaching shall not be applied to the master's degree. Thirty-two (32) units of coursework must be taken in residency.
2. No more than 13 units of acceptable graduate credit may be transferred from another graduate institution. No more than 13 units taken through Extended University may be used on a contract. No more than 13 units of acceptable graduate credit may be petitioned by an undergraduate student. A total limit of 13 transfer, Extended University, and/or units petitioned for graduate credit may be included on a master's contract. The stipulated time limit of 7 years applies to all of the above.
3. A grade-point average of 3.0 (B) or better must be maintained in all upper-division undergraduate and graduate courses to satisfy the requirements for the Master of Arts in Education.
4. Completion of all requirements for a clear teaching credential, or equivalent is required prior to the granting of the degree of Master of Arts in Education. Certain exceptions can be made at the discretion of the department.
5. Advancement to Candidacy must be achieved. The Graduation Writing Test (GWT) requirement must have been satisfied beforehand.
6. A thesis, comprehensive examination, or project must be satisfactorily completed as a terminal requirement.
7. The candidate must be enrolled in the university during the quarter of graduation.

### CURRICULUM

The master's degree curriculum in education is a flexible one requiring a minimum of 45 units, organized as follows: 11-16 units in research and project/thesis; 18-24 units in a specific area, and; 10-16 units of electives. Credit for 13 quarter units of Extended University or transfer courses, or up to 18 quarter units of credit in a single specified area not offered by the College of Education and Integrative Studies, but taken at this university, may become a part of the Master of Arts in Education contract.

The approved program constitutes the student's curriculum for the master's degree. No change will be made in the program without the mutual agreement of the student and advisor and approval of the associate vice president for Academic Programs.

The curriculum consists of three elements. The first element consists of coursework from the graduate offerings in education, selected by the student and advisor/coordinator to meet the student's academic needs, based upon previous preparation and the requirements of employment. Courses available for this purpose cover such areas as language and literacy, educational multimedia, design and creativity; applying technology, bilingual/cross-cultural education, special education, computers in education, educational leadership, and for those seeking National Board Certification, the accomplished professional teacher program.

The second part of the curriculum is made up of approved upper-division and graduate electives from offerings in education or in other appropriate disciplines to complement the rest of the student's curriculum. Special certificates of competence are issued for the Accomplished Professional Teacher and in Educational Multimedia and Computers in Education.

There are program emphases within the Curriculum and Instruction, Educational Multimedia and Special Education options. The Curriculum and Instruction program prepares teachers for leadership in education, including classroom teaching, staff development, alternative education and program development. This option of the Master of Arts in Education offers programs for The Accomplished Professional Teacher, Bilingual/Cross Cultural Education, Design and Creativity: Applying Technology, and Language and Literacy Education. The Educational Multimedia option offers program certificates in multimedia and computer education. Special Education offers programs for the Mild/Moderate and Moderate/Severe credentials and the Resource Specialist Certificate.

The Educational Multimedia program reflects the convergence of two powerful technologies, computers and media. It also reflects the increasing importance of the new tools of technology in today's world. The mission of the Educational Multimedia program encompasses the following purposes:

1. Development of superior computer and media teachers;
2. Development of educational multimedia software: designers and producers;
3. Development of educational multimedia training consultants;
4. Development of instructional designers, media producers, technology project managers and evaluators; and,
5. Development of life-long learners and explorers in the fascinating arena of educational technology.

The Special Education program offers emphases in Mild/Moderate, Moderate/Severe, and Resource Specialist. The program is designed to give students a theoretical and practical background in the educational, social, and environmental aspects of students with special needs.

The third part of the curriculum consists of the basic courses required in all programs for the Master of Arts degree in Education. These courses include:

Tests, Measurements and Evaluations . . . . .	GED	532	(4)
Seminar in Educational Research . . . . .	GED	690	(4)
Directed Study . . . . .	GED	691	(3)
Conducting Educational Research . . . . .	GED	693	(4)
Master's Degree Project . . . . .	GED	695	(6)
*or Master's Degree Thesis . . . . .	GED	696	(6)
*or Comprehensive Examination . . . . .	GED	697	(1)

\*(Not available to Educational Multimedia students)

**I. OPTION—CURRICULUM AND INSTRUCTION: ACCOMPLISHED PROFESSIONAL TEACHER**

The requirements for the Accomplished Professional Teacher program may include the following:

**Core Courses (18-22 Quarter Units)**

Curriculum and Instruction . . . . .	GED	542	(4)
Learning and Instruction . . . . .	GED	592/592A(3/1)	
Leadership in Building Multicultural Community of Learners . . . . .	GED	593/593A(3/1)	
The Professional Teacher . . . . .	GED	595/595A(3/1)	
Professional Teacher Assessment . . . . .	GED	598	(2-6)

**Elective Courses: (3-12)**

By approval of an advisor:

Independent Study . . . . .	GED	692	(1-9)
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Courses in technology, policies and issues, or in content areas by advisement.

Total Units . . . . . (22-34)

Path A: Students desiring only the special certificate of competency for the Accomplished Professional Teacher need to complete the core courses of this program, and approved elective courses for a minimum of 22 quarter units.

Path B: Students seeking the M. A. in Education degree will complete the core and recommended elective courses in this program emphasis and additionally, the research core courses for a minimum requirement of 45 quarter units. Students seeking the degree option are required to meet the admission requirements for advancement to candidacy.

**CURRICULUM AND INSTRUCTION: DESIGN AND CREATIVITY, APPLYING TECHNOLOGY**

The requirements for the Design and Creativity strand are the following:

Teacher As Designer Part I: The City As Context for Creativity . . . . .	GED	540	(4)
Teacher As Designer Part II: Creativity As a Process . . . . .	GED	541	(4)
Making Curriculum Physical . . . . .	GED	547	(4)
The School, the Classroom and the Curriculum: Organizing Time and Space . . . . .	GED	548	(4)
The Built Environment, Computers, and the Creative Process . . . . .	GED	549	(4)

Total Units . . . . . (20)

**BILINGUAL/CROSS CULTURAL EDUCATION**

The requirements for the Bilingual/Cross-Cultural Education program may include the following:

Bilingual Education: Reading, Language Arts and Content Instruction in the Primary Language (Spanish) . . . . .	TED	415	(4)
Language Structure and Development for Teaching/Learning in English/Bilingual Classrooms . . . . .	TED	452	(4)
Education of the Minority . . . . .	GED	504	(3)
School, Community and Home Relations . . . . .	GED	546	(3)
Bilingual/Cross-Cultural Instruction: Social Studies and Language Arts . . . . .	GED	560	(3)
Bilingual/Cross-Cultural Curriculum . . . . .	GED	561	(3)
Bilingual/Cross-Cultural Instruction: Mathematics and Science . . . . .	GED	562	(3)
Topic in Bilingual/Cross-Cultural Education . . . . .	GED	563	(3)
Survey of Patterns in Language for Bilingual Teaching . . . . .	GED	564	(3)
Advanced ESL Instruction . . . . .	GED	565	(3)

Total Units . . . . . (45)

**LANGUAGE AND LITERACY EDUCATION**

The requirements for the Language and Literacy Education program may include the following:

Diagnosis, Assessment and Evaluation of Literacy . . . . .	GED	520	(4)
The Psychology of Literacy . . . . .	GED	525	(4)
Sociolinguistic and Multicultural Aspects of Language and Literacy Acquisition . . . . .	GED	528	(4)
Applied Linguistics in Literacy Acquisition . . . . .	GED	534/534A	(3/1)
Leadership and Public Policy in Language and Literacy: Public Policy and Facilitation . . . . .	GED	567/567L	(2/2)

or Language, Literacy and Human  
Development .....GED 596 (4)

Total Units .....(24)

## II. OPTION—EDUCATIONAL MULTIMEDIA

The requirements for the Educational Multimedia include the following:  
Prerequisite Courses (0-8 Quarter Units)

(Or equivalent courses, or permission of instructor)  
Educational Computer Literacy .....GED 505/505L (3/1)  
Media Production and Multimedia  
Applications .....GED 573/573L (3/1)

### Required Courses (32 Quarter Units)

Educational Computer Programming .....GED 511/511L (3/1)  
Educational Telecommunications .....GED 512/512L (3/1)  
Educational Computer Systems .....GED 514/514L (3/1)  
Hypermedia in the Classroom .....GED 516/516L(3/1)  
Graphic Design and Digital Photography .....GED 571/571L (3/1)  
Instructional Design for Multimedia .....GED 572/572L (3/1)  
Video Production and Digital Video Editing .....GED 575/575L (3/1)  
Interactive Video Production .....GED 577/577L (3/1)

### Elective Courses (3-4 units)

With the approval of the advisor, a minimum of 3 units is to be selected from the following list:

Educational Computer Research .....GED 515/515L (3/1)  
Alternative Learning Environments .....GED 578/578L (3/1)  
Directed Study (Internship) .....GED 692 (1-4)  
Motion Graphics: Computer Assisted Design ...ART 456 (3)  
Advanced Visual Communication .....COM 442/442A (2/2)  
Professional Presentations Using Technology ...GBA 565 (3)  
Computers and Music .....MU 408/408A (3/1)

## III. OPTION—SPECIAL EDUCATION

The requirements for the Special Education option may include approved courses from Levels I and II Mild/Moderate and Moderate/Severe credential courses as follows:

### Level I

Preliminary Courses (15 Quarter Units)

Special Populations .....TED 551/A (3/1)  
Positive Classroom Interventions .....TED 581/A (2/1)  
Assessment for Special Education .....TED 555/A (3/1)  
Curriculum for Students with Moderate/  
Severe Disabilities .....TED 556/A (3/1)

### Level II

Core Courses (14 Quarter Units)

Induction Plan Development .....TED 499 (2)  
Transition to Postsecondary Settings .....TED 552 (4)  
Leadership in Special Education .....TED 591 (4)  
Current Issues and Research in  
Special Education .....TED 597 (4)

### Mild/Moderate Emphasis (18 Quarter Units)

Advanced Instruction of Students  
with Mild/Moderate Disabilities .....TED 554 (4)  
Integrated Mathematics, Science,  
and Computer Curricula for Students  
with Mild/Moderate Disabilities .....TED 569 (4)

### Moderate/Severe Emphasis (8 Quarter Units)

Characteristics of Moderate/Severe .....  
Disabilities .....TED 530 (4)  
Introduction to Assistive Technology .....TED 588 (4)

### Resource Specialist Certificate of Competency

(16 Quarter Units)

Introduction to Resource Specialist Program .....TED 583 (4)  
Organization and Management of  
Special Education Programs .....TED 584 (4)  
Current Education Issues for the  
Resource Specialist .....TED 585 (4)  
Leadership in Special Education .....TED 591 (4)

## CREDENTIAL PROGRAMS

The university offers a number of programs leading to certification for elementary and secondary school teaching as well as various specialists' credentials under the auspices of the College of Education and Integrative Studies. These are described in other sections of this catalog.

Field experiences and student teaching courses are not applicable for the Master of Arts Degree in Education.

## GRADUATE CERTIFICATE PROGRAMS IN EDUCATIONAL MULTIMEDIA

Admission requirements for the special certificates of competencies for the Educational Multimedia and Computers in Education programs are the same as the requirements for admission to the Master of Arts in Education degree program.

The following courses are required to complete these certificate programs, respectively:

### Computers in Education Certificate (20 Units)

#### Prerequisite Courses

(or equivalent courses, or permission of instructor.)

Educational Computer Literacy .....GED 505/505L (3/1)  
Media Production and Multimedia Applications ...GED 573/573L (3/1)

#### Required Courses

Educational Computer Programming .....GED 511/511L(3/1)  
Educational Telecommunications .....GED 512/512L(3/1)  
Educational Computer Seminar .....GED 514/514L (3/1)  
Hypermedia in the Classroom .....GED 516/516L(3/1)  
Interactive Video Production .....GED 577/577L(3/1)

### Educational Multimedia Certificate: (20 Units)

#### Prerequisite Courses

(or equivalent courses, or permission of instructor)

Educational Computer Literacy .....GED 505/505L (3/1)  
Media Production and Multimedia Applications ...GED 573/573L (3/1)

#### Required Courses

Graphic Design and Digital Photography .....GED 571/571L (3/1)  
Instructional Design for Multimedia .....GED 572/572L (3/1)  
Video Production and Digital Video Editing .....GED 575/575L (3/1)  
Hypermedia in the Classroom .....GED 516/516L (3/1)  
Interactive Video Production .....GED 577/577L (3/1)

**GRADUATE COURSE DESCRIPTIONS****GED 501 Introduction to Exceptionality (4)**

A survey course consisting of an introduction to the understanding of children and youth classified as exceptional for educational purposes. Includes field observations. This course satisfies the California Special Education requirement for the Clear Basic Credentials. 4 lecture discussions.

**GED 504 Education of the Minority (3)**

Foundation study of the ethnic minority cultures as they relate to the teaching-learning process. Research, principles, and practices. Refer to College of Education class schedule for specific group emphasis each quarter. May be repeated for a total of 9 units. 3 lecture discussions.

**GED 505/505L Educational Computer Literacy (3/1)**

An investigation into the issues involved in access and control of computer-based technologies. An introduction to the historical framework of the modern-day computer: uses of computers and computer-based technology in the classroom; telecommunications; authoring systems; selection and evaluation of educational software. 3 seminars, 1 three-hour laboratory.

**GED 506 Child and Adolescent Development (3)**

Overview of the child and adolescent development process, 0-21 years of age and its relationship to the learning process. 3 lecture discussions.

**GED 509 Education of Contemporary Youth (3)**

The dynamics of contemporary youth in the public secondary school. Values of youth, major problems, struggles, and conflicts as adolescents move toward maturity. Cultural and societal values which have an impact on youth; role of the teacher and school in helping young people achieve identity. 3 seminars. Prerequisite: TED 421/421A or consent of instructor.

**GED 510 Interpersonal Relations in Teaching (3)**

Examination of personality factors that are obstacles to effective teaching; emphasis upon developing open and authentic interpersonal relationships. Role-playing, demonstrations and other laboratory activities. 3 lecture discussions. Prerequisite: TED 421/421A or consent of instructor.

**GED 511/511L Educational Computer Programming (3/1)**

Introduction to computer programming on the use of high-level authoring systems; script editors, debuggers, structured programming techniques, top-down design, modularization, messages, message order, variables, values, operators, precedence, writing efficient code, stylistic issues, efficient use of memory, XCMDs, XCFNs, AppleScript, AppleEvents. 3 seminars, 1 three-hour laboratory. Prerequisites: GED 505/505L, 516/516L, or permission of instructor.

**GED 512/512L Educational Telecommunications (3/1)**

Introduction to telecommunications for teachers on the use of the Internet as an educational tool; the VAX/VMS system, modems, communication software, etiquette, E-mail, Listserves, news-groups, local news, local gopher, Veronica, anonymous ftp, Archie, WAIS, World-Wide Web, Lynx, graphics viewers, Mosaic. 3 seminars, 1 three-hour laboratory. Prerequisite: GED 505/505L or permission of instructor.

**GED 514/514L Educational Computer Seminar (3/1)**

An advanced study of the Macintosh operating system, including: System 7.1, System 7.5, Resource Editing, Apple Script, Troubleshooting

and networking. 3 seminars, 1 three-hour laboratory. Prerequisite: GED 505/505L or permission of instructor.

**GED 515/515L Educational Computer Research (3/1)**

An intensive study of selected issues and survey and critical analysis of selected research on computers, microcomputers and related technologies. An examination of the social, political, and educational implications of various computer technologies. 3 seminars, 1 three-hour laboratory. Prerequisite: GED 505/505L, 690, or permission of instructor.

**GED 516/516L Hypermedia in the Classroom (3/1)**

Introduction to hypermedia, use of high-level authoring systems as hypermedia environments; including authoring system basics, the stack, the page, buttons/button design, fields/field design, instructional design, hypermedia design, messages, handlers, precedence, drawing tools, text tools, icon editing, animation and sound. 3 seminars, 1 three-hour laboratory. Prerequisites: GED 505/505L or permission of instructor.

**GED 518/518A Teaching Writing: Process and Product (K-8) (3/1)**

An in-depth exploration of writing. An investigation of the writing process and an exploration of strategies for teaching writing across the curriculum for diverse populations. 3 seminars, 1 two-hour activity. Prerequisites: TED 424/424A, 432/432A, 415 or consent of instructor.

**GED 519/519A Language and Literacy Research: Design and Application (3/1)**

Survey of language and literacy research from a variety of methodological perspectives. Application of findings for the improvement of instruction and literacy. 3 seminars, 1 two-hour activity. Prerequisite: GED 532 or equivalent.

**GED 520 Diagnosis, Assessment and Evaluation of Literacy (4)**

Introduction to formal and informal, individual and group assessment materials related to language and literacy acquisition in first and second languages; understanding validity; reliability and cultural bias of literacy assessment instruments. Prerequisites: TED 415, 424/424A or 432/432A or consent of instructor. 4 seminars.

**GED 522/522A Instructional Strategies for Language and Literacy Field Sites (2,2)**

Application of theoretical knowledge and formal and informal assessment leading to the development and implementation of instructional strategies to specific individual and group language/literacy needs in the context of our complex contemporary society. Must include 15 student contact hours. 2 seminars, 2 two-hour activity. Prerequisite: GED 594 or 593.

**GED 523 Language Acquisition and Emergent Literacy for the Young Child (4)**

The development of literacy in the young child. Classroom and clinical experience in assessment of development in literacy. Criteria for selection of curriculum materials and procedures in the development of emergent literacy. 4 seminars. Prerequisites: TED 421/421A, 424/424A, or 432/432A or consent of instructor.

**GED 525 The Psychology of Literacy (4)**

Examination of reading as a process of constructing meaning through the dynamic interaction of the reader's existing knowledge, the information suggested by the written language, and the context of the reading situation. 4 seminars. Prerequisites: TED 424/424A, 432/432A, or consent of instructor.

**GED 527/527A Literacy and Technology (3/1)**

Inquiry into the uses of computer and allied information technologies in literacy instruction; critiques of instructional software; evaluation of programs in light of contemporary literacy and theory practice; opportunity to design new software. 3 seminars, 1 two-hour activity. Prerequisite: GED 505/505L or equivalent or consent of instructor.

**GED 528 Sociolinguistic and Multicultural Aspects of Language and Literacy Acquisition (4)**

Application of theories and models of second language acquisition: historical, cultural, social, political, and economic factors influencing literacy for the second language learner. Further exploration of the influence of specific cultural context and convention on the learning environment. 4 seminars. Prerequisites: TED 415, 424/424A, or 432/432A or consent of instructor.

**TED 530 Advanced Study of Moderate and Severe Disabilities (4)**

Advanced study of moderate and severe developmental disabilities: mental retardation, autism, serious emotional disturbance, physical disabilities, traumatic brain injury, dual diagnosis, and multiple disabilities. Concepts, etiology, characteristics, and educational implications for general and special educators. Twenty student/classroom/activity contacts hours required. 4 seminar/discussion. Prerequisite: Level II status or permission of instructor.

**GED 532 Tests, Measurements and Evaluations (4)**

Basic principles of educational measurement and evaluation; teacher constructed instruments and techniques; selection and interpretation of standardized and criterion referenced measurements. Required of Master of Arts degree in Education students. 4 seminars. Prerequisite: TED 421/421A.

**GED 534/534A Applied Linguistics in Literacy Acquisition (3/1)**

Exploration of the relationship between literacy and linguistics as effected by pragmatics, syntax, phonology and semantics. 3 seminars, 1 two-hour activity. Prerequisite: GED 525 or 528.

**GED 535 The Gifted Individual: Curriculum and Instruction (3)**

Current practice, research, issues and trends of teaching models and curriculum development for the gifted and talented. 3 seminars. Prerequisite: GED 531 or consent of instructor.

**GED 536 Seminar in Giftedness and Creativity (3)**

Problems of affective, cognitive, and social development of gifted and talented individuals. Examination of higher cognitive functioning and characteristics of performance of creativity. 3 seminars. Prerequisite: GED 531 or consent of instructor.

**GED 537 Curriculum Evaluation (3)**

Theory and practice of instructional program evaluation. Educational evaluation models, alternatives, and guidelines for curriculum evaluation. 3 seminars. Prerequisites: GED 532, 535, or 542 or consent of instructor.

**GED 540 Teacher As Designer Part I: The City as Context for Creativity (4)**

Studies processes and transformations that lead to the creation of the physical environment through a teaching method known as City Building Education™. Explored are curriculum uses, practical examples and guidebooks of how to integrate subjects from various State Curriculum Frameworks. This is a course for students of graduate standing in education only. No technical design skills are needed. 4 seminars.

**GED 541 Teacher As Designer II: Creativity as a Process (4)**

Continues Part I. Isolating and making explicit transformations associated with intuition and leaps of insight which produce solutions to environmental dilemmas. Topics include non-specific transfer of learning among spatial, visual, aural, and written domains around thinking skills found in design professions. 4 seminars. Prerequisite GED 540.

**GED 542/542A Curriculum and Instruction (3/1)**

Integrating curriculum and instruction in multicultural schools. Examination of curriculum emphasizing the needs of the student, the environment and teacher. Creation and validation of curriculum programs. 3 lecture-discussions; 1 two-hour activity.

**GED 543 Implementation of Early Childhood, Elementary and Secondary Education Programs (3)**

Instructional strategies to achieve curriculum goals in language arts, science, motor activities, music, art, and other major curriculum areas. Refer to College of Education class schedule for specific group emphasis each quarter. May be repeated for a total of 9 units. 3 seminars. Prerequisite: GED 542 or permission of instructor.

**GED 544 Advanced Child and Adolescent Development (3)**

Experimental and theoretical literature relating to the development of child and adolescent; implications for the student's continuing educational experiences. 3 seminars. Prerequisite: GED 506 or consent of instructor.

**GED 546 School, Community, and Home Relations (3)**

Cooperative school, home, and community relations. Professional and community resources for family, health, welfare, and improving child and adolescent development. Implications for school curriculum. 3 seminars. Prerequisite: permission of the instructor.

**GED 547 Making Curriculum Physical (4)**

Studies processes, tools, and techniques used to visualize, display, and organize information. Provides practice with a variety of mechanisms and methods for envisioning basic curriculum and linking it to any subject matter. 4 seminars. Prerequisites: GED 540 and GED 541.

**GED 548 The School, the Classroom and the Curriculum: Organizing Time and Space (4)**

Design and organization of the classroom and the school facility, as a response to the classroom curriculum. Provides practice in relating the curriculum to physical spaces. 4 seminars. Prerequisites: GED 540, GED 541, and GED 547.

**GED 549 The Built Environment, Computers, and the Creative Process (4)**

Combines the physical world and computers to amplify creative thinking and the living environment. Explores the relationship between the environment and advanced computer-based technologies as a basis for development of design and creative thinking in the classroom instruction process. 4 seminars. Prerequisites: GED 540, GED 541, GED 547, and GED 548. Minimum computer literacy, specifically the ability to use HyperCard and the World Wide Web on the Internet.

**GED 550 Seminar in Educational Issues (4)**

Intensive study of selected issues, problems, or areas in education, according to the interests of the students enrolled. Each seminar subtitled by its content. May be repeated for a maximum of 12 units. 4 seminars.

**TED 551/551A Special Population (3/1)**

An overview of students with disabilities which includes principles for assessing and instructing mainstreamed students in relation to federal legislation requirements; diverse instructional strategies, IEP implementation, and fieldwork across a variety of special education settings. Minimum 20 hours student/classroom/activity contact hours required. Satisfies the California Special Education requirement for the Clear Credential. Three seminar/discussion; one two-hour activity.

**TED 552 Transition to Post-secondary Settings (4)**

Examination and application of current legislation, theories, and strategies in transition services for students with mild/moderate/severe disabilities. Assessment procedures, community and agency resources, employment opportunities, transition domains and skills K-12, and joint program planning across multiple service agencies. Twenty student/classroom/activity contact hours required. 4 seminar/discussion. Prerequisite: Level II status or permission of instructor.

**TED 553 Advanced Assessment and Remediation of the Mildly Handicapped (4)**

Advanced seminar in the theory and practice of assessment and remediation of mildly handicapped pupils. Experience in relating diagnostic and evaluative data to IEP prescriptive elements. 4 seminars. Prerequisites: TED 554/GED 554, TED 559/GED 559, TED 582/GED 582.

**TED 554 Advanced Instruction of Students with Mild/Moderate Disabilities (4)**

Advanced seminar on needs and characteristics of students with mild/moderate disabilities and implementation of specific strategies in various educational settings. Includes cognitive, social and emotional instructional strategies and data-based decision-making. Emphasizes integrated content in literacy and social sciences. Twenty student/classroom/activity contact hours required. Prerequisite: Level II status or permission of instructor.

**TED 555/555A Assessment of Students with Disabilities (3/1)**

Theory and practice of formal and informal assessment of students with mild/moderate and moderate/severe disabilities, and serious emotional disturbance. Policies/procedures for adapting assessment for English language learners. Using assessment results to plan and implement student goals and objectives and curricula. Twenty student/classroom/activity contact hours required. 3 seminar/discussion; 1 two-hour activity.

**TED 556/556A Curriculum for Students with Moderate/Severe Disabilities (2,1)**

Theory and application of curricula for students with moderate/ severe disabilities. Instructional strategies, curricular modification, and practices. Adaptations for English language learners. Theories and practices of inclusion. Strategies for meeting mobility, sensory, and specialized health care needs in the classroom. Twenty student/classroom/activity contact hours required. 2 seminar/discussion; one two-hour activity.

**TED 559 Integrated Mathematics, Science and Computer Curricula for Students with Mild/Moderate Disabilities (4)**

Advanced seminar on the examination, evaluation, and implementation of math, science, computer curricula for students with mild/moderate disabilities. Application of learning principles to curriculum theories and

educational considerations for the math, science, and computer technology areas. Twenty student/classroom/activity contact hours required. 4 seminar/discussion. Prerequisite: Level II standing.

**GED 560 Bilingual/Cross-Cultural Instruction: Social Studies and Language Arts (3)**

Implementation of bilingual cross-cultural instruction in social studies and language arts. Effective instructional strategies to achieve curriculum objectives. 3 lectures/problem-solving.

**GED 561 Bilingual/Cross-Cultural Curriculum (3)**

Curriculum development in theory and practice; processes and roles in curricular development; criteria for analysis and evaluation of curricula and instructional materials; analysis and planning of bilingual/cross-cultural programs. 3 seminars. Prerequisites: GED 560; two years of college Spanish or equivalent; possession of a teaching credential or admission to a credential program.

**GED 562 Bilingual/Cross-Cultural Instruction: Mathematics and Science (3)**

Implementation of bilingual/cross-cultural strategies in mathematics and science, classroom individualization and evaluation. 3 lectures/problem-solving.

**GED 563 Topics in Bilingual/Cross-Cultural Education (3)**

Review of critical issues and topics in bilingual/cross cultural education. Refer to College of Education class schedule for specific topic each quarter. May be repeated for a total of 9 units.

**GED 564 Survey of Patterns of Language for Bilingual Teaching (3)**

The nature of language structure; the development of language; Barrio dialects; similarities and differences among languages; linguistic change and reconstruction. Inter-relationships between language and culture in the Chicano community. 3 seminars. Prerequisites: GED 560 and two years of college Spanish or equivalent; possession of a teaching credential or admission to a credential program.

**GED 565 Advanced ESL Instruction (3)**

Advanced ESL instructional strategies for the non-English speaker/student. 3 lectures/problem-solving.

**GED 567/567L Leadership and Public Policy in Language and Literacy: Public Policy and Facilitations (2/2)**

Analysis of local, state, national and international policies, planning and legal issues related to literacy. Examination of the dynamics of interpersonal communication, multiculturalism and leadership in literacy of education. 2 seminars, 2 laboratory field experiences. Prerequisite: GED 596 or consent of instructor.

**GED 568/568A Specially Designed Instruction for the Content Areas (3/1)**

Inquiry into and application of specially designed academic instruction in English for access to core curricula; examination of methodologies for developing literacy and text analysis in content areas; exploration of assessment issues/methods for English-only and transitional English speakers. 3 seminars, 1 two-hour activity. Prerequisite: TED 452.

**GED 569/569A Integrating Literature and the Language Arts (3/1)**

Exploration of classic and contemporary juvenile literature from interdisciplinary and multicultural perspectives; approaches for integrating literature and specific student interests with the writing

process and aural-oral traditions. 3 seminars, 1 two-hour activity. Prerequisites: TED 415, 424, 432 or consent of instructor.

### **GED 571/571L Graphic Design and Digital Photography (3/1)**

Theory and application of visual concepts to communication theory, semiotics, and its application to technology, learning and pedagogy, visualization techniques, exploring the graphical power of computers, and digital photography tools and techniques for all designers. 3 seminars, 1 three-hour laboratory. Prerequisites: GED 505/505L, 573/573L, or permission of instructor.

### **GED 572/572L Instructional Design for Multimedia (3/1)**

Review of instructional design process based on scientific research/theory in field of human learning, applications of current research into development of instructional materials for classroom and non-classroom settings, exploring strategies/techniques for developing multimedia materials for training, educational, or entertainment projects. 3 seminars; 1 three-hour laboratory. Prerequisites: GED 505/505L, 573/573L, or permission of instructor.

### **GED 573/573L Media Production and Multimedia Applications (3/1)**

Role of media/interactive media in learning environments; systematic approach; theoretical aspects of impact of media/multimedia on teaching; multimedia applications in education, training, business, industry, art; producing/utilizing media/multimedia; producing digital materials; transparencies, slides, graphics, QuickTime movies; optical technology. 3 seminars, 1 three-hour laboratory. Prerequisite: GED 505/505L or permission of instructor.

### **GED 575/575L Video Production and Digital Video Editing (3/1)**

Analysis, planning and preparation of instructional video programs; exploring the convergence of video and computers; technical aspects of QuickTime and digital video, capturing/manipulating video images on computers; research on utilization and effectiveness of television and video programs in educational and non-educational settings. 3 seminars, 1 three-hour laboratory. Prerequisites: GED 505/505L, 573/573L or permission of instructor.

### **GED 577/577L Interactive Video Production (3/1)**

Introduction to the interactive video technology: the marriage of computer and video technologies. Designing interactive video disc programs using different authoring systems, re-purposing video discs, and CD-ROMs for use in education, entertainment, business, marketing, communication. 3 seminars, 1 three-hour laboratory. Prerequisites: GED 505/505L, 573/573L or permission of instructor.

### **GED 578/578L Alternative Learning Environments (3/1)**

The application of media in the design and delivery of academic programs through distance learning and other technology-mediated instruction. The theory and practice, case studies of ongoing programs, and research on the effectiveness of technology-mediated learning will be examined. 3 seminars, 1 three-hour laboratory. Prerequisite: GED 573/573L or permission of instructor.

### **TED 581/581A Positive Classroom Interventions (2,1)**

Theory and practice of organizing and managing classroom learning environments for diverse learners. Organizing and scheduling, behavior management techniques, relationships between learners, curriculum, and behavior. Developing and implementing learning environments that enable students to reach their full potential. Minimum 20

student/classroom/activity contact hours required. 2 seminar/discussion; one two-hour activity.

### **TED 583 Introduction to Resource Specialist Program (4)**

Functions of the resource specialist; collaborative consultation, inservice training, direct instruction with special education students. Resource specialist program models. 4 seminars. Prerequisites: Admission to Resource Specialist Program and either a Special Education credential or concurrent enrollment in special education credential program.

### **TED 584 Organization and Management of Special Education Programs (4)**

Legal compliance requirements in planning and financing special education programs. Conceptual framework and research in operation of special education procedures and programs. 4 seminars. Prerequisite: TED 583/GED 583.

### **TED 585 Current Education Issues for the Resource Specialist (4)**

Issues and trends in resource specialist service delivery models and programs. Examination and analysis of current problems, current curricular and instructional practices relevant to the resource specialist. 4 seminar. Prerequisite: TED 583/GED 583.

### **TED 586 Communicating with Parents of Student with Disabilities (4)**

Communication strategies for working with parents of handicapped students. Parent education, rights, due process, resource agencies, local and state parent organizations, counseling, and in-service training techniques and procedures. 4 seminars. Prerequisites: TED 501/GED 501 or TED 551/551A or GED 551, TED 532/GED 532, TED 581/GED 581.

### **TED 587 Current Issues and Research in Special Education (4)**

Study of educational research theory and methods in the context of a critical review of current literature that affects or involves special education. Investigation of issues and trends in special education research. Twenty student/classroom/activity contact hours required. 4 seminar/discussion. Prerequisite: Level II status or permission of instructor.

### **TED 588 Introduction to Assistive Technology (4)**

Overview and introduction to assistive technology, adaptive computer hardware and software, and integration of adaptive devices into curricular activities for students with severe disabilities. Alternative and augmentative communication strategies in the context of language development. 4 seminar/discussion.

### **GED 589 Introduction to Serious Emotional Disturbance (4)**

Advanced seminar in the study of serious emotional disturbance within an educational context. Concepts, significance, etiology, characteristics, and educational considerations of seriously emotionally disturbed students who present academic and social learning problems. 4 seminars. Prerequisite: GED 530 or GED 582.

### **GED 590 Instruction of Culturally and Linguistically Different Students with Disabilities (4)**

Introduction to instructional approach strategies for teaching culturally and linguistically diverse exceptional students. Overview of training techniques in specialized informal assessment, culturally and linguistically appropriate programming, language minority parent involvement strategies, and provision of school-based support/consulting. Prerequisites: GED 501, GED 532, GED 551, GED 581.

**TED 591 Leadership in Special Education (4)**

Application of leadership techniques relevant to special education settings including organizational behavior, group culture, consultation and collaboration, communication skills, problem solving, and group dynamic theory. Preparation in coordination of special education placements and professional interactions. Twenty student/classroom/activity contact hours required. 4 hours seminar discussion.

**GED 592/592A Learning and Instruction (3/1)**

Study of contemporary issues, principles and concepts on learning theory and information processing. Overview of trends and research on assessment of learning and instruction. 3 seminars; 1 two-hour activity. Prerequisite: GED 542 or permission of instructor.

**GED 593/593A Leadership in Building Multicultural Communities of Learners (3/1)**

Approaches to leadership, planning, organizational behavior, and professional relations. Issues, research and trends in teacher leadership. Concepts and models of effective schools with focus on creative and cultural leadership. 3 seminars; 1 two-hour activity. Prerequisite: GED 542 or permission of instructor.

**GED 594/594A Analysis, Development of Language and Literacy Curricula (3/1)**

Examination of language/literacy curricula; development of needs assessment for language/literacy programs and formative/summative evaluations. 3 seminars, 1 two-hour activity. Prerequisites: GED 596, 528 or consent of instructor.

**GED 595/595A The Accomplished Professional Teacher (3/1)**

Assessment of the roles of the professional teacher. Examination of the teacher as reflector, communicator and organizer, researcher and practitioner, scholar and leader. 3 seminars; 1 two-hour activity. Prerequisite: GED 542 or permission of instructor.

**GED 596 Language, Literacy, and Human Development (4)**

Introduction to literacy in the context of life-long learning in a pluralistic society. Political, economic, social and psychological factors affecting language/literacy development explored. Models of first and second language acquisition examined. 4 seminars. Prerequisites: TED 424, 432, or consent of instructor.

**GED 598 The Professional Teacher Assessment (2-6)**

Capstone course for prospective candidates for the National Board for Professional Teaching (NBPT) Standard certification. Context, process and procedures for application for NBPT certification. Prerequisite: Candidates must be enrolled in the NBPT program option. May be repeated each quarter during year of certification application. 2 hour problem-solving seminar. Prerequisite: GED 542 or permission of instructor.

**GED 599/599A/599L Special Topics for Graduate Students (1-4)**

Study and explorations of topics of current interest related to education. Total credit limited to 12 units with a maximum of 4 units per quarter. May include lectures, seminars and /or laboratory work, activity, research, or a combination to be determined by the instructor. Prerequisite: permission of instructor.

**GED 650 Seminar in Current Problems and Strategies in Education (4)**

Critical treatment of new strategies, innovations, conditions, and the findings of research that currently affect or involve education. Choice of

topics will be related to contemporary education problems. 4 seminars. May be repeated for a maximum of 12 units. Unconditional standing required.

**GED 690 Seminar in Educational Research (4)**

Overview of research in education; emphasis on the design and implementation of research projects and theses preparation; discussion of educational issues relevant in the development of a research project. Required of Master of Arts Degree in Education students. 1 three-hour seminar/discussion. Unconditional standing required.

**GED 691 Directed Study (1-9)**

Study, research or readings of a particular problem in education directed by a faculty advisor. May be repeated for credit up to 9 units. Required of Master of Arts in Education students. Prerequisite: consent of the Graduate Coordinator and/or faculty advisor. Unconditional standing required.

**GED 692 Independent Study (1-6)**

Independent study, research or readings proposed by the student and conducted under the supervision of a faculty member, but not leading to a thesis/project. May be repeated for credit up to 6 units. Unconditional standing required.

**GED 693 Conducting Educational Research (4)**

Introduction to educational research. Analysis of qualitative and quantitative evaluation and research methods. Planning a research study and organization of a research report. Required of students in the Master of Arts degree in Education. 4 seminars. Prerequisite: GED 532 and GED 690 or consent of instructor. Unconditional standing required.

**GED 695 Master's Degree Project (3-6)**

Independent research leading to successful completion of a project. Open to graduate candidates and with approval of Graduate Department Chair. Maximum credit, 9 units. Prerequisite or concurrent: GED 694/691. Advancement to Candidacy required and approved committee form filed in the Graduate and Professional Studies Office.

**GED 696 Master's Degree Thesis (3-6)**

Independent research leading to successful completion of a thesis. Open to graduate candidates and with approval of Graduate Department Chair. Maximum credit, 9 units. Prerequisite or concurrent: GED 693/691. Advancement to Candidacy required and approved committee form filed in the Graduate and Professional Studies Office.

**GED 697 Comprehensive Examination (1)**

Preparation for and completion of an examination on the subject area of the candidate's coursework listed on the degree program. May be taken no more than two times. Failure to complete exam satisfactorily the second time will result in termination from the program. Candidates must register through the Graduate and Professional Studies Office. Advancement to Candidacy required. Course may be taken on a credit/no credit basis.

**GED 699 Master's Degree Continuation (0)**

Registration or an approved leave of absence is required for any quarter following the final assignment of the grade "SP" until the completion of thesis or project. The candidate must be enrolled in the university during the quarter in which he/she graduates. Advancement to Candidacy required.



## ENGINEERING

### Master of Science in Engineering

#### Master of Science in Electrical Engineering

Uei-Jiun Fan, Director, Graduate Studies and Research

Engineering Graduate Studies Committee:

Uei-Jiun Fan, Chair	Narayan Mysoor
Ali R. Ahmadi	Thuan K. Nguyen
Norman C. Cluley	John D. O'Neil
Peter Dashner	Hing Pang

The College of Engineering offers two graduate programs:

- 1) An interdisciplinary program leading to the Master of Science in Engineering degree which, coupled with a bachelor's degree, provides the student with a comprehensive preparation for advanced work in the engineering profession. This program is designed to accept students with diverse undergraduate engineering backgrounds. Each student in this program has the opportunity to choose from all the graduate courses offered by the College of Engineering. The student completes a course of study individually tailored to the student's unique talents and professional goals.

The student can choose any of the following emphasis areas: aerospace, chemical, civil, electrical, engineering management, environmental, industrial, manufacturing, materials, mechanical, and structural engineering.

- 2) A more structured program leading to the Master of Science in Electrical Engineering degree which, coupled with a bachelor's degree in Electrical Engineering or a closely related field, provides comprehensive preparation for advanced work in the electrical engineering profession. This program has three options: Communication and Microwave Engineering, Computer Systems Engineering, and Control Systems and Robotics Engineering. After completing a limited number of required courses, students have the opportunity to choose from an extensive list of approved courses to tailor the program of study to their professional goals.

NOTE: Proposals to institute new master's degrees in Environmental Engineering, Mechanical Engineering, Structural Engineering and Engineering Management are currently under review. Please check with the Graduate Studies Office in the College of Engineering for planned date of implementation of these new programs.

The programs of study for each degree feature breadth courses supplemental to the student's undergraduate education, courses designed to emphasize the chosen technical area of specialization, and a thesis or a comprehensive examination.

#### ADMISSION TO THE PROGRAMS

An applicant for admission to either program must meet university criteria as specified in the Admission section of this catalog as well as the criteria outlined below. Applicants are advised that a reasonable proficiency in computer programming is necessary for successful completion. If the student is deficient in this area, he or she will be expected to remove the deficiency early in the program.

Successful applicants will be admitted to the program either unconditionally or with conditions imposed on them. To receive unconditional admission, an applicant must satisfy these criteria:

- 1) The applicant must hold a baccalaureate degree in engineering from a program that has been accredited by the Accreditation Board for Engineering and Technology (ABET) and for which the accreditation was in effect at the time of award of the degree. The degree must have been granted within five years prior to the proposed beginning of the graduate program. A baccalaureate degree in engineering technology does not satisfy this criterion.
- 2) The applicant must have achieved a grade point average of at least 3.00 in all undergraduate upper division coursework in mathematics, science and engineering and, additionally, in all coursework attempted with graduate standing.
- 3) The applicant must receive a positive recommendation from the Director of Graduate Studies and Research and approval by the Dean of the College of Engineering.

Conditional admission may be granted in cases in which the applicant's academic preparation for graduate study is such that criteria 1) and/or 2) above are not satisfied. In such cases, the applicant is required to submit recent test scores of the Graduate Record Examination, letters of recommendation, and other documents attesting to the applicant's aptitude for graduate studies. Applicants who do not satisfy criterion 1) may be required to take a limited number of preparatory courses with no degree credit. Criterion 3) above must be met. When an applicant is admitted conditionally, the conditions to be met and the time allowed for meeting them are stated in the letter of admission. If these conditions are not satisfied, the student may be disenrolled.

#### PROGRAM REQUIREMENTS

Admission to a program does not admit a student to candidacy for a degree. Advancement to Candidacy is granted a student upon the recommendation of the graduate faculty and implies a readiness to attempt the thesis or comprehensive examination. Students who are not candidates are not eligible to register for EGR 692 or 696.

In order to advance to candidacy for either the Master of Science in Engineering degree, or the Master of Science in Electrical Engineering degree, the student must:

- 1) satisfy all admissions conditions, if any;
- 2) complete at least 32 units of graduate coursework with a grade point average of 3.0 or better;
- 3) satisfy the Graduation Writing Test; and
- 4) with the assigned advisor, develop and file a formal Program of Study and have it approved by the Engineering Graduate Studies Committee, by the Graduate Studies Analyst, and by the Director of Graduate Studies and Research.

The program of study must be submitted for approval before the end of the second quarter of attendance.

At the time of filing of the program of study, the student must opt for publishing a thesis or performing independent study with a comprehensive examination as a culminating experience of his/her graduate education after completing the required coursework. The thesis effort is intended to involve independent research by the student with the goal of advancing knowledge in a specialized area. The thesis effort includes a defense of the effort by the student before a committee of faculty members. The independent study with comprehensive examination is a one-quarter case study or research, which concludes with a written report and a comprehensive written and/or oral exam conducted by a committee of faculty members. Information regarding the thesis and independent study with comprehensive examination is available at the Engineering Graduate Studies Office.

In addition, each student is responsible for satisfying all university requirements specified elsewhere in the catalog.

### CURRICULAR REQUIREMENTS

General requirements for advanced degrees are found in the Graduate Scholastic Requirements section of this catalog. No more than 13 units of acceptable graduate credit may be transferred from another graduate institution. No more than 13 units taken through Extended University may be used on a contract. No more than 13 units of acceptable graduate credit may be petitioned by an undergraduate student. A total of 13 transfer, Extended University, or units petitioned for graduate credit, or any combination of 13 units, may be included on a master's contract. The stipulated time limit of 7 years applies to all of the above.

Technical specialty courses are chosen to emphasize an area that is a logical continuation of the student's undergraduate and graduate preparation. At most, one 400-level course may be included in this category, and a maximum of 4 transfer units can be used to satisfy this requirement.

The remainder of the courses in the student's program of study will be chosen in collaboration with an advisor to insure consistency with undergraduate preparation and graduate goals, and to assure an integrated educational experience. A course in the program of study may be taken only after the student has satisfied the course prerequisites for enrolling in the course. It is the student's responsibility to satisfy all prerequisites for a course before enrolling in the course.

Engineering graduate students may be granted graduate credit only for courses numbered 400 and above. A grade point average of 3.0 (B) or better must be maintained in all upper-division and all graduate courses. Candidates must be enrolled in the university during the quarter of graduation.

### Master of Science in Engineering

The curriculum for the Master of Science in Engineering degree requires a minimum of 45 quarter units of coursework, of which at least 32 units must be in 500 and 600 level courses. Each program of study consists of at least 15 units of breadth courses, at least 15 units of technical specialty courses, elective course, and either a thesis (4-8 units) or an independent study with comprehensive examination (2 unit). The breadth courses are intended to insure that the student acquires a broad basis in fundamental courses in advanced mathematics, science and engineering, and are chosen so that they will be most beneficial to the student, complementing the student's undergraduate program. Breadth courses may include at most one course from the sequence EGR 521, 538, 539, 540, 553; the rest of the breadth courses must be chosen from the sequence EGR 509 through 515.

### Master of Science in Electrical Engineering

The curriculum for the Master of Science in Electrical Engineering degree requires a minimum of 46 quarter units of coursework, of which at least 34 units must be in 500 and 600 level courses. Each program of study consists of at least 8 units of breadth courses, at least 16 units of technical emphasis courses, at least 16 units of elective courses, and either EGR 696, Thesis (4-8 units) or EGR 692, Independent Study with Comprehensive Examination (2 units). Breadth courses include one required and one optional course from among EGR 509, 510, 511, 512, and 515. They are intended to insure that the student acquires a fundamental knowledge in advanced mathematics. Two required emphasis area courses are specified for each option. The rest of the emphasis courses and electives may be chosen from an extensive list of courses in electrical engineering and related areas of mathematics, science, and engineering.

### Discipline Listing of Engineering Graduate Courses

For assistance in filing a Program of Study, the graduate courses are listed here by the department/discipline typically offering the courses. Students in the Engineering Management and Environmental Engineering emphasis areas should consult with the advisors for the full list of approved courses, including those offered by other colleges.

#### GENERAL OFFERINGS

EGR 509	Advanced Differential Equations for Engineers (4)
EGR 510	Engineering Probability and Statistics (4)
EGR 511	Numerical Modeling (4)
EGR 512	Vector Analysis and Complex Variables (4)
EGR 513	Engineering Tensor Analysis (4)
EGR 514	Methods in Engineering (4)
EGR 515	Matrix Methods in Engineering (4)
EGR 553	Computer Simulation of Engineering Systems(4)
EGR 596	Research Methods (4)
EGR 599/599A/599L	Special Topics for Graduate Students (4)
EGR 691	Directed Study (2)
EGR 692	Independent Study with Comprehensive Examination (2)
EGR 696	Master's Degree Thesis (2)
EGR 699	Master's Degree Continuation (4)

#### AEROSPACE ENGINEERING

EGR 524L	Advanced Aerospace Vehicle Design (2)
EGR 528	Hypersonic Aerodynamics (4)
EGR 535	Advanced Fluid Dynamics (4)
EGR 575	Inlet Design (4)
EGR 577	Aerodynamics of Wings and Body (4)
EGR 578	Aircraft Stability (4)
EGR 579	Vibration and Flutter (4)
EGR 583	Aerodynamic Heating (4)
EGR 624L	Advanced Aerospace Vehicle Design (2)
EGR 632	Computational Fluid Dynamics (4)

#### CHEMICAL AND MATERIALS ENGINEERING

EGR 533	Mechanical Metallurgy (4)
EGR 534	Fracture of Solids (4)
EGR 537	Polymer Fluid Dynamics (4)
EGR 546	Heterogeneous Phase Equilibria (4)
EGR 547	Process Modeling and Analysis (4)
EGR 550	Advanced Transport Phenomena (4)
EGR 565	Water Quality Analysis (4)
EGR 567	Unit Processes in Water and Wastewater Treatment (4)
EGR 568	Biological Unit Processes in Wastewater Treatment (4)
EGR 580	Materials for Electronics (4)

#### CIVIL ENGINEERING

EGR 516	Advanced Indeterminate Structures (4)
EGR 517	Advanced Steel Design (4)
EGR 519	Advanced Reinforced Masonry Design (4)
EGR 522	Advanced Reinforced Concrete Design (4)
EGR 523	Prestressed Concrete Design (4)
EGR 525	Advanced Foundation Engineering (4)
EGR 566	Fundamentals of Aseismic Design (4)
EGR 569	Groundwater Hydrology & Modeling (4)
EGR 581	Open Channel Hydraulics (4)
EGR 618	Stability of Structures (4)

**ELECTRICAL AND COMPUTER ENGINEERING**

EGR 540	Systems Theory (4)
EGR 543	Stochastic Processes (4)
EGR 544	Communication Theory (4)
EGR 548	Solid State Electronics (4)
EGR 551	Digital Signal Processing (4)
EGR 552	Introduction to Neural Networks (4)
EGR 555	Microprocessor-based Control Systems (4)
EGR 558	Computer Arithmetic (4)
EGR 559	Computer Networks (4)
EGR 560	Information Theory and Coding (4)
EGR 561	Advanced Microprocessors (4)
EGR 562	Advanced Microwave Engineering (4)
EGR 563	Solid State Microwave Devices and Circuits (4)
EGR 585	Computer Organization (4)
EGR 586	Satellite Communication (4)
EGR 587	Advanced Integrated Circuit Applications (4)
EGR 588	Biological Control Systems (4)
EGR 589	Antenna Theory (4)
EGR 640	Systems Theory (4)
EGR 642	Digital Control Systems (4)
EGR 643	Optimal Control Systems (4)
EGR 644	Advanced Communication Systems (4)
EGR 651	Advanced Signal Processing (4)
EGR 652	Nonlinear Control Systems (4)
EGR 685	Advanced Computer Organization (4)

**INDUSTRIAL AND MANUFACTURING ENGINEERING**

EGR 538	Advanced Engineering Economy (4)
EGR 539	Advanced Human Factors in Engineering Design (4)
EGR 549	Advanced Methods in Operations Research (4)
EGR 572	Total Quality Management in Engineering (4)
EGR 573	Advanced Operations Planning and Control Systems (4)
EGR 574	Advanced Facilities Planning (4)

**MECHANICAL ENGINEERING**

EGR 520	Elasticity (4)
EGR 521	Structural Dynamics (4)
EGR 532	Conduction Heat Transfer (4)
EGR 536	Advanced Classical Dynamics (4)
EGR 545	Advanced Engineering Thermodynamics (4)
EGR 556	Advanced Mechanics of Materials (4)
EGR 557	Analysis of Mechanical Designs (4)
EGR 564	Radiation Heat Transfer (4)
EGR 570	Nonlinear Dynamics (4)
EGR 576	Combustion Theory (4)
EGR 584	Convective Heat Transfer (4)
EGR 590	Solar Energy Systems (4)
EGR 591	Direct Energy Conversion (4)
EGR 595	Boundary Layer Concepts (4)

**GRADUATE COURSE DESCRIPTIONS****EGR 509 Advanced Differential Equations for Engineers (4)**

An advanced course in applied differential equations. Multi-disciplinary engineering models are developed and solved. Analytical and numerical techniques for solving differential systems with either a single independent variable or multiple independent variables are used. 4 lectures/problem-solving. Prerequisite: Undergraduate course in differential equations.

**EGR 510 Engineering Probability and Statistics (4)**

Mean square estimation, introduction to stochastic processes, time averages and ergodicity, continuous testing and estimation, confidence intervals, significance, applications in thermodynamics, machine design, systems analysis, and reliability. 4 lectures/problem-solving. Prerequisite: Undergraduate course in probability theory.

**EGR 511 Numerical Modeling (4)**

Advanced interpolation and approximation methods. Advanced integration concepts. Solution of ordinary differential equations. systems of differential equations, statistical methods. Applications to electrical networks, transport phenomena, structural systems, dynamic systems, etc. 4 lectures/problem-solving. Prerequisite: Undergraduate course in numerical analysis or consent of instructor.

**EGR 512 Vector Analysis and Complex Variables (4)**

Vector and scalar fields. Gradient, divergence, curl. Green's and Stokes' theorems. Complex functions and conformal mapping. Applications in electrodynamics, heat transfer, fluid dynamics and aerodynamics. 4 lectures/problem-solving. Prerequisite: Mathematics equivalent to ABET-accredited curriculum.

**EGR 513 Engineering Tensor Analysis (4)**

Vector-tensor notation and operations. Generalized coordinate systems. Tensor algebra and calculus. Transport and conservation laws in continuum mechanics. Formulation and modeling of engineering phenomena. 4 lectures/problem-solving. Prerequisite: Mathematics equivalent to ABET-accredited curriculum.

**EGR 514 Variational Methods in Engineering (4)**

Calculus of variations. Approximate methods. Applications in fluid dynamics, heat transfer, dynamics, structures. 4 lectures/problem-solving. Prerequisite: Mathematics equivalent to ABET-accredited curriculum.

**EGR 515 Matrix Methods in Engineering (4)**

Application of matrix methods in engineering analysis. Matrix algebra. Eigenvalues and eigenvectors. Energy techniques. Transformations. Applications in classical mechanics, analysis of structures, circuit analysis, vibrations, heat transfer and fluid dynamics. 4 lectures/problem-solving. Prerequisite: Mathematics equivalent to ABET-accredited curriculum.

**EGR 516 Advanced Indeterminate Structures (4)**

Analysis of multi-degree of freedom systems by slope deflection and superposition of distribution process. Elements of matrix application including flexibility and stiffness methods. Deflection of continuous trusses and frames. Stability analysis of beam-column utilizing classical strain energy theorems. 4 lectures/problem-solving. Prerequisite: Upper-division course in structural analysis.

**EGR 517 Advanced Steel Design (4)**

Structural steel analysis and design including long span and tapered girders, orthotropic plates, space frames. Column stability and post buckling states, secondary stresses. Design of lateral force resistant building frames and composite steel-concrete systems. Plastic analysis and design of rigid frame structures. 4 lectures/problem-solving. Prerequisite: Upper-division course in structural steel analysis.

**EGR 519 Advanced Reinforced Masonry Design (4)**

Applied design and analysis of one and two-story reinforced masonry buildings. Design considerations in high-rise masonry structures. Design and analysis of masonry retaining walls. 4 lectures/problem-solving. Prerequisite: CE 442, or equivalent.

**EGR 520 Elasticity (4)**

Theory of stress and strain for continuous media. Stress-strain relations of elasticity. Plane stress and strain. Introduction to thermoelasticity. 4 lectures/problem-solving. Prerequisite: Upper-division courses in structural analysis and EGR 513, or consent of the instructor.

**EGR 521 Structural Dynamics (4)**

Concepts of the dynamics of elastic bodies. Longitudinal, transverse and torsional vibrations of structural elements. Vibrations of plates and shells. Approximate methods in dynamics of structures. 4 lectures/problem-solving. Prerequisites: Upper-division courses in structural analysis, dynamics, vibrations and EGR 515.

**EGR 522 Advanced Reinforced Concrete Design (4)**

Advanced design and analysis of continuous building frames to include floor systems, eccentrically loaded columns, folded plate and shell roof elements. Retaining structures, composite deck sections. 4 lectures/problem-solving. Prerequisite: Upper-division course in design of reinforced structures.

**EGR 523 Prestressed Concrete Design (4)**

Design and analysis of prestressed concrete components including slabs, beams, and columns utilizing both elastic and ultimate strength design concepts; special problems involving composite design of structural systems. 4 lectures/problem-solving. Prerequisite: Upper-division course in reinforced concrete design.

**EGR 524L Advanced Aerospace Vehicle Design (2)**

Preliminary design of aerospace systems. Interdisciplinary concepts in design. System analysis and integration. Design optimization. Design compromise in multidisciplinary systems. Trades study evaluations. Verbal and written presentation of system design. Individual and team projects. 2 three-hour laboratories. Prerequisite: completion of 24 units of graduate level coursework.

**EGR 525 Advanced Foundation Engineering (4)**

Advanced analysis and design of foundations and earth retaining structures, including both structural and geotechnical considerations. Laterally loaded piles, braced excavations, sheet piles and tieback anchors. 4 lectures/problem-solving. Prerequisite: CE 424 or equivalent.

**EGR 528 Hypersonic Aerodynamics (4)**

Two- and three-dimensional flow fields. Hypersonic small disturbance and Newtonian impact theories and application. Boundary layer interaction with the inviscid flow field. Real gas phenomena. Blunt body and conical flow fields; minimum drag bodies; aerodynamic analysis of complete configurations. 4 lectures/problem-solving. Prerequisite: Upper-division course in supersonic aerodynamics.

**EGR 532 Conduction Heat Transfer (4)**

Application of principles of heat transfer and thermodynamics in solution of steady-state and transient heat transfer problems. Classical heat conduction theory. Derivation of Fourier equation and integration of

various single and multidimensional problems. Detailed discussion of thermal conductivity. 4 lectures/problem-solving. Prerequisite: Upper-division course in heat transfer.

**EGR 533 Mechanical Metallurgy (4)**

Study of the mechanical behavior of metals. Fundamental mechanisms controlling deformation phenomena, strain-hardening, creep, fatigue, and fracture. Strengthening mechanisms involving alloying and heat treatment. 4 lectures/problem-solving. Prerequisite: Undergraduate courses in strength of materials and materials science.

**EGR 534 Fracture of Solids (4)**

Engineering and microscopic approaches, fracture of steels, creep and fatigue, stress corrosion cracking, and hydrogen embrittlement. 4 lectures/problem-solving. Prerequisite: Upper-division course in stress analysis.

**EGR 535 Advanced Fluid Dynamics (4)**

Governing field laws: mass, momentum, energy. Reynolds' Transport Theorem: mass, momentum, energy. Cartesian tensor notation. Rotation, stress, rate-of-strain relations. Flow kinematics. Ideal fluid flow. Conformal transformations. Viscous flows: pipe, flat plate. 4 lectures/problem-solving. Prerequisite: Upper-division course in fluid mechanics or consent of instructor.

**EGR 536 Advanced Classical Dynamics (4)**

Lagrange's equations, Hamilton's principle, variational principles, equations of motion in Eulerian angle systems, characteristic equation of inertia matrix, cuspidal motion and nutation. 4 lectures/problem-solving. Prerequisites: EGR 515 and upper-division course in dynamics, or consent of instructor.

**EGR 537 Polymer Fluid Dynamics (4)**

The structure, flow phenomena, and material functions for polymeric fluids. Constitutive equations available to solve polymeric fluid dynamics problems. Applications in plastics manufacturing, performance of lubricants, processing of food-stuffs, and movement of biological fluids. 4 lectures/problem-solving. Prerequisites: Upper-division courses in heat transfer, fluid mechanics, and EGR 513.

**EGR 538 Advanced Engineering Economy (4)**

Engineering economic decision criteria and models for evaluating capital investment proposals and engineering projects. Replacement studies, risk and uncertainty, tax effects, intangibles, probabilistic models, computer techniques. 4 lectures/problem-solving. Prerequisite: 3 quarter units of undergraduate engineering economy.

**EGR 539 Advanced Human Factors in Engineering Design (4)**

Methods and research techniques in engineering design of optimum man-machine systems. Designing systems with the objective of developing optimum combinations of physical and human components. Effects of environment on human performance. Man-machine dynamics. 4 lectures/problem-solving. Prerequisite: Upper-division course in human engineering principles.

**EGR 540 Systems Theory (4)**

Application of matrix theory and linear vector spaces to the mathematical representation of systems. Analysis of the state equations for linear, time varying and invariant, continuous and discrete systems, controllability and observability for linear systems. 4 lectures/problem-

solving. Prerequisite: EGR 515. (Some previous exposure to Laplace Transforms is recommended.)

#### **EGR 541 Object-oriented Approach to Engineering Software Design (4)**

Essential object-oriented programming concepts: encapsulation, inheritance, and polymorphism, GUI development, multimedia software design, application modeling using unified modeling language. 4 lectures/problem-solving. Prerequisite: ECE 303 or equivalent, or consent of instructor.

#### **EGR 543 Stochastic Processes (4)**

Analysis of random phenomena associated with the transmission of digital and analog signals. Investigation of random binary signals, thermal noise, signal-to-noise ratios, and Markov processes. Applications include optimum filtering, estimation theory, and queuing theory. 4 lectures/problem-solving. Prerequisite: EGR 510 or equivalent.

#### **EGR 544 Communication Theory (4)**

Selected advanced topics in communication systems such as information theory for continuous and discrete channels; signal detection and recognition; coding for optimal communication nets. 4 lectures/problem-solving. Prerequisite: Upper-division course in communications systems.

#### **EGR 545 Advanced Engineering Thermodynamics (4)**

Development of concept of equilibrium. Reversible and irreversible principles of thermodynamics, second law consequences; estimation and correlation of thermodynamic properties. Physical basis of conservation equations. Statistical foundations. 4 lectures/problem-solving. Prerequisites: Upper-division course in thermodynamics.

#### **EGR 546 Heterogeneous Phase Equilibria (4)**

Applied phase equilibria. A development of theoretical and empirical principles for understanding complex multiphase behavior in multicomponent chemical systems. 4 lectures/problem-solving. Prerequisite: Upper-division course in engineering thermodynamics.

#### **EGR 547 Process Modeling and Analysis (4)**

Mathematical modeling of physical and chemical processes. Analytical and numerical solutions for steady and unsteady state problems. Design project based on results of modeling. 4 lectures/problem-solving. Prerequisite: Baccalaureate degree in Chemical Engineering or consent of the instructor.

#### **EGR 548 Solid State Electronics (4)**

Quantum theory and atomic structure. Classical and quantum statistics. Description of crystal structures. Lattice vibrations. Band theory of solids. Transport phenomena in semi-conductors and metals. 4 lectures/problem-solving. Prerequisite: Upper-division course in solid-state electronics.

#### **EGR 549 Advanced Methods in Operations Research (4)**

Methodology of operations research and algorithms for system and subsystem optimization; emphasis on methods yielding practical numerical procedures. Linear programming and extension, dynamic and integer programming, queuing theory, network analysis, game theory and decision theory. 4 lectures/problem-solving. Prerequisite: Upper-division course in operations research.

#### **EGR 550 Advanced Transport Phenomena (4)**

Differential balances for momentum, heat, and mass transfer. Convective energy, mass, and momentum transfer; internal and external flow, exact

and approximate solutions. Application for space vehicle re-entry, binary and multicomponent systems, nuclear reactor cooling, mass transfer and heat exchanger analysis. 4 lectures/problem-solving. Prerequisites: Upper-division courses in heat transfer and fluid mechanics.

#### **EGR 551 Digital Signal Processing (4)**

Analysis and design of multirate signal processing and its applications. Linear prediction filter design and implementation using FIR and lattice filters. Non-parametric, parametric, and eigensystem algorithms for power spectrum estimation. 4 lectures/problem-solving. Prerequisites: Upper-division courses in Fourier transforms and ECE 428, or equivalent.

#### **EGR 552 Introduction to Neural Networks (4)**

Theory and engineering applications of artificial neural networks. 4 lecture/problem solving sessions. Prerequisites: Basis Probability Theory and EGR 515.

#### **EGR 553 Computer Simulation of Engineering Systems (4)**

Systems theory as foundation for engineering analysis and synthesis of complex systems. Numerical methods and simulation models using digital computers. Optimization of engineering systems design and performance. Applications to engineering systems problems. 4 lectures/problem-solving. Prerequisite: Undergraduate course in computer programming.

#### **EGR 555 Microprocessor-based Control Systems (4)**

Typical computer control systems. Supervisory and DDC Control. Mathematics of sample-data control systems. Development of controller algorithms using Z-transforms and microprocessors. On-Line identification techniques, advanced control techniques. Typical microprocessor-based process control systems. 4 lectures/problem-solving. Prerequisites: Upper-division courses in microprocessor and control theory.

#### **EGR 556 Advanced Mechanics of Materials (4)**

Stress and strain analysis, 2-D elasticity problems, unsymmetrical bending, shear center, torsion of prismatic members, inelastic and plastic behavior in torsion and bending, topics from: micro-mechanics of composite materials, energy methods, failure theories, theory of plates, thick walled pressure vessels. 4 lectures/problem-solving. Prerequisite: Upper-division course in stress analysis.

#### **EGR 557 Analysis of Mechanical Designs (4)**

Analysis of common machine elements. Relation to design decision making. Optimization, reliability, miniaturization, and statistical strength theory. 4 lectures/problem-solving. Prerequisite: Upper-division course in stress analysis.

#### **EGR 558 Computer Arithmetic (4)**

High speed multiplication and division algorithms. Residue, floating-point, and distributed arithmetic. Hardware structure for functional evaluations. 4 lectures/problem-solving. Prerequisite: Undergraduate course in computer architecture.

#### **EGR 559 Computer Networks (4)**

Principles, Protocols, Architecture and Performance Analyses of Local Area Networks, Wide Area Networks, and Internetworking. Asynchronous transfer mode (ATM) networks. 4 lecture/problem solving sessions. Prerequisite: ECE342 and ECE 405 or equivalent.

**EGR 560 Information Theory and Coding (4)**

Channel models, coding theorems, coding systems, statistical properties of information sources. 4 lectures/problem-solving. Prerequisite: Upper-division course in probability theory.

**EGR 561 Advanced Microprocessors (4)**

State of the art 32- and 64-bit microprocessors; assembly language and C programming; input/output techniques; system design and peripheral interfacing. 4 lectures/problem-solving. Prerequisite: ECE 432/482L or equivalent.

**EGR 562 Advanced Microwave Engineering (4)**

Analysis of microwave components and networks, Green's functions; plane, cylindrical, and spherical wave functions; wave guides, cavities, scattering and diffraction of waves, microwave networks and radiation. 4 lectures/problem-solving. Prerequisite: Undergraduate course in field theory.

**EGR 563 Solid State Microwave Devices and Circuits (4)**

Introduction to parameter matrices and microwave circuit design techniques. Microstrip lines. Design and evaluation of FET amplifiers, FET oscillators. Varactors, mixer diodes, control devices and their microwave circuit applications. Computer-aided design of microwave circuits. New developments. 4 lectures/problem-solving. Prerequisites: Upper-division courses in EM theory and linear active circuits.

**EGR 564 Radiation Heat Transfer (4)**

Radiation properties of surfaces; radiant interchange among surfaces separated by radiatively non-participating media including the interchange among black and gray surfaces; radiant energy transfer through absorbing, emitting, and scattering media. 4 lectures/problem-solving. Prerequisite: Undergraduate course in heat transfer.

**EGR 565 Water Quality Analysis (4)**

Application of chemical principles to analysis of natural water systems, water purification technology, and water pollution control. Physiology of organisms of importance in water supply and in wastewater treatment processes. Enzymatic reaction. Biochemical oxidation and fermentations. Ecology and eutrophication. 4 lectures/problem-solving. Prerequisite: Undergraduate lecture and laboratory course in sanitary engineering.

**EGR 566 Fundamentals of Aseismic Design (4)**

Characteristics of strong ground motion, causes, response spectra, earthquake response of single degree and multiple degree of freedom systems. Structural analysis and design based on UBC and SEAOC recommendations relative to earthquake-resistant design. 4 lectures/problem-solving. Prerequisite: Upper-division course in structural analysis.

**EGR 567 Unit Processes in Water and Wastewater Treatment (4)**

The physical and chemical unit processes in water and waste treatment, relationship of design practice and theory, operational considerations, and the optimization of unit processes; aeration, sedimentation, flocculation, flotation, adsorption, filtration, ion exchange, coagulation, corrosion, control, and disinfection. 4 lectures/problem-solving. Prerequisite: Upper-division course in sanitary engineering.

**EGR 568 Biological Unit Processes in Wastewater Treatment (4)**

Microbial reactions related to water and wastewater treatment. Biological interactions in various unit processes related to design and operational considerations required for optimization; disinfection, activated sludge,

trickling filters, and sludge digestion. 4 lectures/ problem-solving. Prerequisite: Upper-division course in sanitary engineering.

**EGR 569 Groundwater Hydrology and Modeling (4)**

Properties of water-bearing materials, basic differential-flow equations, well-mechanics, sources and types of contamination, mass transport equations advection, dispersion, sorptions, numerical modeling, and remediation method: Optimum design, groundwater modeling techniques, and the use of advanced software packages. 4 lectures/problem-solving. Prerequisite: Upper-division course in hydrology.

**EGR 570 Nonlinear Dynamics (4)**

Complementary methods of nonlinear modeling of physical, chemical and fluid systems. Analytic, topologic and computational perspectives. Dimensions and fractals. Bifurcations and catastrophes. Deterministic chaos. Solitons. Applications to ecology, hydrodynamics, electrical and mechanical systems. 4 lectures/problem-solving. Prerequisite: EGR 536 or consent of the instructor.

**EGR 572 Total Quality Management in Engineering (4)**

Introduction to the principles and practices of Total Quality Management (TQM). The course will also cover the tools and techniques for understanding and implementing TQM. A practical state-of-the-art approach will be used. Applications in service, manufacturing, government, military, construction, education, small business, health care, and nonprofit organizations will be presented. 4 lectures/problem-solving. Prerequisite: consent of instructor.

**EGR 573 Advanced Operations Planning and Control Systems (4)**

Operations analysis of integrated production systems; mathematical and computer models for planning, scheduling, and control of production and service systems. Statistical techniques in forecasting; optimization of resources utilization. 4 lectures/problem-solving. Prerequisite: Upper-division course in operations research.

**EGR 574 Advanced Facilities Planning (4)**

Planning, analyzing, justifying, controlling, and evaluating physical facilities. Long- and short-range facilities plans, decision criteria, authorization and control procedures, post completion audits. Resource allocation, optimization, simulation, and computer techniques. Technical, economic, ecological, safety, and intangible factors. Case studies. 4 lectures/problem-solving. Prerequisite: Undergraduate course in engineering economy.

**EGR 575 Inlet Design (4)**

Subsonic, supersonic and hypersonic inlet design. Subsonic inlets: friction loss, diffusion, plenum chambers, pressure recovery. Transonic effects: pre-entry flow, separation, shock-boundary layer interaction. Supersonic compression: external, internal, boundary layer bleed. Cowl design. Additive drag. Flow distortion. Matching and control. Applications to aircraft and helicopters. 4 lectures/problem-solving. Prerequisites: Undergraduate courses in gas dynamics and propulsion.

**EGR 576 Combustion Theory (4)**

Molecular structure and statistical thermodynamics. Real gases. Transport phenomena. Chemical reactions in gases. Reactive gas dynamics. Combustion phenomena and diffusion flames. Premixed gas flames; flame propagation, cellular flames, quenching. Aerodynamics of flames; flame shape, turbulent flames. Detonation. Applications. 4 lectures/problem-solving. Prerequisites: Undergraduate courses in thermodynamics and heat transfer.

**EGR 577 Aerodynamics of Wings and Body (4)**

Three-dimensional wings; steady, subsonic flow; supersonic flow. Lifting line theory: span-wise lift distribution, induced drag, twist, sweepback. Introduction to lifting surface theory: planar, nonplanar, interference. Transonic small-disturbance flow. Unsteady flow. Conical flows. 4 lectures/problem-solving. Prerequisite: Undergraduate course in aerodynamics.

**EGR 578 Aircraft Stability (4)**

General equations of unsteady motion. Stability derivatives. Stability of uncontrolled motion; longitudinal, lateral. Response of the vehicle to actuation of the controls. Flight in turbulent air. Automatic stability and control. Specialization to missiles. Simulation. Transfer functions. 4 lectures/problem-solving. Prerequisite: Undergraduate course in stability and control.

**EGR 579 Vibration and Flutter (4)**

Two- and three-dimensional flutter theory. Structural damping. Aerodynamics forces. Flutter stability. Non-linear characteristics. Aspect ratio and compressibility effects. Empennage vibration and flutter analysis. Wing torsional divergence, aileron reversal and effectiveness. Modeling concepts. 4 lectures/problem-solving. Prerequisites: Upper-division courses in aerodynamics, structures and dynamics and EGR 515.

**EGR 580 Materials for Electronics (4)**

Preparation techniques for materials used in electronic devices. Structure and purity control. Crystal growth, epitaxy, vapor deposition, magnetic domains, and solid state phase transformations. Current problems concerning Si and III-V compound device production and research. 4 lectures/problem-solving. Prerequisite: An undergraduate course in materials science.

**EGR 581 Open Channel Hydraulics (4)**

Advanced topics in open channel flow. Energy and momentum principles applied to non-prismatic channels. Gradually varied flow. Rapidly varied flow. Computer applications. 4 lectures/problem-solving. Prerequisite: Upper-division lecture and laboratory hydraulics course.

**EGR 583 Aerodynamic Heating (4)**

Fundamental equations. Laminar and turbulent boundary layer properties. Laminar and turbulent skin friction. Recovery temperature. Reference enthalpy method. Slip flow. Free molecule flow. Stagnation point heat transfer. Mass transfer cooling. Calculation of skin temperature. 4 lectures/problem-solving. Prerequisites: Undergraduate courses in heat transfer and gas dynamics.

**EGR 584 Convective Heat Transfer (4)**

Conservation principles. Fluid stresses and flux laws. Laminar and turbulent boundary layers. Internal flow; noncircular cross sections, entry lengths, asymmetric heating. External flow; variable velocity, injection, specified temperature and heat flux distribution. Temperature dependent fluid properties. Computer solutions. 4 lectures/problem-solving. Prerequisite: Undergraduate course in heat transfer.

**EGR 585 Computer Organization (4)**

Memory Subsystems: Cache, virtual and interleaved memories. Instruction pipelines. Dynamic scheduling algorithms and principles of vector processing. Principles of pipeline processing. Arithmetic and instruction pipeline design. Pipeline scheduling and control. 4 lectures/problem-solving. Prerequisite: ECE 425 or consent of instructor.

**EGR 586 Satellite Communication (4)**

Introduction to satellite system configurations and digital communication techniques. Link budget analysis. Baseband transmission systems. Power efficiency and spectrally efficient modulation techniques for linear and non-linear satellite channels. Coding for error detection and correction. Synchronization systems. Time division, frequency division, and code division multiple access techniques. Satellite transponders and earth stations. 4 lectures/problem-solving. Prerequisite: EGR 544 or equivalent, or consent of instructor.

**EGR 588 Biological Control Systems (4)**

Application of control systems analysis to biological control systems. Development of mathematical models of selected biological control systems and the application of computer techniques in simulation of these systems. 4 lectures/problem-solving. Prerequisite: Upper-division course in control systems.

**EGR 589 Antenna Theory (4)**

Dipole, loop and small antennas, arrays, wire, aperture, lens, horns, reflectors and other special antenna; currents and impedances; radiation and radiation patterns. 4 lectures/problem-solving. Prerequisites: Two upper-division courses in field theory.

**EGR 590 Solar Energy Systems (4)**

Analysis of advanced, hybrid solar collectors. Advanced solar energy storage. Design of solar energy systems. 4 lectures/problem-solving. Prerequisite: Upper-division course on solar energy or equivalent.

**EGR 591 Direct Energy Conversion (4)**

Conversion of primary chemical, nuclear, solar and heat energy directly to electrical energy without intermediate mechanical elements. Fuel cells, solar cells, magnetohydrodynamic generators, and fusion plasma generators. 4 lectures/problem-solving. Prerequisite: Upper-division course in thermodynamics.

**EGR 595 Boundary Layer Concepts (4)**

Treatment of Newtonian and non-Newtonian fluids in the laminar and turbulent regimes. Positive and negative pressure gradients. Development of the thermal boundary layer. Some exact and inexact solutions. Wedge flow. 4 lectures/problem-solving. Prerequisite: EGR 535 or consent of instructor.

**EGR 596 Research Methods (2)**

Introduction to research methods with emphasis on preparing an engineering thesis problem statement. This course prepares engineering graduate candidates for writing theses and independent research papers. Writing problem statements; research questions; experimental and non-experimental design; sampling; instrument design. 2 discussions. Prerequisite: completion of all required breadth courses on contract.

**EGR 599/599A/599L Special Topics for Graduate Students (2-4)**

Selected topics comprising new or experimental courses not otherwise offered. Each offering identified in the current schedule and on the student's transcript. Prerequisite: consent of instructor.

**EGR 618 Stability of Structures (4)**

Stability of beam columns; elastic and inelastic buckling of straight columns; torsional buckling of bars; lateral buckling of beams; local buckling of plate elements; stability to frames. 4 seminars. Prerequisite: EGR 511. Unconditional standing required.

**EGR 624L Advanced Aerospace Vehicle Design (2)**

Completion of the design of an interdisciplinary aerospace vehicle system. Preparation of a final report on the project together with an oral briefing to an industrial design review panel. 2 three-hour laboratories. Prerequisite: EGR 524. Unconditional standing required.

**EGR 632 Computational Fluid Dynamics (4)**

Fundamentals of finite-difference methods: partial differential equations, difference representation, stability, errors. Dynamics of a body moving through a fluid medium. Inviscid fluid flows. Compressible fluid flows. Viscous fluid flows. Secondary flows and flow instabilities. Panel methods. 4 lectures/problem-solving. Prerequisites: EGR 509 and 535. Unconditional standing required.

**EGR 640 Systems Theory (4)**

Pole-placement design using state-feedback for linear systems, observer (state-estimator) design. Introduction to nonlinear systems and perturbation theory; stability for linear and nonlinear systems using Liapunov methods. 4 seminars. Prerequisite: EGR 540. Unconditional standing required.

**EGR 642 Digital Control Systems (4)**

Basic theory of sampling, quantizing and modeling of the digital computer for computer controlled feedback systems. State-space and Z-transform representation. Time response stability and design using both classical and modern techniques. 4 seminars. Prerequisites: Upper-division course in control systems and EGR 540. Unconditional standing required.

**EGR 643 Optimal Control Systems (4)**

Selected topics in optimal control theory such as variational calculus; maximum principle; dynamic programming; state estimation and computational methods in optimal systems control. 4 seminars. Prerequisite: EGR 540. Unconditional standing required.

**EGR 644 Advanced Communication Systems (4)**

Selected advanced topics in communication systems such as spread spectrum systems, computer communications, optical communications and image processing. 4 lecture discussions. Prerequisite: EGR 544 or equivalent. Unconditional standing required.

**EGR 651 Advanced Signal Processing (4)**

Selected advanced topics in signal processing such as multi-rate signal processing, adaptive filtering, parametric spectrum estimation and signal analysis with higher order spectra. 4 lecture discussions. Prerequisite: EGR 551 or equivalent. Unconditional standing required.

**EGR 652 Nonlinear Control Systems (4)**

Numerical approximation methods in the solution of non-linear systems. Phase-plane techniques including method of isoclines, delta, and analysis of singular points. Describing function techniques, perturbation reversion, variation of parameters and harmonic balance methods. Liapunov stability methods. 4 seminars. Prerequisites: upper-division course in control-systems and EGR 540, or consent of instructor. Unconditional standing required.

**EGR 685 Advanced Computer Organization (4)**

Array processing. Multiprocessor architecture programming and control. Data flow computers and introduction to artificial neural networks. 4 lectures/problem-solving. Prerequisite: EGR 585. Unconditional standing required.

**EGR 691 Directed Study (1-4)**

Case study or investigation of selected engineering problems under the direction of a graduate faculty member. May be repeated as needed for a maximum of 6 units. Students must register through the Engineering Graduate Studies Office. The study should be in the student's emphasis area and should conclude with a written report. May be combined with EGR 692. Unconditional standing required.

**EGR 692 Independent Study with Comprehensive Examination (2)**

Study, research, or readings (not leading to a thesis) proposed by the student with the consultation and approval, and under the supervision of, a graduate faculty member. The student must pre-register through the Engineering Graduate Studies Office during the quarter prior to taking the course. The study should be in the student's emphasis area, and should conclude with a report and an exam conducted by a committee of faculty members. Advancement to Candidacy required.

**EGR 696 Master's Degree Thesis (2)**

Independent investigation intended to be an extension of an existing body of knowledge into an area not thoroughly investigated before, directed by a committee of graduate faculty members, and resulting in a published thesis. Must be repeated as appropriate. Students must register through the Engineering Graduate Studies Office. Credit assigned upon successful completion of entire thesis and approval of the committee. Total credit, 4, 6 or 8 units. Advancement to Candidacy required.

**EGR 699 Master's Degree Continuation (0)**

Registration or an approved leave of absence is required for any quarter following the final assignment of the grade "SP" until the completion of thesis, project or comprehensive examination. The candidate must be enrolled in the university during the quarter in which he/she graduates. Advancement to Candidacy required.



## ENGLISH

### Master of Arts in English

In the Department of English and Foreign Languages, College of Letters, Arts, and Social Sciences

Liliane Fucaloro, Donald Kraemer, Harold Levitt, Victor Okada,  
Executive Committee  
Donald J. Kraemer, Jr., Graduate Coordinator

The program leading to the Master of Arts in English features a broad-based curriculum that offers three concentrations: (1) Literature; (2) Rhetoric/Composition; and (3) Teaching English as a Second Language. Within a 45 (or 49) quarter-unit degree requirement, students, working with their advisors, tailor their course of study to their own interests and needs. The primary objective of the Literature concentration is to deepen the student's understanding of literary texts through close analysis and through related readings in theory and culture. It also provides useful preparation for the teaching of literature in high school and community college, as well as for entry into a doctoral program. The Rhetoric and Composition concentration offers training for graduate students in the teaching of writing at all levels of the educational system. The concentration in Teaching of English as a Second Language provides refined technical expertise in this discipline, enabling the student to perform valuable service in school and community upon completion of the degree program. The English M.A. program prepares students to become English teachers in high schools and community colleges or to proceed directly to doctoral studies; it offers the opportunity for students to engage in sustained pursuit of advanced study within the discipline of English.

### ADMISSION TO THE PROGRAM

In order to be admitted as an unconditional student in the Master of Arts program in English, the applicant must have successfully completed an undergraduate program of study in all major periods of English and American literature, as well as in critical theory and in the English language. Deficiencies in any of these areas will be made up by course work; at the discretion of the chair of the departmental graduate committee, a portion of such work may count toward the 45 (or 49) units required for the degree. The student's grade point average in the upper-division English courses of his/her undergraduate program must be at least 3.0 (B). A student who does not meet these requirements may request special consideration for admission as a conditional student. Removal of conditional status will require the completion of at least 12 quarter units of graduate work in English, in residence, with an average of B (3.0). No grade below C (2.0) will be accepted.

### REQUIREMENTS AND CURRICULUM

#### 1. Advancement to Candidacy

Admission to the program does not admit a student to candidacy for a degree. Advancement to Candidacy is granted, with the recommendation of the graduate faculty, when the student has completed all preparatory course work. Advancement to Candidacy is a prerequisite for the culminating experience of the comprehensive examination or thesis.

The Graduation Writing Test (GWT) must have been passed prior to Advancement to Candidacy. If the GWT is not taken the quarter following the completion of 8 units in the English M.S. program, a hold will be placed on the student's registration.

#### 2. Course Work

A grade point average of 3.0 (B) or better must be maintained in all upper-division undergraduate and all graduate courses.

No more than 13 units of acceptable graduate credit may be transferred from another graduate institution. No more than 13 units taken through Extended University may be used on a contract. No more than 13 units of acceptable graduate credit may be petitioned by an undergraduate student.

A total limit of 13 transfer, Extended University units petitioned for graduate credit may be included on a master's contract. The stipulated time limit of 7 years applies to all of the above.

The candidate must be enrolled in the university during the quarter of graduation.

The student will complete 45 (or 49 if Literature is primary and TESL is secondary) units as follows:

### I. REQUIRED COURSES FOR ALL CONCENTRATIONS (5-8 UNITS)

Introduction to Graduate Research . . . . .	ENG	500	(4)
Master's Degree Thesis . . . . .	ENG	696	(4)
or Comprehensive Examination . . . . .	ENG	697	(1)

Total . . . . . (5-8)

### II. REQUIRED COURSES WITHIN CONCENTRATIONS (16-24 UNITS)

Three concentrations available:

- 1) Literature (20 units if primary concentration, 16 if secondary)
- 2) Rhetoric and Composition (16 units)
- 3) Teaching of English as a Second Language (24 units)

#### Literature Concentration (16-20 units)

The student must choose two of the following three sequences (16 units). In sequences A and B, study is to be continuous by chronological period (e.g., ENG 551a/ENG 552a, NOT ENG 551a/ENG 552c).

A. Studies in English Literature . . . . .	ENG	551, 552	(4,4)
a. to 1500			
b. 1500-1660			
c. 1660-1800			
d. 19th Century			
e. 20th Century			
B. Studies in American Literature . . . . .	ENG	561, 562	(4,4)
a. to 1800			
b. 19th Century			
c. 20th Century			
C. Studies in World Literature . . . . .	ENG	541,542	(4,4)

One course selected from either of the following groups (4 units):

D. Studies in Fiction . . . . .	ENG	571,572	(4,4)
Studies in Drama . . . . .	ENG	573,574	(4,4)
Studies in Poetry . . . . .	ENG	575,576	(4,4)
E. Teaching ESL Composition . . . . .	ENG	525	(4)
Teaching High School Composition . . . . .	ENG	586	(4)
Teaching Basic Writing . . . . .	ENG	587	(4)
Teaching College Freshman Composition . . . . .	ENG	588	(4)

**Rhetoric and Composition Concentration (16 units)**

Three courses (12 units) selected from the following:

History of Rhetoric . . . . .	ENG	581	(4)
Rhetoric and Poetics . . . . .	ENG	582	(4)
Composition Theory . . . . .	ENG	583	(4)
Theory and Practice of Modern Rhetoric . . . . .	ENG	584	(4)
Special Topics in Rhetoric and Composition . . . . .	ENG	585	(4)
Pedagogies of Reading . . . . .	ENG	589	(4)

One course selected from the following (4 units):

Teaching High School Composition . . . . .	ENG	586	(4)
Teaching Basic Writing . . . . .	ENG	587	(4)
Teaching College Freshman Composition . . . . .	ENG	588	(4)

**Teaching English as a Second Language Concentration (24 units)**

Introduction to Teaching English as a

Second Language . . . . .	ENG	521	(4)
Second Language Acquisition . . . . .	ENG	522	(4)
Grammar for Teachers of ESL . . . . .	ENG	523	(4)
Principles of Accent Reduction in TESL . . . . .	ENG	524	(4)
Teaching ESL Composition . . . . .	ENG	525	(4)
Practicum in TESL . . . . .	ENG	526/526A(3/1)	

**III. ELECTIVE COURSES (13-24 units)**

(Contingent upon choice of concentration[s] and/or thesis)

These may include electives listed under any of the concentrations above, and any of the following:

Ethnic Literatures of the United States . . . . .	ENG	531,532	(4,4)
Special Topics . . . . .	ENG	550	(4)
Contemporary Literary Theory . . . . .	ENG	570	(4)
The Contemporary American Novel . . . . .	ENG	577	(4)
Pedagogies of Dramatic Literature . . . . .	ENG	590	(4)
Directed Study . . . . .	ENG	691	1-4
Teaching Associate Practicum . . . . .	ENG	692	1

In consultation with their advisor, students may take a maximum of 8 upper-division or graduate units in fields related to English—chiefly philosophy, history, drama, communication arts, history of art, and teacher preparation.

**GRADUATE COURSE DESCRIPTIONS****ENG 500 Introduction to Graduate Research (4)**

Principles and techniques used in scholarly and critical writing; bibliographical sources and methods, including on-line research. Emphasis may be placed in specialized subjects, such as literature period or genre, rhetoric and composition, teaching English as a Second Language, etc. 4 seminars.

**ENG 521 Introduction to Teaching English as a Second Language (4)**

Overview of TESL terminology, historical perspectives, methodologies, socio-political aspects of language and language-teaching profession, and TESL research tools, including elements of qualitative and quantitative design. Readings, discussions, computer applications, and research. 4 seminars.

**ENG 522 Second Language Acquisition (4)**

Survey of the current research and literature on second-language acquisition. Attention will be given to research methodology in second-language acquisition and to current theories in SLA. 4 seminars.

**ENG 523 Grammar for Teachers of English as a Second Language (4)**

Survey of aspects of English grammar most troublesome for non-native speakers of English. 4 seminars.

**ENG 524 Principles of Accent Reduction in Teaching English as a Second Language (4)**

Features of the English sound system that are important in achieving accurate pronunciation. Emphasis on consonant and vowel articulation, intonation, stress, consonant clusters, contextual alterations, and speech rhythm. 4 seminars.

**ENG 525 Teaching ESL Composition (4)**

Topics in pedagogical and theoretical perspectives. Methods for helping non-native, English-speaking students master the requirements of basic and academic written English. Strategies for integrating recent research on second-language composing into a course or curriculum in ESL composition. 4 seminars.

**ENG 526, 526A Practicum in Teaching English as a Second Language (3) (1)**

Emphasis on curriculum analysis, textbook and material selection, lesson preparation, and classroom teaching practice. TESL program administration also considered. 3 seminars; 1 two-hour activity. Prerequisite: ENG 592.

**ENG 531, 532 Ethnic Literatures of the United States (4) (4)**

Selected authors and topics. In the first quarter, extensive reading and comparative analysis. In the second, selected authors and topics in one of the following: (A) African-American Literature, (B) Asian-American Literature, (C) Mexican-American Literature, (D) Native-American Literature. ENG 532 may be repeated with different content for up to 12 units of credit. 4 seminars.

**ENG 541, 542 Studies in World Literature (4) (4)**

Selected authors and topics in world literature, including major works and movements in the European and non-European traditions. In the first quarter, extensive reading. In the second, intensive study of individual authors, genres, movements, or topics included in the first quarter. ENG 542 may be repeated with different content for up to 12 units. 4 seminars.

**ENG 550 Special Topics (4)**

Topics in advanced areas of language or literature. May be repeated for a total of 12 units. 4 seminars. Prerequisite: consent of instructor.

**ENG 551, 552 Studies in English Literature (4) (4)**

Selected authors and topics in one of the following periods: (A) to 1500, (B) 1500-1660, (C) 1660-1800, (D) 19th century, (E) 20th century. In the first quarter, extensive reading. In the second, intensive study of individual authors or topics included in the first quarter. Substantial paper at the end of each quarter. Enrollment in the second quarter by consent of the instructor. May be repeated with different content for up to 12 units each. 4 seminars.

**ENG 561, 562 Studies in American Literature (4) (4)**

Selected authors and topics in one of the following: (A) to 1800, (B) 19th century, (C) 20th century. In the first quarter, extensive reading. In the second, intensive study of individual authors or topics included in the first quarter. Substantial paper at the end of each quarter. Enrollment in the second quarter by consent of the instructor. May be repeated with different content for up to 12 units each. 4 seminars.

**ENG 570 Contemporary Literary Theory (4)**

Important ideas in contemporary theory, focusing on such theorists as Bakhtin, Barthes, Derrida, Kristeva, Lacan, Fish, Lukacs, de Lauretis. 4 seminars.

**ENG 571, 572 Studies in Fiction (4) (4)**

Selected authors and topics. In the first quarter, extensive reading. In the second, intensive study of individual authors or topics included in the first quarter. Substantial paper at the end of each quarter. 4 seminars.

**ENG 573, 574 Studies in Drama (4) (4)**

Selected authors and topics. In the first quarter, extensive reading. In the second, intensive study of individual authors or topics included in the first quarter. Substantial paper at the end of each quarter. 4 seminars.

**ENG 575, 576 Studies in Poetry (4) (4)**

Selected authors and topics. In the first quarter, extensive reading. In the second, intensive study of individual authors or topics included in the first quarter. Substantial paper at the end of each quarter. 4 seminars.

**ENG 577 The Contemporary American Novel (4)**

Structure and theme in the American novel since 1945. Such writers as Bellow, Malamud, Morrison, Updike, Walker, Erdrich. 4 seminars.

**ENG 581 History of Rhetoric (4)**

History of rhetoric from pre-classical times through the 18th century; the interplay of theory and practice in this history. 4 seminars.

**ENG 582 Rhetoric and Poetics (4)**

Examination of converging theories and practices focused on the rhetorical nature of literature and literary study; emphasis on providing future rhetoricians and teachers with a coherent understanding of the relations between rhetorical and literary disciplines. 4 seminars.

**ENG 583 Composition Theory (4)**

Major theories of the composing process and analysis of the research on which they are based. 4 seminars.

**ENG 584 Theory and Practice of Modern Rhetoric (4)**

Readings in rhetorical theory since the 18th century, with reference to its relevance in public written discourse and composition pedagogy. 4 seminars.

**ENG 585 Special Topics in Rhetoric and Composition (4)**

Intensive study of a topic or figure of special interest to advanced students. May be repeated for credit with a different content. 4 seminars.

**ENG 586 Teaching High School Composition (4)**

Topics in pedagogical and theoretical perspectives. Methods for helping students to master the writing process. Strategies for integrating recent research on composing into a course or curriculum in composition. 4 seminars.

**ENG 587 Teaching Basic Writing (4)**

Topics in pedagogical and theoretical perspectives. Methods for helping basic writing students to master the writing process. Strategies for integrating recent research on composing into a course or curriculum in composition in basic writing. 4 seminars.

**ENG 588 Teaching Freshman Composition (4)**

Topics in pedagogical and theoretical perspectives. Methods for helping students to master the writing process. Strategies for integrating recent research on composing into a course or curriculum in composition. 4 seminars.

**ENG 589 Pedagogies of Reading (4)**

Developmental, historical, and theoretical approaches to reading. 4 seminars. Prerequisite: consent of instructor.

**ENG 590 Pedagogies of Dramatic Literature (4)**

Theory, research, and practice in using performance approaches for teaching plays to students at high school and college levels. These techniques will be presented in combination with the use of writing for discovery. 4 seminars.

**ENG 691 Directed Study (1-4)**

Independent investigation of selected topics in English under the direction of a graduate faculty member. Students must register through the office of the graduate coordinator in English. Unconditional standing required.

**ENG 692 Teaching Associate Practicum (1)**

Practicum for Teaching Associates. Readings, discussions, supervised classroom teaching. Prerequisite: Teaching Associate appointment, unconditional standing required. 1 seminar/discussion. May be repeated twice.

**ENG 696 Master's Degree Thesis (4)**

An analytical study, using critical sources and/or literary theory, on a topic chosen by the student in consultation with the graduate coordinator in English. The student undertakes this study, under the direction of a thesis committee, as the culminating project of the graduate program. Advancement to Candidacy required.

**ENG 697 Comprehensive Examination (1) (Credit/No Credit)**

An examination on areas of special concentration in English as determined by the student in consultation with the graduate coordinator in English and other graduate faculty. May be taken no more than two times. Failure to complete exam satisfactorily the second time will result in termination from the program. Students must register through the office of the graduate coordinator in English. Advancement to Candidacy required.

**ENG 699 Master's Degree Continuation (0)**

Registration or an approved leave of absence is required for any quarter following the final assignment of the grade "SP" until the completion of the thesis or comprehensive examination. The candidate must be enrolled in the university during the quarter in which she/he graduates. Advancement to Candidacy required.

# HISTORY

## Master of Arts in History

In the Department of History, College of Letters, Arts and Social Sciences

Mahmood Ibrahim, Chair

The Master of Arts in History is designed for K-12 teachers who would like to pursue professional development, as well as for those who wish to prepare themselves for the Ph.D. degree or to teach at the community college level. The Department is currently made up of thirteen award winning, full time, tenure track faculty. All hold the Ph.D. degree and are recognized scholars in their field. The Department offers courses in the histories of Africa, Asia, Europe, Latin America, Middle East, and the United States as well as world history and historiography. Faculty specialties and interests include topics and civilizations as ancient as China or Sumeria and as recent as science and technology or current U. S. foreign policy.

### ADMISSION TO THE PROGRAM

1. The applicant must hold a B.A. degree in either history or in one of the social sciences, humanities, or fine arts disciplines from an accredited college or university.
2. The applicant must have achieved a grade point average of at least 3.00 in history, social science, fine arts, and humanities course work.
3. The applicant must submit an essay with the application explaining why he/she wishes to pursue a graduate degree and describing his/her post-baccalaureate work experience and plans for the future.
4. The applicant must submit three letters of recommendation from professors, supervisors (in the case of K-12 teachers, their principal and two colleagues).
5. The applicant must receive a positive recommendation from the Department of History Director of the Graduate Program and the Department of History Graduate Committee.

Conditional admission is granted to applicants in cases where criteria (1) and (2) are not satisfied. The applicant then may demonstrate an aptitude for graduate study either by submitting test scores of the Graduate Record Examination (GRE), including the achievement test in history, or by submitting letters of recommendation and other relevant documents indicating that preparation for graduate study in history was achieved in other ways.

### REQUIREMENTS FOR GRADUATION

- Students must satisfy all admission requirements.
- Students must maintain a GPA (grade point average) of 3.00 or better.
- Students must file a program of study indicating an option for either a thesis or a comprehensive exam (Full-time students must file after the end of the 2nd quarter; Part-time students after completing 24 units).

### CURRICULUM

#### Required Courses

25 units of 500- or 600-level courses . . . . . (25)  
 20 units of 300- and 400-level courses . . . . . (20)

(12 units in History, 8 units in social science or humanities. Teachers and potential teachers are encouraged to enroll in GED 550, GED 650, and/or GED 690).

Total units of course work . . . . . (45)  
 Includes an option of either Comprehensive Examinations or a Masters Thesis.

### GRADUATE COURSE DESCRIPTIONS

#### HST 501 Advanced Methods (4)

Advanced historical research methods, including use of electronic databases and internet resources. Interpretation and contextualization of primary source materials as well as annotation of secondary sources. Term papers, in-class presentations, and panels. 4 seminars. Required for all graduate students in History who did not take the equivalent of Cal Poly Pomona's HST 300.

#### HST 510 Teaching History (4)

Investigation and evaluation of teaching and assessment methods in high school or college classrooms. Includes internship or mentoring experience in teaching and classroom preparation. Prerequisite: graduate standing.

#### HST 540 Readings in Ancient World History (4)

In-depth study and analysis of common themes, issues, and documents in ancient civilizations. 4 seminars. Prerequisite: HST 501 or equivalent, or permission of instructor.

#### HST 541 Readings in the Middle Period of World History (4)

In-depth study and analysis of common themes, issues, and documents in medieval world civilizations. 4 seminars. Prerequisite: HST 501 or equivalent, or permission of instructor.

#### HST 542 Readings in Modern World History (4)

In-depth study and analysis of common themes, issues, and documents in modern world civilizations. 4 seminars. Prerequisite: HST 501 or equivalent, or permission of instructor.

#### HST 560 Readings in U. S. History (4)

In-depth study and analysis of common themes, issues, and documents in U. S. history from Colonial times to present. 4 seminars. Prerequisite: HST 501 or equivalent, or permission of instructor.

#### HST 570 Contemporary Historiography (4)

Close reading and analysis of recent trends in historiography— feminist and gender theory, cultural studies, post-colonial studies, narratology, and post-modern and post-structuralist approaches to history. 4 seminars. Prerequisite: HST 501 or equivalent, or permission of instructor.

#### HST 600 Independent Study (2)

Independent study of a particular subject under faculty supervision. May be repeated two times for credit.

#### HST 650 Seminar in Theories of World History (4)

Analysis of theories of universal, comparative, and world history, especially the "world systems" theories of Braudel, Wallerstein, Abu-Lughud, Gunder Frank and their critics. Alternative approaches to the problem of world history. 4 seminars. Prerequisite: HST 501 or equivalent, or permission of instructor.

**HST 691 Seminar in History Topics (4)**

Focus on selected areas of current interest (World or U. S., depending on instructor). 4 seminars. Prerequisite: HST 501 or equivalent, or permission of instructor.

**HST 696 Master's Thesis (5)**

Research and writing the MA thesis under faculty supervision. Directed research.

**HST 697 Comprehensive Exam Preparation (1)**

Individual study for the comprehensive examination. May be repeated two times for credit.

## KINESIOLOGY AND HEALTH PROMOTION

### Master of Science in Kinesiology

In the Department of Kinesiology and Health Promotion, College of Letters, Arts, and Social Sciences

Priscilla F. Stromer, Chair

Wanda J. Rainbolt, Graduate Coordinator

Stanley Bassin

W. Turi Braun

Kristine Brown

G. S. Don Morris

Leo H. Teghtmeyer

The Master of Science in Kinesiology is planned to provide the student with an opportunity to improve professional competencies within a chosen area of specialization. Experiences will be provided to enhance the analytical and critical tools for research and decision-making. The student will be provided with a frame of reference that will aid in understanding today's problems in the profession.

A candidate for the Master of Science in Kinesiology will be required to choose among four areas of specialization: Adapted Physical Education; Curriculum and Instruction; Exercise Physiology; Socio-Psychological Aspects of Sport and Play/Sport History.

The Adapted Physical Education Specialization is directed toward those interested in working with persons with special needs. It combines practical experience with theoretical knowledge of individuals with disabilities. Students in this specialization must complete either a thesis or a comprehensive examination.

The Curriculum and Instruction Specialization focuses on methodology, curriculum development, preparation for college teaching, and evaluation with practical implementation. Students in this specialization must complete either a thesis or a comprehensive examination.

The Exercise Physiology Specialization offers a varied theoretical base including the influence of physical activity on public health issues along with clinical experience in the assessment of human performance. Objectives of the program include the preparation of students for research positions and advanced graduate programs or for careers in the exercise science area such as health fitness specialists and counselors. Students in this specialization must complete a thesis.

The Socio-Psychological Aspects of Sport and Play/Sport History Specialization is directed toward two diverse populations. Socio-Psychological Aspects of Sport and Play prepares the student in either sociology or psychology of sport and is scientifically grounded in the social and behavioral sciences. Sport History emphasizes the social and cultural forces which influenced and shaped sport and games throughout history. It utilizes the past to develop an understanding of today's sport and physical education. These two areas aim toward either a practical coaching career or future graduate study. Students in this specialization must complete either a thesis or a comprehensive examination.

All KHP graduate students, regardless of their specialization, have the opportunity to select elective courses from within the department as well as from other graduate programs within the university.

The Sports Nutrition option, an interdisciplinary program, is offered jointly by the Departments of Kinesiology and Health Promotion and Food, Nutrition and Consumer Sciences. Refer to "Sports Nutrition Option."

### ADMISSION TO THE PROGRAM

An applicant for admission to this program must have received a baccalaureate degree in physical education or a related discipline from an accredited institution. A student with a baccalaureate degree in a major other than physical education may be admitted subject to review of the student's academic background, performance and interests by the Graduate Coordinator.

An undergraduate grade point average of 3.0 or better, or an undergraduate grade point average of 2.5 or better with a 3.0 grade point average in all upper division work, is required for admission. An applicant not meeting these admission criteria will be reviewed by the KHP Graduate Coordinator. If the Coordinator approves, the applicant will be admitted conditionally.

The conditions, including the time allowed for meeting them, will be stated in writing at the time the applicant is admitted to the university. One condition will be completion of KIN 590, Research Methods, with a grade of B or better.

Each graduate student will select an advisor from the KHP graduate faculty. This should be based upon the student's area of specialization and the thesis topic so that the advisor's expertise will coincide with the student's academic emphasis. The student, with an advisor, will develop a program based on the individual's interests and preparation. This program (also referred to as a "contract") will include required core courses, area of specialization courses, and appropriate elective courses. All programs will be reviewed and approved by the student's advisor, the Graduate Coordinator, and the Graduate Studies Analyst.

### REQUIREMENTS

1. The degree program must include a minimum of 45 quarter units. No more than 18 units may be in approved upper-division courses. An overall 3.0 grade point average in all graduate work attempted is required. Six units of required core courses and 9-11 units in an area of specialization must be included.
2. Students must take a minimum of 6 units outside their chosen area of specialization and still in the KHP Department.
3. No more than 13 units of acceptable graduate credit may be transferred from another institution. No more than 13 units taken through Extended University may be used on a contract. No more than 13 units of acceptable graduate credit may be petitioned by an undergraduate student. A total of not more than 13 transfer, Extended University, or units petitioned for graduate credit may be included in a master's contract. The stipulated time limit of 7 years applies to all of the above.
4. Advancement to Candidacy is granted upon the recommendation of the graduate coordinator and implies a readiness of the candidate to fulfill the terminal requirement of either a thesis or a comprehensive examination. The Graduation Writing Test (GWT) must have been passed prior to Advancement to Candidacy.
5. The student shall indicate at the time of filing the program the decision as to the manner of fulfilling the terminal requirement. The candidate who chooses to write a thesis must enroll for 9 units of thesis credit. Prior to beginning the collection of data, the candidate must make a formal presentation of the thesis proposal to the thesis committee and receive its approval. Upon completion of the thesis, the candidate must make an oral presentation of the thesis to the KHP graduate faculty. The candidate adopting the option of a comprehensive examination will be tested on material from the core and specialization areas.

6. The candidate must be enrolled in the university during the quarter of graduation.

### CURRICULUM

#### REQUIRED COURSES

Philosophical Bases of Sport and Physical Education . . . . .	KIN	510	(3)
Research Methods . . . . .	KIN	590	(3)

#### Option I:

Research Design . . . . .	KIN	591	(3)
Master's Degree Thesis . . . . .	KIN	696	(9)

#### Option II:

Comprehensive Examination . . . . .	KIN	697	(1)
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### SPECIALIZATION AREAS

#### Adapted Physical Education

Management of Adapted Physical Education Programs . . . . .	KIN	570	(3)
Motor Practicum for Individuals with Disabilities . . . . .	KIN	575/575A(2/1)	
Issues in Adapted Physical Education . . . . .	KIN	670	(3)

#### Curriculum and Instruction

Curriculum Development in Physical Education . . . . .	KIN	553	(3)
Evaluating Teacher Effectiveness in Physical Education . . . . .	KIN	555	(3)
Contemporary Approaches to Physical Education Instruction . . . . .	KIN	559	(3)

#### Exercise Physiology

Sports Medicine . . . . .	KIN	455	(4)
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Advanced Physiology of Exercise . . . . .	KIN 683/683L	(3/1)
Advanced Concepts in Exercise Testing and Counseling . . . . .	KIN 684	(3)
<b>Socio-Psychological Aspects of Sport and Play/Sport History</b>		
Select three of the following courses:		
Sociology of Sport and Physical Education . . . . .	KIN 540	(3)
Sport History . . . . .	KIN 543	(3)
International Physical Education and Sport . . . . .	KIN 545	(3)
Sport Psychology . . . . .	KIN 548	(3)

**ELECTIVES**

Elective courses to complete the required minimum of 45 units must be selected. Electives must have approval of the student's advisor.

A list of electives, which includes upper-division and graduate courses in related disciplines is available from the department's Graduate Coordinator.

**GRADUATE COURSE DESCRIPTIONS****KIN 510 Philosophical Bases of Sport and Physical Education (3)**

The development of the philosophies of physical education and the assumptions upon which current professional philosophies rest. 3 lecture discussions.

**KIN 540 Sociology of Sport and Physical Education (3)**

Preparation and presentation of critical reviews of literature in sociology of sport. The topics to be considered are: the impact of sport on industry, economics, and the institutions of politics and education; sport as it affects one's sociocultural development and value system. 3 lecture discussions.

**KIN 543 Sport History (3)**

Development of sport in Western civilization; emphasis on political, religious and social influences and their effect on American sport. 3 lecture discussions. Prerequisite: graduate standing.

**KIN 545 International Physical Education and Sport (3)**

Examination and analysis of similarities and differences of physical activities in developed and developing countries. Cultural, educational, and historical backgrounds of contemporary physical education and sport programs. 3 seminars.

**KIN 548 Sport Psychology (3)**

Personal characteristics of athletes, coaches, and various sports environs in relation to athletic participation, performance, and learning. 3 lecture/ discussions.

**KIN 553 Curriculum Development in Physical Education (3)**

Basic considerations and problems of physical education curricula in secondary schools. 3 lecture discussions.

**KIN 555 Evaluating Teacher Effectiveness in Physical Education (3)**

Strategies and procedures used for evaluating and implementing on-site teacher effectiveness. 3 seminars.

**KIN 559 Contemporary Approaches to Physical Education Instruction (3)**

Strategies for improving instruction, interpersonal-interaction skills, instruments for measuring teaching outcomes and research studies on teacher effectiveness. 3 seminars. Prerequisite: KIN 553 or permission of instructor.

**KIN 570 Management of Adapted Physical Education Programs (3)**

Teacher training approaches, grant writing, research responsibilities, in-service presentations, service delivery in the public schools, advocacy practices and other skills in management needed by the adapted physical education teacher. 3 seminars. Prerequisite: KIN 206 or graduate standing.

**KIN 575/575A Motor Practicum for Individuals with Disabilities (2/1)**

Supervised clinical type experience in APE at selected public and private agencies. May be taken a maximum of 3 times for credit. 2 lectures/problem-solving; 2 hours fieldwork. Concurrent enrollment required. Prerequisite: KIN 206 or graduate standing.

**KIN 580 Advanced Motor Learning and Human Performance (3)**

Preparation and presentation of critical reviews of literature in motor learning. Topics are: kinesthesia, reaction time, strength in neuromotor coordination, motor learning, and transfer factors affecting motor performance. 3 seminars. Prerequisite: KIN 430/430L.

**KIN 583 Advanced Motor Development (3)**

Preparation and presentation of critical reviews dealing with physical growth and motor development throughout life. Changes in anthropometric measurements, rates of growth of various body tissues, organs and segments, and ossification of the skeleton from infancy to adulthood. 3 seminars. Prerequisite: KIN 312/312A.

**KIN 590 Research Methods (3)**

Study the nature of research and the various methods for acquiring information relevant to the profession. 3 lecture discussions.

**KIN 591 Research Design (3)**

Examine the nature and role of applying and interpreting statistical techniques for specific problems related to our professional field. 3 seminars. Prerequisite: KIN 590.

**KIN 670 Issues in Adapted Physical Education (3)**

Study of current trends and issues in adapted physical education as influenced by special education legislation. 3 seminars. Prerequisite: KIN 206 or graduate standing. Unconditional standing required.

**KIN 680 Kinesiological Analysis (3)**

Advanced kinesiological analysis utilizing knowledge of muscle groups and principles of movement and human performance to develop a logical and cohesive understanding of human movement. 3 lecture discussions. Prerequisite: KIN 302. Unconditional standing required.

**KIN 683/683L Advanced Physiology of Exercise (3/1)**

The physiological and biochemical adjustments made by the body during exercise and changes which result from prolonged periods of intensive physical training. 3 seminars, 2 one-hour laboratories. Prerequisite: KIN 303/303L. Unconditional standing required.

**KIN 684 Advanced Concepts in Exercise Testing and Counseling (3)**

Advanced concepts of graded exercise testing (GXT), interpretation, and counseling. GXT preparation, administration, and evaluation. Modes and purposes of GXT, exercise electrocardiography, energy cost calculations, and principles of exercise prescription. Special considerations for select population groups and case study preparation. 3 lectures/problem-solving. Prerequisite: KIN 683/683L. Unconditional standing required.



**KIN 685/FN 685 Nutrition in Sports and Exercise (4)**

Knowledge concerning the role of nutrients in optimizing human performance. Assessment of caloric and nutrient requirements associated with exercise. Special consideration is given to gender specific needs of athletes, nutritional ergogenic aids, and eating disorders. 4 seminars. Prerequisites: KIN 683/683L and FN 533. Unconditional standing required.

**KIN 691 Directed Study (2)**

A thorough investigation and research of a theme or subject selected by the student in consultation with the faculty. The scholarly research should be undertaken by the initiative of the student but with general guidance and advice from the faculty. Maximum credit 4 units. Unconditional standing required.

**KIN 696 Master's Degree Thesis (3)**

Development of a terminal creative research report on a topic selected by the student, approved by the department graduate studies committee and submitted to the faculty as evidence of his/her mastery of the principles of the profession. May be scheduled for a maximum of 9 units. Prerequisite: KIN 591, except Sport History. Advancement to Candidacy required.

**KIN 697 Comprehensive Examination (1)**

Preparation for and completion of the written comprehensive examination. May be taken no more than two times. Failure to complete exam satisfactorily the second time will result in termination from the program. Advancement to Candidacy required.

**KIN 699 Master's Degree Continuation (0)**

Registration or an approved leave of absence is required for any quarter following the final assignment of the grade "SP" until the completion of thesis and final oral examination. The candidate must be enrolled in the university during the quarter in which he/she graduates. Advancement to Candidacy required.

## KINESIOLOGY AND HEALTH PROMOTION

### Master of Science in Agriculture

### Master of Science in Kinesiology

#### Sports Nutrition Option

A joint program in the College of Letters, Arts, and Social Sciences, Department of Kinesiology and Health Promotion, and the College of Agriculture, Department of Food, Nutrition and Consumer Sciences.

Dr. Wanda Rainbolt, Graduate Coordinator, Department of Kinesiology and Health Promotion

Dr. Anahid Crecelius, Graduate Coordinator, Department of Food, Nutrition and Consumer Sciences

The Sports Nutrition graduate study option is an interdisciplinary program offered jointly by the Kinesiology and Health Promotion Department and the Food, Nutrition and Consumer Sciences Department. It is designed for students interested in pursuing graduate work which integrates nutrition science and human performance.

The curriculum has been developed to provide an advanced understanding of nutrition science and exercise physiology and to facilitate the pursuit of a variety of careers in clinical and/or applied settings. The curriculum consists of two parts: a required core area and a restricted electives area. Students can choose courses from the elective area in accordance with their particular interest and goals. Students are expected to meet all of the prerequisites for the core courses.

#### ADMISSION TO THE PROGRAM

An applicant for admission to the program must have received a baccalaureate degree in kinesiology or foods and nutrition or a related discipline from an accredited institution. A student with a baccalaureate degree in a major other than kinesiology or foods and nutrition may be admitted subject to review of the student's performance and academic background by the graduate coordinators of the respective departments. The student must file complete application forms, three letters of recommendation, a statement of purpose, and official transcripts from all colleges and/or universities attended.

#### CURRICULUM

##### REQUIRED CORE (19-21 units required)

Research Methods in Nutrition/Laboratory . . . . .	FN	538/538L	(1/1)
or Research Methods . . . . .	KIN	590	(3)
Statistics for Agriculture . . . . .	ABM	575	(4)
or Research Design . . . . .	KIN	591	(3)
Advanced Nutrition . . . . .	FN	533	(3)
Physiology of Exercise/Laboratory . . . . .	KIN	683/683L	(3/1)
Advanced Exercise Testing and Counseling . . . . .	KIN	684	(3)
Nutrition in Sports and Exercise . . . . .	FN/KIN	685	(4)

##### RESTRICTED ELECTIVES (15-20 units required)

Sports Medicine . . . . .	KIN	455	(4)
Exercise Metabolism and Weight Control . . . . .	KIN	456	(3)
Advanced Nutrition (cellular nutrient metabolism) .FN		433	(4)
Nutritional Assessment Methods/Laboratory . . . . .	FN	435/435L	(1/1)
Advanced Nutrition (hormonal effects on nutrient metabolism) . . . . .	FN	434	(4)
Recent Advances in Nutrient Metabolism . . . . .	FN	535	(3)
(may be repeated for credit)			
Seminar . . . . .	FN	570	(2-4)
Immunology-Serology/Laboratory . . . . .	MIC	415/415L	(3/2)

Hematology . . . . .	MIC	444/444L	(3/1)
Endocrinology . . . . .	BIO	520/520L	(3/1)
Cellular Immunity and Disease . . . . .	BIO	570/570L	(3/1)
Advanced Topics in Biology (as pertinent and with approval) . . . . .	BIO	575	(2)
Bioethics . . . . .	PHL	433	(4)
Theories of Counseling . . . . .	PSY	412	(4)

#### TERMINAL REQUIREMENT

Thesis . . . . .	KIN/FN	696	(6-9)
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Core courses must be completed and student must be Advanced to Candidacy prior to enrolling in thesis.

Total units required . . . . . (45)

#### GRADUATE COURSE DESCRIPTIONS

See Biological Sciences, Philosophy, and Psychology for other course descriptions.

#### KIN 590 Research Methods (3)

Study the nature of research and the various methods for acquiring information relevant to the profession. 3 lecture discussions.

#### FN 538/538L Research Methods in Nutrition (1,1)

Contemporary research techniques and methods used in the field of nutrition. Interpretation of data in relationship to the nutritional status of humans and experimental animals. 1 lecture discussion; 1 three-hour laboratory. Concurrent enrollment required. Prerequisites: FN 433, 435/435L, and ABM 575 or equivalent.

#### KIN 591 Research Design (3)

Examine the nature and role of applying and interpreting statistical techniques for specific problems related to our professional field. 3 seminars. Prerequisite: KIN 590.

#### ABM 575 Statistics for Agriculture (4)

A summary of statistical tools and techniques used in agriculture. Application of computer to selected statistical techniques. 4 lecture discussions.

#### KIN 683/683L Advanced Physiology of Exercise (3/1)

The physiological and biochemical adjustments made by the body during exercise and changes which result from prolonged periods of intensive physical training. 3 seminar/discussion. 1 two-hour laboratory. Prerequisite: KIN 303/303L.

#### KIN 684 Advanced Concepts in Exercise Testing and Counseling (3)

Advanced concepts of graded exercise testing (GXT), interpretation, and counseling. GXT preparation, administration, and evaluation. Modes and purposes of GXT, exercise electrocardiography, energy cost calculation, and principles of exercise prescription. Special considerations for select population groups and case study preparation. 1 three-hour lecture/problem-solving. Prerequisite: KIN 683/683L.

#### KIN 685/FN 685 Nutrition in Sports and Exercise (4)

Knowledge concerning the role of nutrients in optimizing human performance. Assessment of caloric and nutrient requirements associated with exercise. Special consideration is given to gender specific needs of athletes, nutritional ergogenic aids, and eating disorders. 4 seminars. Prerequisites: KIN 683/683L and FN 533.

**KIN 696 Master's Degree Thesis (3)**

Development of a terminal creative research report on a topic selected by the student approved by the department graduate studies committee and submitted to the faculty as evidence of his/her mastery of the principles of the profession. May be repeated for a maximum of 9 units. Prerequisite: KIN 591, except Sport History. Advancement to Candidacy required.

**FN 696 Master's Degree Thesis (3)**

Compilation of data culminating in the summarizing and reporting, in thesis form, of independent supervised research. May be repeated for a maximum of 9 units. Advancement to Candidacy required.

**KIN 699 Master's Degree Continuation (0)**

Registration or an approved leave of absence is required for any quarter following the final assignment of the grade SP until the completion of thesis and final oral examination. The candidate must be enrolled in the university during the quarter in which he/she graduates. Advancement to Candidacy required.

**FN 699 Master's Degree Continuation (0)**

Registration or an approved leave of absence is required for any quarter following the final assignment of the grade "SP" until the completion of thesis and final oral examination. The candidate must be enrolled in the university during the quarter in which he/she graduates. Advancement to Candidacy required.

## LANDSCAPE ARCHITECTURE

### MASTER OF LANDSCAPE ARCHITECTURE

In the Department of Landscape Architecture, College of Environmental Design

Kenneth S. Nakaba, Chair

Landscape Architecture Graduate Studies Committee:

Joan H. Woodward, Chair and Graduate Coordinator

Kyle D. Brown

Joan M. Safford

Jeffrey K. Olson

Mark J. von Wodtke

Philip N. Pregill

The Department of Landscape Architecture welcomes graduate students from a variety of academic disciplines who are concerned with the shaping of our physical environment. Students learn current and advanced methods for establishing strong, well-defined, and mutually life-sustaining and enhancing relationships between people and the land. The curriculum emphasizes case study projects at scales varying from the garden to the region with frequent review, discussion, and seminar sessions.

Students with degrees in non-design disciplines take a series of preparatory courses designed specifically to meet their needs. The preparatory courses, which begin in summer quarter, will normally require four quarters of study before the student proceeds with regular graduate courses. Completion of the degree program requires six quarters in residence for students with bachelor's degrees in landscape architecture or architecture. Students seeking a first professional design degree will have ten quarters in residence for completion of degree requirements.

The Landscape Architecture Department considers its location in southern California to be of special advantage for the study of landscape and environment. The presence of sea coast, mountain and desert terrain as well as one of the major metropolitan centers in North America offers a unique opportunity for professional study. Project sites may range throughout the southern area of California and field trips to a variety of areas and locations throughout the state are a regular aspect of the graduate program. Applicants to the program should anticipate frequent field trips as an essential part of their studies. Students may also participate in programs at the Center for Regenerative Studies, an interdisciplinary laboratory for sustainable living, located on campus.

The objectives of the graduate program encompass both a general professional educational background and advanced specialized study. Upon completion of the degree requirements the graduate should have developed:

1. An advanced level of professional expertise in ecosystematic land planning, that is, in shaping and controlling land in conformance to and in harmony with the processes of natural ecosystems (LA 512/512L, 602/602L, 606/606L).
2. A basic competence in the major skills of landscape architecture and be able to function productively, though probably not yet independently, in professional practice. These skills and the courses in which they are emphasized are: (a) Plants and planting design (LA 540/540L, 541/541L) (b) Landscape construction and technology (LA 531/531L, 532/532L, 565, 632/632L) (c) Project design and site planning (LA 510/510L, 512/512L) (d) Environmental analysis and impact prediction (LA 604/604L, LA 576).
3. An ability to make a creative and original contribution to some particular area of landscape architecture, either theoretical or practical, according to personal interest (LA 601, 692, 695, 696).

4. A comprehension of the literature, history, and theory of landscape architecture sufficient to communicate the concepts of the profession to others and to use as a philosophical basis for individual professional work (acquired primarily through LA 322/322L, LA 423/423L, LA 424/424L, LA 521/521L, LA 552).

### ADMISSION TO THE PROGRAM

Admission to the Master of Landscape Architecture program requires an undergraduate grade point average of 3.0 (B) or better. An applicant with an average between 2.5 and 3.0 will be considered for admission if other qualifications can be demonstrated.

Admission as an unconditional graduate student requires a professional design degree (such as landscape architecture or architecture). Applicants with degrees in other disciplines are admitted as conditional graduate students. The conditions of admission are described in the section on "Curricular Requirements."

Complete applications must be received by the Graduate Studies Committee by March 1 to be considered for admission the following summer or fall quarter. Applications are accepted from students with degrees in all disciplines. Applicants who have developed skills and knowledge in areas directly applicable in landscape architecture, such as ecology, geography, or fine arts, may be given priority in selection.

### PROGRAM REQUIREMENTS

Admission to the program does not admit a student to candidacy for a degree. Advancement to Candidacy is granted a student upon the recommendation of the graduate faculty and implies a readiness to attempt the project or thesis. Students who are not candidates are not eligible to register for LA 695 or 696.

In order to advance to candidacy for the Master of Landscape Architecture the student must: (1) satisfy all admissions conditions, if any; (2) satisfy the Graduation Writing Test; and (3) with the graduate advisor, develop and file a program of study and have it approved by the Graduate Studies Analyst, and by the graduate coordinator for Landscape Architecture. The curriculum specified in the program may be altered only by written petition, which shall be submitted in accordance with university regulations.

### CURRICULAR REQUIREMENTS

1. A minimum of 72 quarter units of graduate work must be completed in the graduate degree program. Prerequisite courses are in addition to this minimum. Upper division courses in elective and minor emphasis areas must be approved by the student's advisor. A minimum grade point average of 3.0 must be maintained in all courses taken to satisfy degree requirements as well as in all graded course work attempted while in graduate standing at this university.
2. No more than 13 units of acceptable graduate credit may be transferred from another graduate institution. No more than 13 units taken through Extended University may be used on a contract. No more than 13 units of acceptable graduate credit may be petitioned by an undergraduate student. A total limit of 13 transfer, Extended University, or units petitioned for graduate credit may be included on a master's contract. The stipulated time limit of 7 years applies to all of the above.
3. The following courses are required for all graduate students in landscape architecture: LA 512/512L, LA 601, LA 602/602L, LA 604/604L, LA 606/606L (18 units), LA 632/632L, and LA 695 or 696. Students with a degree in landscape architecture have the option of including LA 540/540L to satisfy degree requirements if it is their preference.

4. In addition to the above, the following courses are required for first professional design degree students: one of the following three courses in history: LA 322/322L, LA 423/423L or LA 424; LA 509/509L; LA 510/510L; LA 511/511L; LA 521/521L; LA 531/531L; LA 532/532L; LA 540/540L; and LA 541/541L. Additional courses may be required for students without adequate preparation for graduate study in landscape architecture.
5. Each student must also identify a program elective pattern from the following:
  - A. Design: LA 551, LA 552, LA 553 (required only of first professional design degree students); LA 555, LA 556, and LA 652 (4 units).
  - B. Planning: LA 551, LA 552, LA 553 (required only of first professional design degree students); LA 576, LA 652 (4 units).
  - C. Research/Education: LA 692 (6-12 units).
6. Additional elective content is required to satisfy the minimum unit requirements for the Master of Landscape Architecture degree. Courses may be selected from offerings in the College of Environmental Design as well as other colleges.
7. The candidate must be enrolled in the university during the quarter of graduation.

### CURRICULUM

In consultation with an advisor and in accordance with the above requirements, each student will select courses from the following list and approved electives to complete the requirements for the Master of Landscape Architecture degree.

Foundations of Landscape Design	LA 509/509L	(3/3)
Foundations of Landscape Design	LA 510/510L	(3/3)
Design Graphics	LA 511/511L	(2/2)
Methods and Applications for Landscape Architecture	LA 512/512L	(3/3)
Landscape Awareness	LA 521/521L	(3/1)
Landscape Construction and Design	LA 531/531L	(2/2)
Landscape Construction and Design	LA 532/532L	(2/2)
Plant Ecology and Design	LA 540/540L	(2/3)
Landscape Planting	LA 541/541L	(2/2)
Seminar on the Profession	LA 551	(2)
Seminar on Theory and Literature	LA 552	(2)
Seminar on Professional Directions	LA 553	(2)
Seminar on Human Behavior in the Landscape	LA 555	(2)
Seminar on Human Behavior and Landscape Design	LA 556	(2)
Advanced Information Technology in Landscape Architecture	LA 565/565L	(1/2)
Seminar on Landscape Planning	LA 576	(4)
Design Research	LA 601	(4)
Landscape Design and Natural Processes	LA 602/602L	(3/3)
Environmental Analysis	LA 604/604L	(2/3)
Ecosystematic Landscape Design	LA 606/606L	(3/6)
Landscape Technology	LA 632/632L	(3/3)
Graduate Seminar	LA 652	(2)
Independent Study	LA 692	(1-6)
Master's Degree Project	LA 695	(4)
or Master's Degree Thesis	LA 696	(4)

### GRADUATE COURSE DESCRIPTIONS

#### LA 509/509L Foundations of Landscape Design (3/3)

Principles and techniques of basic design as applied to shaping the landscape. Concepts in visual thinking, introduced and developed by means of studio exercises, and their importance in design concepts. Offered summer quarter only. 3 lecture discussions, 3 three-hour laboratories. Concurrent enrollment required.

#### LA 510/510L Foundations of Landscape Design (3/3)

Principles and techniques of environmental design applied to shaping the landscape; development of landscape design skills. 3 lecture discussions, 3 three-hour laboratories. Concurrent enrollment required.

#### LA 511/511L Design Graphics (2/2)

Techniques of graphic communication for environmental design; freehand sketching, orthogonal drafting; audio-visual presentation applied to the development and presentation of design ideas and proposals. To be taken during summer quarter concurrently with LA 509/509L and LA 521/521L. 2 lecture discussions, 2 three-hour laboratories. Concurrent enrollment required.

#### LA 512/512L Methods and Applications for Landscape Architecture (3/3)

Examination of concerns underlying landscape design and planning and processes for dealing with them at scales from the very small project to the region; emphasis on applied ecology, systems techniques, and environmental policy and management as well as design and planning techniques. 3 lecture discussions, laboratory 9 hours to be arranged. Concurrent enrollment required. Prerequisite: LA 510/510L or degree in design discipline.

#### LA 521/521L Landscape Awareness (3/1)

Sensory exploration of natural and man-made environments in relation to historical and contemporary theory and philosophy of landscape architecture; discussion and analysis of contemporary movements and the various roles of the landscape architect. 3 lecture discussions, 1 three-hour laboratory. Concurrent enrollment required.

#### LA 531/531L, LA 532/532L Landscape Construction and Design (2/2) (2/2)

Basic methods of landscape alteration, augmentation and control including grading, drainage, roads and trails, utilities, and small structures; the uses, limitations, and effects of such alterations. 2 lecture discussions, 2 three-hour laboratories. Concurrent enrollment required.

#### LA 540/540L Plant Ecology and Design (2/3)

Exploration and study of plant associations of southern California and the environmental factors that control these communities as related to planting design theory and application. Identification of native and adapted species; introduction to cultural, functional, and aesthetic criteria in the organization of design associations of plants. 2 lecture discussions, 3 three-hour laboratories. Concurrent enrollment required.

#### LA 541/541L Landscape Planting (2/2)

Selection of plant association for the developed landscape on the basis of culture, utility, and visual character; identification, classification, and use of common plants. 2 lecture discussions, 2 three-hour laboratories. Concurrent enrollment required. Prerequisite: LA 540/540L or

unconditional graduate standing.

#### **LA 551 Seminar on the Profession (2)**

Analysis and discussion of the structure and organization of the profession of landscape architecture; its history and future. Case studies of professional firms and organizations in the Los Angeles region. 1 two-hour seminar.

#### **LA 552 Seminar on Theory and Literature (2)**

Review and analysis of the existing body of literature concerning landscape architecture, relationships between humans and the natural environment, and humans and the designed environment. 1 two-hour seminar.

#### **LA 553 Seminar on Professional Directions (2)**

Analysis and discussion of current and future activities in the profession of landscape architecture; emphasis on individual development and specialization. 1 two-hour seminar. Prerequisite: LA 552.

#### **LA 555 Seminar on Human Behavior in the Landscape (2)**

Analysis and discussion of human behavior in designed environments, methods of observation and recording of behavioral activities. Application of behavioral analysis to design. 1 two-hour seminar.

#### **LA 556 Seminar on Human Behavior and Landscape Design (2)**

Analysis and discussion of design theory and application as a response to human needs and behavior. 1 two-hour seminar/discussion. Prerequisite: LA 555.

#### **LA 565 Advanced Information Technology in Landscape Architecture (1/2)**

Investigation and application of information technology appropriate to practice and research in landscape architecture. Course covers advanced computer applications for design analysis, conceptualization, development, and communication, as well as issues of ethics and information literacy related to information technology and design. Course may be repeated. Maximum credit 6 units. 1 hour lecture, 2 three-hour laboratories.

#### **LA 576 Seminar on Landscape Planning (4)**

Investigation and discussion of political, economic, social and institutional influences on planning decisions and policy formulation with particular concentration on issues related to the natural environment. 1 four-hour seminar.

#### **LA 601 Design Research (4)**

Investigation and discussion of basic research methods; development of design research techniques and skills. 2 two-hour lecture discussions. Prerequisite: LA 512/512L or permission of instructor. Unconditional standing required.

#### **LA 602/602L Landscape Design and Natural Processes (3/3)**

Application of ecosystematic principles and methods to physical problems of landscape design, encompassing a broad and complex range of human and natural considerations. 3 lecture discussions, 3 three-hour laboratories. Concurrent enrollment required. Prerequisite: LA 512/512L. Unconditional standing required.

#### **LA 604/604L Environmental Analysis (2/3)**

Techniques for prediction of alterations in social and natural processes brought about by human use of the land and the application of such

assessments to environmental management. 2 lecture discussions, 3 three-hour laboratories. Concurrent enrollment required. Prerequisites: LA 512/512L, LA 602/602L, and LA 601 or permission of instructor. Unconditional standing required.

#### **LA 606/606L Ecosystematic Landscape Design (3/6)**

Application of the ecosystematic approach to complex large-scale problems of landscape design and natural resource planning. May be repeated. Maximum credit 18 units. 3 lecture discussions, laboratory 18 hours to be arranged. Concurrent enrollment required. Prerequisite: LA 604/604L or permission of instructor. Unconditional standing required.

#### **LA 632/632L Landscape Technology (3/3)**

Application of modern technology to landscape construction involving adaptation of the landscape for human purposes. 3 lecture discussions, 3 three-hour laboratories. Concurrent enrollment required. Prerequisites: LA 512/512L and LA 532/532L or degree in landscape architecture. Unconditional standing required.

#### **LA 652 Graduate Seminar (2)**

Seminar presentations and discussion of work in progress by graduate students. May be repeated. Maximum credit 4 units. 1 two-hour seminar. Unconditional standing required.

#### **LA 692 Independent Study (1-6)**

Independent study and research on a subject chosen by the student with the consultation, approval, and direction of an advisor. Course may be repeated. Maximum credit, 12 units. Unconditional standing required.

#### **LA 694 Thesis/Project Research (1-4)**

Research conducted as part of the preparation for writing a thesis or preparing a graduate project. Open only to unconditional graduate students with the approval of the graduate advisor. Course may be repeated. Maximum credit 4 units. Prerequisites: LA 601 and LA 602. Unconditional standing required.

#### **LA 695 Master's Degree Project (4)**

Development of a terminal creative project designed to demonstrate skills and knowledge achieved in the graduate program. The subject will be selected by the student in consultation with an advisor. Prerequisite: LA 606/606L. Advancement to Candidacy required.

#### **LA 696 Master's Degree Thesis (4)**

Development of a terminal creative research report on a problem in landscape architecture selected by the student and approved by the graduate studies committee. Prerequisite: LA 606/606L. Advancement to Candidacy required.

#### **LA 699 Master's Degree Continuation (0)**

Registration or an approved leave of absence is required for any quarter following the final assignment of the grade "SP" until the completion of thesis or project. The candidate must be enrolled in the university during the quarter in which he/she graduates. Advancement to Candidacy required.

## MATHEMATICS

### MASTER OF SCIENCE IN MATHEMATICS

In the Department of Mathematics, College of Science

Claudia Pinter-Lucke, Chair

Alan Krinik, Coordinator, Graduate Program

There are two programs for the Master of Science in Mathematics. The Pure Mathematics Program is for individuals whose principal interest is in pure mathematics. It is intended for students who are interested in either further graduate study or in attaining the teaching credential for the community college. The Applied Mathematics Program is intended for students who wish to learn the applications of mathematics, in particular with a goal of working in industry. This program is also appropriate for the individual seeking the community college teaching credential.

#### ADMISSION TO THE PROGRAM

An applicant for admission should have completed a baccalaureate degree program in mathematics comparable to that offered at this university or a baccalaureate degree in a related field with at least 20 quarter units of upper-division courses in mathematics. Students whose undergraduate degree is in a field other than mathematics will generally find it necessary to follow a program of additional preparation before undertaking graduate work in mathematics. Applicants for the Pure Mathematics Program must have course work which includes MAT 314, MAT 315, MAT 417, MAT 418 and MAT 428 (or their equivalent). Applicants for the Applied Program must have course work which includes MAT 314, MAT 315, MAT 417 and MAT 428 (or their equivalent). Work experience, as well as undergraduate course work, may be taken into account by the Graduate Committee for credit towards the admission of an applicant.

An upper-division grade point average of at least 3.0 is required for admission as an unconditional graduate student in mathematics. Each applicant will be considered by the departmental graduate committee and recommended for admission on the basis of all evidence applicable to the student's admission. An applicant not meeting the minimum standards of the department may be admitted as a conditional student, if space is available. The student must comply with the conditions of admittance within the time stipulated.

#### Student Program

The student's program will be based upon his/her undergraduate preparation, current interests in mathematics, occupational and professional goals. During the first quarter of residence, each unconditional graduate student will prepare a contract in consultation with the graduate coordinator. This will define all courses and requirements which the student must fulfill to earn the degree. Once approved by the College of Science and verified by the Graduate Studies Office, the study list may be amended only by petition, as outlined in the appropriate sections of this catalog.

#### Advancement to Candidacy

Advancement to candidacy is required of all students who register for MAT 696 (thesis) or 697 (comprehensive exam). In order to advance to candidacy, a student must:

1. Have an overall GPA of at least B (3.0);
2. Satisfy the GWT requirement;
3. Satisfy all requirements stipulated by the graduate coordinator at the time of admission;

4. Have a contract approved by the graduate coordinator and the associate vice president for Academic Programs;
5. Complete at least 6 courses which appear on the student's contract, 4 of which must be at the 500 level; and
6. Have at least a B (3.0) average on contract courses taken.

#### REQUIREMENTS

1. Applied Mathematics Program: At least 45 units of acceptable graduate work must be completed in the master's degree program. At least 33 of these units shall be in courses at the graduate level. A thesis (three units) and directed readings (two units) are required..
2. Pure Mathematics Program: Two alternatives: either a thesis (three units) and directed readings (two units), or a comprehensive exam (one unit) is required. Those students who take the comprehensive exam must complete at least 49 units of acceptable graduate work in the master's degree program. At least 36 of these units shall be in courses at the graduate level. Those students who write a thesis must complete at least 45 units of acceptable graduate work in the master's degree program. At least 33 of these units shall be in courses at the graduate level.
3. No more than 13 units of acceptable graduate credit may be transferred from another graduate institution. No more than 13 units taken through Extended University (400- level only) may be used on a contract. No more than 13 units of acceptable graduate credit may be petitioned by an undergraduate student. A total limit of 13 transfer, Extended University, or units petitioned for graduate credit may be included on a master's contract. The stipulated time limit of 7 years applies to all of the above.
4. A grade-point average of at least 3.0 shall be maintained in all course work taken to satisfy the degree requirements, as well as in all courses taken at Cal Poly Pomona postbaccalaureate which number 300 or more.
5. The candidate must be enrolled in the university during the quarter of graduation.

#### Curriculum for Pure Mathematics

The student is required to complete 6 of the following 7 courses: MAT 511, MAT 512, MAT 517, MAT 518, MAT 521, MAT 528, MAT 529. In addition, either a thesis or comprehensive examination is required.

Electives can be graduate or senior level mathematics courses other than MAT 417, MAT 418, MAT 428, MAT 429, and MAT 400 or MAT 499 by petition.

#### Curriculum for Applied Mathematics

Required courses are MAT 508, 511, 512, 545 and the completion of three sequences from the list: MAT 508 and 509; MAT 545 and 546; MAT 570 and 580; STA 533 and 534; STA 530 and either STA 584 or MAT 540. In addition, the thesis is required. Electives can be graduate or senior level mathematics courses other than MAT 417, 418, and MAT 400 or MAT 499.

#### GRADUATE COURSE DESCRIPTIONS

##### MAT 508 Numerical Linear Algebra (4) W (even years)

Topics will include numerical methods for determinants, systems of linear equations (direct and iterative methods), matrix inversions, eigenvalues, eigenvectors, techniques to minimize error propagation, splittings, rates of convergence of methods. 4 lectures/problem-solving. Prerequisites: "C" or better in MAT 208, MAT 315 and MAT 401 or consent of instructor.

**MAT 509 Error Analysis (4) Sp (even years)**

Topics will include sources of error, types of error, error propagation, techniques for minimizing error, backward error analysis, approximation of functions, error analysis of iterative methods for non-linear equations. 4 lectures/problem-solving. Prerequisites: "C" or better in MAT 401 and 402 or consent of instructor.

**MAT 511, 512 Real Analysis (4) (4) F, W**

Properties of Lebesgue measure and integration, Borel Sets, monotone functions and functions of bounded variation, classical Banach spaces, metric spaces, measure spaces and measurable functions, the Radon-Nikodym theorem, the Fubini theorems, Daniel integrals, applications. 4 lecture discussions. Prerequisite: "C" or better in MAT 315 or consent of instructor.

**MAT 517, 518 Abstract Algebra (4) (4) W, Sp (odd years)**

Groups, Sylow theorems, rings and modules, chain conditions, morphism theorems, principal ideal domains, field extensions and finite fields, Galois theory. 4 lecture discussions. Prerequisite: "C" or better in MAT 418 or consent of instructor.

**MAT 521 Topology (4) F (even years)**

Topological spaces, connectedness, compactness, continuity, separation and countability axioms, metric spaces, product spaces, function spaces and quotient spaces, uniform spaces, paracompactness. 4 lecture discussions. Prerequisite: consent of instructor.

**MAT 528, 529 Complex analysis (4) (4) F (odd years) W (even years)**

General form of Cauchy's theorem, conformal mappings, normal families. Riemann mapping theorem, theorems of Mittag-Leffler and Weierstrass, analytic continuation. Picard's theorem. Selected topics such as Dirichlet's problem, generalization of Picard's theorem, gamma and zeta functions. 4 lecture discussions. Prerequisite: MAT 314 or 428, or consent of instructor.

**MAT 535 History of Mathematics (4)**

Historical development of selected mathematical topics drawn generally from the body of 18th century and later mathematics. Topics to be covered announced by the professor prior to registration. 4 lecture discussions. Prerequisite: consent of instructor.

**MAT 540 Kalman Filter (4) F (odd years)**

Discrete- and continuous-time Kalman Filter. Design, simulation, and implementation; the extended Kalman Filter. Applications to radar, tracking, communication networks, space navigation, social and environmental systems. 4 lectures/problem-solving. Prerequisites: CS 120 or CS 125, MAT 208, MAT 216, STA 330, or STA 326, or consent of instructor.

**MAT 545, 546 Modeling (4) (4) W, Sp (odd years)**

Modeling of deterministic systems and random processes using ordinary and partial differential equations. Fourier methods, general modeling principles and techniques, perturbation theory and sensitivity analysis, applications. 4 lectures/problem-solving. Prerequisite: consent of instructor.

**MAT 550 Seminar in Mathematics (1-4)**

Topics in advanced mathematics chosen according to the interests and needs of the students enrolled. Each seminar will have a subtitle according to the nature of the content. May be repeated for a maximum of 8 units. 1-4 seminars. Prerequisite: consent of instructor.

**MAT 570 Graphs and Network Flows (4) Sp (even years)**

Matching theory in graphs and network flows in capacity-constrained networks. Major topics include the Konig-Egervary Theorem for bipartite graphs and the Maximal Flow Algorithm for networks, along with a wide variety of applications. 4 lectures/problem-solving. Prerequisite: MAT 370 or consent of the instructor.

**MAT 580 Optimization Theory and Applications (4) F (odd years)**

Topics will include convex sets, extrema of functions, convex functions, non-linear convex, quadratic and dynamic programming, applications, primal-dual methods for solving constrained problems, applications to large scale mathematical programming problems. 4 lectures/problem-solving. Prerequisite: "C" or better in MAT 480 or consent of instructor.

**MAT 599/599A/599L Special Topics for Graduate Students (1-4)**

Group study of a selected topic, the title to be specified in advance. Total credit limited to 8 units with a maximum of 4 units per quarter. Lecture/Activity/Laboratory/or combination of these. Prerequisite: consent of Instructor.

**MAT 691 Directed Study (1)**

Individual reading program in an area chosen by the student under the direction and supervision of the faculty. Maximum of 4 units credit. Students must obtain the written permission of the graduate coordinator in order to register for this course. Unconditional standing required.

**MAT 696 Master's Degree Thesis (1)**

Independent research and study under supervision of a faculty advisor. Research results must be reported in an acceptable form. Require 3 units credit for thesis. Students must obtain the written permission of the graduate coordinator in order to register for this course. Advancement to Candidacy required.

**MAT 697 Comprehensive Examination (1) Credit/no Credit**

Preparation for the comprehensive examination. Students must obtain the written permission of the graduate coordinator in order to register for this course. May be taken no more than twice. Failure to complete exam satisfactorily the second time will result in termination from the program. Only applicable with Pure Math option. Advancement to Candidacy required.

**MAT 699 Master's Degree Continuation (0)**

Registration or an approved leave of absence is required for any quarter following the final assignment of the grade SP until the completion of thesis. The candidate must be enrolled in the university during the quarter in which he/she graduates. Students must obtain the written permission of the graduate coordinator in order to register for this course. Advancement to Candidacy required.

**STA 530 Random Processes (4) Sp (odd years)**

Topics will include second order stationary processes, mean and covariance properties, Gaussian processes, Wiener process and white noise, counting and renewal processes. 4 lectures/problem-solving. Prerequisite: "C" or better in STA 330 or STA 326, or consent of instructor.

**STA 533 Linear Statistical Models I (4) W (even years)**

Introduction to general linear models, distribution of quadratic forms, the Gauss-Markov theorem, estimation, testing the general linear hypothesis. Computer package SAS will be used. 4 lectures/problem-solving. Prerequisite: C or better in STA 432 or consent of instructor.



**STA 534 Linear Statistical Models II (4) Sp (even years)**

Fixed and random components models, balanced and unbalanced cases, analysis of covariance, components of variance. Computer package SAS will be used. 4 lectures/problem-solving. Prerequisite: C or better in STA 533 or consent of instructor.

**STA 550 Probability Theory (4) W (odd years)**

Independence, zero-one laws, laws of large numbers, convergence theorems, characteristic functions, and basic limit theorems. Prerequisite: "C", or better, in STA 440, or consent of instructor.

**STA 584 Queueing Theory (4) F (even years)**

Analysis of queueing systems, discrete and continuous time Markov processes, birth and death processes, equilibrium results for single and multiple server queues, method of stages, priority queues. Prerequisites: "C" or better in MAT382 or STA 430, and STA 332 or STA 441, or consent of instructor.

**STA 599/599A/599L Special Topics for Graduate Students (1-4)**

Group study of a selected topic, the title to be specified in advance. Total credit limited to 8 units with a maximum of 4 units per quarter. Lecture/Activity/Laboratory /or combination of these. Prerequisite: consent of Instructor.

# PSYCHOLOGY

## MASTER OF SCIENCE IN PSYCHOLOGY

In the Department of Psychology, College of Letters, Arts, and Social Sciences

Gary A. Cretser, Chair  
 Jeffery Mio, Director, Graduate Program

The purpose of the Master of Science Program in Psychology is to provide students with coursework and the foundation in pre-degree supervised practice in marriage and family therapy (MFT). The program will prepare students for eventual MFT licensure. This, in turn, will prepare them for a variety of counseling jobs, from counselor positions in industrial programs to marriage and family therapy in clinic settings and private practice.

### ADMISSION TO THE PROGRAM

An applicant for admission to this program must hold a bachelor's degree from an accredited college or university and satisfy university and departmental requirements for graduate study. A minimum requirement for admission is a baccalaureate degree in psychology with at least 24 semester or 36 quarter units in upper division psychology. Students with a baccalaureate degree in other fields, but who have strong psychology backgrounds, will also be considered. Applicants should have successfully completed upper division undergraduate psychology courses such as in statistics, experimental, history and systems, abnormal, personality, and psychological testing, and either an upper or lower division course in physiological psychology. Any deficiencies must be made up before the student receives unconditional graduate standing.

Applicants should have an undergraduate minimum grade point average of 3.0 (B) or better in both psychology courses and in their overall GPA. The minimum GPA cutoff may vary somewhat from year to year, depending on the applicant pool.

Applicants will also be required to submit three letters of recommendation, at least one being from a professor familiar with the applicants ability to perform academically at the graduate level, a biographical sketch (2-4 pages), and a statement of purpose. Finalists will be expected to come to campus for an interview with members of the department's Graduate Admissions Committee. These sources of information will be used in evaluating each candidate with respect to character, emotional maturity, and general aptitude for the counseling profession.

### REQUIREMENTS

A minimum of 74 quarter units (two years) is required for the Master of Science degree in Psychology. Coursework will satisfy course requirements for California MFT licensure. Full-time attendance with admission in a fall quarter will allow a student to complete the program in two years. Admission in the winter or spring quarters will necessarily result in part-time status and it will take the student longer to graduate. All courses designated as "First Year Courses" must be completed before practica can be started. Practica only begin in fall quarters and last the entire academic year.

A minimum GPA of 3.0 must be maintained in graduate studies. It is expected that courses will be passed with a minimum grade of 3.00 (B). Grades of less than B- will result in certain consequences: one grade of less than B- will result in automatic probationary status for the student; two grades of less than B- will result in students being subject to disqualification from the program.

Admission to the program does not admit a student to candidacy for the degree. Advancement to Candidacy is granted, upon the recommendation of the psychology faculty, when the student has completed all preparatory coursework prior to the comprehensive examination. In addition, the Graduation Writing Test (GWT) must be passed prior to Advancement to Candidacy. A total limit of 13 transfer and/or Extended University units petitioned for graduate credit may be included on a master's contract if they are within the 7-year time limit.

The candidate must be enrolled in the university during the quarter of graduation.

## PROGRAM FOR THE MASTER OF SCIENCE IN PSYCHOLOGY

### First Year Courses

Research Methods and Statistics . . . . .	PSY	510	(4)
Advanced Topics - Human Development . . . . .	PSY	515	(4)
Introduction to Family and Marital Therapy . . . . .	PSY	545	(4)
Development-Family Life Cycle . . . . .	PSY	550	(4)
Psychopathology I . . . . .	PSY	555	(4)
Psychopathology II . . . . .	PSY	560	(4)
Advanced Testing . . . . .	PSY	565/565L	(4/1)
Ethical Issues in Counseling and Family Therapy . . . . .	PSY	570	(4)
Cross-cultural and Gender Issues in Therapy . . . . .	PSY	575	(4)
Total quarter units, first year. . . . .			(37)

### Second Year Courses

Psychobiology of Mental Disorders . . . . .	PSY	530	(4)
Practicum I . . . . .	PSY	580	(2)
Practicum II . . . . .	PSY	585	(2)
Practicum III . . . . .	PSY	590	(2)
Group Process and Group Therapy . . . . .	PSY	595	(2)
Human Sexuality . . . . .	PSY	598	(4)
Diagnosis and Treatment of the Family/Elder Abuse . . . . .	PSY	605	(4)
Diagnosis and Treatment of Couples/Spousal Abuse . . . . .	PSY	606	(4)
Diagnosis and Treatment of Children/Child Abuse . . . . .	PSY	607	(4)
Special Problems in Treatment: Substance Abuse/Addiction . . . . .	PSY	610	(2)
Supervised Practice . . . . .	PSY	620	(2)
Advanced Supervised Practice I . . . . .	PSY	621	(2)
Advanced Supervised Practice II . . . . .	PSY	622	(2)
Comprehensive Exam . . . . .	PSY	697	(1)
Total quarter units, second year. . . . .			(37)

TOTAL QUARTER UNITS FOR PROGRAM . . . . . (74)

## GRADUATE COURSE DESCRIPTIONS

### PSY 510 Research Methods and Statistics (4)

Review of basic research methods. Systematic examination of advance research methods and statistical procedures. Extensive supervised experience in statistical analysis and in critiquing and redesigning research studies. 4 lectures/problem-solving. Prerequisites: BHS 307, BHS 340, PSY 433 or equivalent and graduate standing.

### PSY 515 Advanced Topics in Human Development (4)

This course focuses on developmental changes in, and interactions between, the physical, cognitive, social and emotional domains throughout the life span. The influence of heredity and environment on development, including cross-cultural influences, will be considered. Psychopathology and its causes throughout the life span will also be highlighted. Prerequisites: Undergraduate course in development, graduate standing or consent of instructor.

**PSY 530 Psychobiology of Mental Disorders**

A neuropsychological overview of effects of brain trauma (stroke, closed head injury, etc.), and a psychobiological overview of the major mental disorders including schizophrenia, the affective disorders, Alzheimer's and developmental disorders such as autism. Introduction to neuropsychological assessment, and to pharmacological therapies. 4 seminars. Prerequisites: PSY 210 or equivalent, PSY 415 or equivalent and graduate standing or consent of instructor.

**PSY 545 Introduction to Family and Marital Therapy (4)**

History and development of family and marital therapy. Introduction to a variety of theoretical approaches with special emphasis on family systems. Exploration of the therapy process and the relationship of therapist's personality to that process. 4 lecture discussions. Prerequisite: Admission to the clinical MS or consent of instructor.

**PSY 550 Development—The Family Life Cycle (4)**

Review of the literature on family life cycle stages and clinical outcomes. Major stages which nuclear, single parent and step families undergo during significant changes in life events and horizontal and transgenerational relationship changes. 4 lecture discussions. Prerequisites: Admission to clinical MS, PSY 545 or consent of instructor.

**PSY 555 Psychopathology I (4)**

Clinical features, diagnosis, prognosis, and suggested etiological explanations of non-psychotic, DSM categories from Axis 1, with special attention given to the familial and interpersonal relationship influences on pathological behavior. 4 lecture discussions. Prerequisites: PSY 403 and PSY 415 or equivalent, admission to clinical MS or consent of instructor.

**PSY 560 Psychopathology II (4)**

Clinical features, diagnosis, prognosis, and suggested etiological explanations of psychotic disorders, nonpsychotic disorders not covered in Psychopathology I, and Axis 2 categories, with special attention given to the familial and interpersonal relationship influences on pathological behavior. 4 lecture discussions. Prerequisites: Admission to clinical MS or consent of instructor, PSY 555.

**PSY 565/565L Advanced Testing (4/1)**

Theory and practice in assessment techniques in clinical practice. Includes use of assessment procedures in diagnosis, outcome evaluation, as an intervention strategy, and in clinical research. 4 lectures/problem-solving, 1 three-hour laboratory. Prerequisites: Admission to clinical MS or consent of instructor, undergraduate testing course.

**PSY 570 Ethical Issues in Counseling and Family Therapy (4)**

Values, ethics, and legal issues in relational therapy. Emphasis on ethical thought and decision-making. Review of professional codes and family, marriage, and divorce laws as they relate to clinical practice. 4 lecture discussions. Prerequisites: Admission to clinical MS or consent of instructor.

**PSY 575 Cross-cultural and Gender Issues in Therapy (4)**

Exploration of gender and race/ethnic relations and their impact on family therapy interventions, on a micro as well as a macro level. Analysis of roles and tasks in families from a multi-cultural and gender perspective. 4 lecture discussions. Prerequisite: Admission to clinical MS or consent of instructor.

**PSY 580 Practicum I (2)**

Introduction to supervised experience in clinical skills required of marital and family therapists. Group supervision through video-taped sessions, and live supervision and case notes, will focus on difficult aspects of case management for the beginning therapist. Prerequisites: Admission to clinical MS program, PSY 545, 515, 555, and 570. Corequisite: PSY 620.

**PSY 585 Practicum II (2)**

Second in a series of group supervision courses. Students' work with marriage and family clients is supervised through faculty and peer discussion of video-taped and live cases. Help-seeking is encouraged for therapy/therapist difficulties. Prerequisite: PSY 580 with B or better. Corequisite: PSY 621.

**PSY 590 Practicum III (2)**

Third in a series. Group supervision of students' therapy sessions with marriage and family clients. Supervision and peer discussion of video-taped and live sessions will be used. Students will present their difficult cases for supervision. Prerequisite: PSY 585 with B or better. Corequisite: PSY 622.

**PSY 595 Group Process and Group Therapy (2)**

First in a sequence of two courses. Examines the techniques and processes of group therapy through readings, discussion and group exploration of various techniques. Experimental group therapy under professional clinical supervision. 2 lectures/problem-solving. Prerequisites: Admission to clinical MS.

**PSY 598 Human Sexuality (4)**

Interdisciplinary considerations (biological, psychological, social) of research and theory related to human sexuality. Prevention and remediation of sexual problems. Clinical case material used to demonstrate dysfunctions and treatment. 4 lecture discussions. Prerequisites: Admission to clinical MS or consent of instructor and BIO 301, PSY 455, PSY 412 or equivalents.

**PSY 605 Diagnosis and Treatment of the Family/Family Violence (4)**

Part of a three-course sequence in Marriage and Family Therapy. Diagnostic assessment of family dysfunctions and therapeutic interventions, covering various approaches. Examination of family violence issues. Student begins to develop a personal orientation to family therapy using a systems approach. 4 lectures/problem-solving. Unconditional standing required.

**PSY 606 Diagnosis and Treatment of Couples (4)**

Part of a three-course sequence of didactic material in Marriage and Family Therapy. The focus is on the diagnostic assessment of couple dysfunctions and therapeutic interventions covering various approaches to working with couples. 4 lectures/problem-solving. Prerequisites: PSY 515 and PSY 598. Unconditional standing required.

**PSY 607 Diagnosis and Treatment of Children/Child Abuse (4)**

Part of a three-course sequence of didactic material in Marriage and Family Therapy. The focus in this course is on the diagnostic assessment of child behavior problems and child abuse and interventions with children and their families. 4 lectures/problem-solving. Prerequisite: PSY 515. Unconditional standing required.

**PSY 610 Special Problems in Treatment: Substance Abuse/Addiction (2)**

Exploration of the theory, research, and clinical treatment of substance abuse and addiction. The medical model of substance abuse treatment will be considered as well as the approach of systemic therapists. 2 lecture discussions. Unconditional standing required.

**PSY 620 Supervised Practice (2)**

Directed and supervised training in psychotherapy in a field placement or on-campus clinic setting. Weekly case presentations and discussions. Student functions with substantial responsibility at this level. Corequisite: PSY 580. Unconditional standing required.

**PSY 621 Advanced Supervised Practice I (2)**

Directed and supervised training in psychotherapy in a field placement or on-campus clinic setting. This continues the format of PSY 620 with steadily increasing student responsibility and autonomy. Weekly case presentations and discussions. Prerequisite: PSY 620 with B or better. Corequisite: PSY 585. Unconditional standing required.

**PSY 622 Advanced Supervised Practice II (2)**

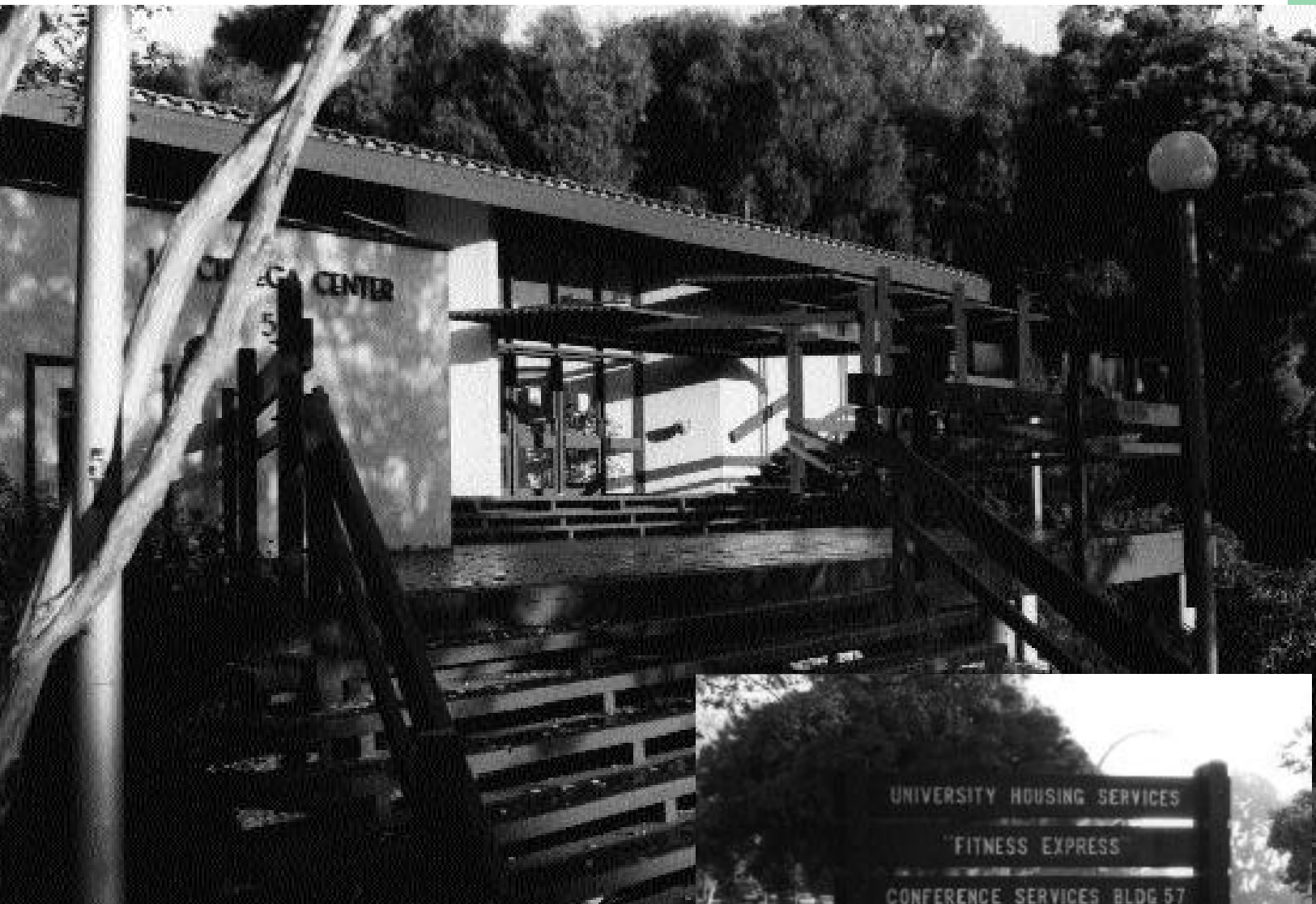
Directed and supervised training in psychotherapy in a field placement or on-campus clinic setting. This continues the format of PSY 621 with steadily increasing student responsibility and autonomy. Weekly case presentations and discussions. Prerequisites: PSY 620 and PSY 621 with B or better. Corequisite: PSY 590. Unconditional standing required.

**PSY 697 Comprehensive Exam (1)**

Students will take an essay examination based on all required coursework. The examination may be taken no more than two times. Failure to complete it satisfactorily the second time results in termination from the program. Advancement to Candidacy required.

**PSY 699 Master's Degree Continuation**

Registration or an approved leave of absence is required for any quarter following the final assignment of the grade "SP" until completion of thesis or project. The candidate must be enrolled in the university during the quarter in which she/he graduates. Advancement to Candidacy required.



## POLITICAL SCIENCE

### MASTER OF PUBLIC ADMINISTRATION

In the Department of Political Science, College of Letters, Arts, and Social Sciences

Sidney G. Silliman, Chair  
David M. Speak, Graduate Coordinator

Sandra M. Emerson  
Maria E. Harris  
Renford R. Reese

Lynda M. Rush  
David M. Speak  
Barbara J. Way

This program is designed to prepare individuals to be successful professionals and managers in the public sector in an era marked by fast-changing technology at a time when government itself is being redefined. The program focuses on the relationships among public agencies, private sector as well as non-profit entities. It is designed to prepare those in allied professions, or in positions with responsibilities related to government, to work more effectively with government.

The goals of the program are to provide students with cutting-edge essential concepts, techniques and skills in understanding public administration, public policy, program evaluation, and information technology, and to make students aware of the ethical, practical and technical concerns of serving the public interest in a democratic society. The MPA program also aims at enhancing the student's understanding of the diverse perspectives that comprise the public interest.

The MPA program provides students with an opportunity to gain in-depth knowledge in the specific areas of public management, public finance and budgeting, human resources management, public policy theories and practices, and public management information technology.

Specific courses from Graduate Business Administration and the Department of Economics will be offered to fulfill MPA curriculum requirements.

### ADMISSION REQUIREMENTS

An applicant for admission to the MPA program must have a bachelor's degree from an accredited college or university and satisfy university requirements for admission to graduate study. Although the bachelor's degree may be in any discipline, the applicant should have met the following graduate program prerequisites:

PLS 314 Public Administration  
PLS 416 Public Organizations  
STA 120 Statistics

In addition, the student must also achieve a score of 2100 or above based on the following formula:

- Graduate Record Examination test score, plus 400 times the applicant's GPA on the last 90 sequential quarter units of course work.

Exceptions to this requirement may be made only after consideration by a three-member department admissions committee. A unanimous vote of the committee is required to grant the exception. Applicants must demonstrate a clear cause for an exception to the department's criteria.

To apply for an exception to the department criteria, an applicant must submit the following documents to the Department of Political Science:

- the applicant's reasons for wanting to pursue the MPA degree,
- an explanation of past academic performance,
- a description of relevant professional work experience,
- and, submission of two letters of recommendation.

Letters of recommendation from prior academic instructors are preferred, although letters of recommendation from persons directly knowledgeable of the applicant's professional work experience will also be accepted.

A TOEFL score of 580 or better is required for admission of international students to the program.

The MPA Graduate Coordinator will notify applicants of their admission or denial.

### PROGRAM REQUIREMENTS

The MPA Graduate Coordinator will serve as advisor to all selected applicants.

Total program units required: 48 units for students with public sector related experience and 52 units for students without public sector related experience.

Specific courses from Graduate Business Administration and the Department of Economics will be offered to fulfill MPA curriculum requirements.

A total limit of 13 transfer, Extended University, and/or units petitioned for graduate credit may be included on a master's contract. The stipulated time limit of 7 years applies to all of the above.

An official degree program of study (contract) will be finalized prior to the completion of the second quarter. It will be approved by the Graduate Coordinator and verified by the Graduate Studies Analyst.

A grade-point average of 3.0 (B) or better must be maintained in all course work taken to satisfy degree requirements and in all graduate-level course work taken at this university.

In order to advance to candidacy for the MPA degree, a student must: (a) achieve unconditional standing; (b) complete at least 12 units of graduate coursework at Cal Poly Pomona with a GPA of 3.0 or better; (c) pass the Graduation Writing Test; and, (d) have an approved program of study (contract) on file.

Continuation in the Master in Public Administration program will occur as stipulated by the University for continuation in graduate studies.

The candidate must be enrolled in the university during the quarter of graduation.

### CURRICULUM

#### CORE COURSES

Public Finance . . . . .	EC	660	(4)
Theories of Public Administration and Democratic Governance . . . . .	MPA	500	(4)
Public Policy Formulation and Evaluation . . . . .	MPA	501	(4)
Public Human Resources: Issues and Management	MPA	503	(4)
Quantitative Methods for Public Sector Issues . . .	MPA	504	(4)
(cross-listed with Project Management, GBA 636 and Directed Study, GBA 637)			
Qualitative Analytic Methods in the Public Sector	MPA	505	(4)

Integration of Theories, Methods and Practices in Public Administration	MPA	600	(4)
Culminating Project	MPA	695	(0)
Or Thesis	MPA	696	(0)
Elective chosen in consultation with advisor			(4)
Total core units			(32)

In addition to the required core courses, students without two full years of employment in a position with public-related responsibilities must complete a 4 unit internship.

Field Work/Internship	MPA	698	(4)
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All students must complete 16 units in a concentration area.

**CONCENTRATION AREAS AND COURSES**

Total units for each concentration area: 16 units.

**PUBLIC MANAGEMENT**

Management Information Systems	GBA	547	(4)
Intergovernmental Relations	MPA	520	(4)

Elective graduate level course with advisor approval. (8)

**PUBLIC FINANCE AND BUDGETING**

Public Fiscal Administration	MPA	530	(4)
Public Sector Revenue Generation: Issues and Practices	MPA	535	(4)

Elective graduate-level course with advisor approval. (8)

**PUBLIC HUMAN RESOURCES**

Public Labor Relations/Management-Union Relations	MPA 540/GBA 617	(4)
Public Organization Training and Development/Organizational Development	MPA 545/GBA 667	(4)

Elective graduate-level course with advisor approval. (8)

**PUBLIC POLICY THEORIES AND PRACTICES**

Public Policy Program Evaluation	MPA	550	(4)
Contemporary Issues in Public Policy	MPA	555	(4)

Elective graduate-level course with advisor approval. (8)

**PUBLIC MANAGEMENT INFORMATION TECHNOLOGY**

Management Information Systems	GBA	547	(4)
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Select two courses from the following:

Information Systems Analysis and Design	GBA	522	(4)
Information Systems Implementation and Programming	GBA	524	(4)
Client/Server Computing	GBA	554	(4)
Computer-Based Data Communications	GBA	557	(4)
Legal Environment of Information Systems	GBA	560	(4)
Security and Privacy of Information Systems	GBA	578	(4)

Elective graduate-level course with advisor approval. (4)

**PUBLIC ADMINISTRATION COURSE DESCRIPTIONS**

**MPA 500 Theories of Public Administration and Democratic Governance (4)**

Socio-economic, political contexts of public administration; role of public administration in the political process; social values, ethics and public interest; characteristics of public bureaucracy, theories and practices; role and responsibility in democratic accountability, governance. 4 hours seminar. Prerequisites: PLS 314 and PLS 416 or equivalents.

**MPA 501 Public Policy Formulation and Implementation (4)**

Public policymaking politics, process and execution in the public, public/private and public/not-for-profit context. Emphasis on policy development, planning, implementation strategies, organizational adaptation and assessing consequences for diverse community interests. 4 hours seminar. Prerequisites: PLS 314, PLS 416 or equivalents.

**MPA 503 Public Human Resources Issues and Management (4)**

Public service concepts, institutions; relationship to executive and legislative functions and issues; adult learning theories, group dynamics; human resource issues including workforce diversity, collaboration, conflict; use of volunteers; assessment methods and instruments. 4 hours seminar. Prerequisites: PLS 314, PLS 416 or equivalents.

**MPA 504 Quantitative Methods for Public Sector Issues (4)**

[Team-taught in collaboration with GBA 636/637 Project Management]

Quantitative methodologies to define, execute, monitor, manage policy, program, projects. Emphasis on problem-solving, actual applications to organizational issues and ethical use of information and analysis in serving diverse community interests. 4 lectures/problem-solving/seminars. MPA prerequisites: STA 120, PLS 314, PLS 416, CIS 101 or equivalents. GBA prerequisites: Microcomputer proficiency and GBA 531.

**MPA 505 Qualitative Analytic Methods in the Public Sector (4)**

Qualitative methodologies to define, execute, monitor, evaluate public policies, programs. Use of theory to address public sector issues, need for collaboration; qualitative techniques; ethical randomization. Emphasis on problem-solving, actual applications; ethical use of information/analysis in serving diverse communities. 4 lectures/problem-solving. Prerequisite: MPA 500.

**MPA 520 Intergovernmental Relations (4)**

Issues explored: governance structures, federalism, intergovernmental grants, local and state relationships, legislative and administrative relationships, legislative intent, oversight and monitoring, intergovernmental decision making, administrative ethics. 4 hours seminar. Prerequisites: Completion of three core courses.

**MPA 530 Public Fiscal Administration (4)**

Examines public agency discretionary decision making, administrative controls, agency coordination, rivalry; intergovernmental relations and budgetary process; emphasis on budgetary reform, planning, process, capital and operating budgets, fiscal management, public accounting procedures; integrated financial management systems. 4 hours seminar. Prerequisites: MPA 500, EC 660 and STA 120.

**MPA 535 Public Sector Revenue Generation: Issues and Practices (4)**

Public sector resource scarcity and demands for innovation, creative revenue/financial management; monitoring financial conditions, revenue trends, market mechanisms, methodological concerns; cost recovery/pricing in non-market environments; bond issues, problems, practices;

balancing risk adverse and risk management strategies. 4 hours seminar. Prerequisites: MPA 500 and EC 660.

#### **MPA 540 Public Labor Relations (4)**

[Team-taught in collaboration with GBA 617 Management-Union Relations]

Evolving interaction--union and management; quality of work life, rapidly changing work culture, participative management, negotiations, arbitration, collective bargaining, conflict resolution. Contemporary role/power of public unions; impact of public policy, case law and executive orders, legislation, political agenda. 4 lecture discussions. MPA prerequisites: MPA 500 and MPA 503.

#### **MPA 545 Public Organization Training & Development (4)**

[Team-taught in collaboration with GBA 667 Organizational Development]

Organizational development, change and innovation, models of organization, structure and design; social values. Context of public organization development; legal structure, political issues, public organization innovation; political and executive leadership characteristics. Faculty team, public administration and business administration will teach this course. 4 lectures/problem-solving. GBA prerequisites: GBA 615 and GBA 616. MPA prerequisites: MPA 500 and MPA 503.

#### **MPA 550 Public Policy Program Evaluation (4)**

Theoretical and practical issues of collaboration, management and support of policy changes; use of systematic design, development, analysis, execution, presentation to policy decision makers, managers and constituencies. Students will partner with public, non-profit or private sector agencies in policy assessments. 4 lectures/problem-solving. Prerequisites: STA 201 or equivalent, MPA 500 and MPA 501.

#### **MPA 555 Contemporary Issues in Public Policy (4)**

Public policy history, successes, failures; policy analyst's role, function; relationship to legislative, executive processes; policy alternatives and options, new models for program development, implementation. 4 hours seminar. Prerequisites: MPA 500 and MPA 501.

#### **MPA 600 Seminar on the Integration of Theories, Methods, and Practices (4)**

Integration of major theoretical, methodological and practical subject matter; use of case studies, examination of reports, practitioner assessment; preparation and administration of field interviews; selection and presentation of project topic or master's thesis proposal. 4 hours seminar. Prerequisites: All core courses should be completed. Unconditional standing required.

#### **MPA 695 Project (4)**

Graduate project integrating theories and methodologies; focus on practical concerns and issues of public and nonpublic agencies, diverse perspectives within a task-oriented framework. Contract with participating agency. Faculty and practitioner supervision. Specialized activity. Prerequisites: MPA 600.

#### **MPA 696 Thesis (4)**

Compilation, evaluation, interpretation, and presentation in thesis form of individual research supervised by faculty advisor. Prerequisites: Completion of all core courses. Specialized activity. Unconditional standing.

#### **MPA 698 Field Work/Internship (4)**

Internship in a public sector context. Work assignment developed in a Department of Political Science, MPA program-agency partnership. Assignment and number of units subject to advisor approval. May enroll

for 2 units per quarter for a total of 4 units. Specialized activity. Prerequisites: MPA 500 and two other core courses.

#### **MPA 699 Project or Thesis Continuation (0)**

Per University requirements, the student should enroll in this course to avoid a break in residence. No credit is given.

### **COURSES IN RELATED DISCIPLINES**

#### **EC 660 Public Finance (4)**

Public policies, principles, and standards of taxation and expenditures, budgeting, public goods, income redistribution, regulation, and development. Examine the equity and efficiency of public policy and assess the fiscal impact. 4 hours seminar. Prerequisite: PLS 314, or equivalent.

#### **GBA 522 Information Systems Analysis and Design (4)**

Introduction to object-oriented analysis and design of computer information systems. The system life cycle and its business environment. Case studies using event analysis, data dictionary, normalization and data modules. Class hierarchies, structures, and collaboration of objects. User/computer interface design. 4 lectures/problem-solving.

#### **GBA 524 Information Systems Development (4)**

Introduction to computer programming. Use of event-driven programming language to develop interactive business information systems. 4 lectures/problem-solving.

#### **GBA 547 Management Information Systems (4)**

Management and development of information systems in modern businesses and the public sector from the customer and the MIS perspective. Information as strategic resource. Acquisition, analysis, integration, presentation of internal and external information. Information management in international and multinational enterprises. Ethical, social impacts. 4 lectures/problem-solving.

#### **GBA 554 Client/Server Computing (4)**

Introduction to client/server computing environments. Relational database concepts, data modeling, and database design. Distributed database and processing techniques. 4 lecture/problem-solving.

#### **GBA 557 Computer-Based Data Communications (4)**

Introduction to the use of computers to support data communications. Information systems design issues related to hardware, software, media, networks and protocols. 4 lectures/problem solving. Prerequisite: GBA 522.

#### **GBA 560 Legal Environment of Information Systems (4)**

Fundamental and intermediate knowledge of the legal environment concerning EDP. Typical legal problems (private and public sector) arising from the acquisition, use and control of EDP. 4 lecture discussions. Prerequisites: GBA 522 and GBA 530 or equivalent experience.

#### **GBA 578 Security and Privacy of Information Systems (4)**

Practical case-study approach to solving security problems peculiar to the commercial and public sector data systems environment. 4 lecture discussions. Prerequisites: CIS 433 and GBA 557 or equivalent experience.

## URBAN AND REGIONAL PLANNING

### Master of Urban and Regional Planning

In the Department of Urban and Regional Planning, College of Environmental Design

Gwendolyn Urey, Chair

Urban and Regional Planning Graduate Studies Committee:  
Felix R. Barreto, Graduate Coordinator

David Bess  
Herschel Farberow  
Charles E. Loggins  
Jerry V. Mitchell

Gail Sansbury  
Ana Maria C. Whitaker  
Richard W. Willson

Professional planners improve the quality of life and the quality of the built and natural environments by developing creative solutions to environmental, transportation, housing, social, economic, and design problems at urban, regional and national levels. Graduate study leads to the Master of Urban and Regional Planning degree which qualifies graduates for employment in a variety of departments at all levels of government, as well as in private consulting. Graduates also work for public foundations, non-profit corporations, and environmental or public interest groups.

The program offers a broad, interdisciplinary, and rigorous two-year curriculum that combines lectures, seminars, and studio projects. Students specialize in areas of interest through specialization modules, program electives and courses that may be taken at other departments or universities upon approval of the Graduate Coordinator. The program features extensive contact with faculty. All required core courses are offered in the evening to accommodate working students. Students in the program come from a variety of undergraduate disciplines and professional experience. The program may be completed on a part-time basis. The Master of Urban and Regional Planning Program is fully accredited by the Planning Accreditation Board and has been cited as a national model for the education of planners.

### ADMISSION TO THE PROGRAM

Admission to the Master of Urban and Regional Planning program requires an undergraduate grade point average of 3.0 (B) or better, three letters of recommendation, and a "Statement of Purpose" setting out an applicant's interest in planning, along with a brief background. An applicant with an undergraduate grade point average between 2.5 and 3.0 will be considered for admission on the basis of scores on the Graduate Record Examination (GRE). A minimum score required on this exam is 1000 on any two of the three parts with not less than 450 on any of the three parts. Applicants with an undergraduate grade point average of 3.0 or better are not required to take the GRE.

Students are admitted into the program from a variety of disciplines and work backgrounds. Following admission, the student and the Graduate Coordinator prepare an individual program that specifies all courses and other requirements that the student must fulfill to earn the master's degree. Students select a specialization module in one of four areas: environmental policy, community development, land use and design, or transportation policy. Each student's program is designed to fit individual needs and interests. The Graduate Coordinator must approve selection of all elective courses. There are opportunities to take interdisciplinary design courses during the summer prior to the first year of study, and to participate in international planning education programs.

### REQUIREMENTS

Seventy-two units must be completed in the graduate degree program. Certain required courses may be substituted by the departmental Graduate Studies Committee based either on a special examination or on an evaluation of the student's prior education and/or professional experience.

A limit of a total of 13 transfer, Extended University, and/or units petitioned for graduate credit may be included on a master's contract. The stipulated time limit of 7 years applies to all of the above.

No course below the 400 level will be accepted for graduate credit. A grade point average of "B" (3.0) or better must be maintained in all graded course work at this University attempted by degree-declared graduate students in the Urban and Regional Planning program, and in all courses used to satisfy degree requirements. A maximum of eight units in required urban and regional planning required courses with the grade of "C" (2.0) will be accepted for credit.

### Completion of the Program

Students must pass the Graduation Writing Test and all courses on the student's contract to complete the program. Students may elect to complete the final part of their contract by either developing a master's thesis or project or by successfully completing the master's comprehensive exam. The exam is given once a year in the spring quarter. Students must take the exam preparatory course given in the winter quarter in order to take the exam that spring. The thesis, project, and exam options are all six units each and may be completed in a minimum of two quarters. Enrollment in thesis or project must begin by the first quarter of the seventh year after the first course taken in pursuit of the MURP degree. In no case will an extension be granted for a thesis, project, or exam that is not completed by the end of the seventh year. An oral defense of the thesis, project, or exam is required.

### CURRICULUM

Introduction to Graphic Communication and Physical Design . . . . .	URP 501/501L	(3)
Urban Analysis Fundamentals . . . . .	URP 502L	(1)
The Economic, Social and Environmental Context for Planning . . . . .	URP 505	(4)
Legal Foundations of Urban and Regional Planning	URP 506	(4)
Urban and Regional Planning Theory and Practice	URP 512	(4)
Urban and Regional Planning Research Methods	URP 521/521L	(4)
Urban and Regional Planning Data Analysis and Simulation . . . . .	URP 522/522L	(4)
Policy Analysis, Implementation and Evaluation . . . . .	URP 523/523L	(4)
Graduate Planning Studio I . . . . .	URP 641/641L	(4)
Graduate Planning Studio II . . . . .	URP 642/642L	(4)
Social and Political Planning Policy . . . . .	URP 651	(4)
Planning Administration and Professional Practice	URP 652	(2)
Independent Study with Comprehensive Exam . . . . .	URP 692	(6)
or Master's Degree Project . . . . .	URP 695	
or Master's Degree Thesis . . . . .	URP 696	
Specialization module courses . . . . .		(12)
Electives . . . . .		(12)
Total Units . . . . .		(46)



**SPECIALIZATION MODULE COURSES**

Each module is composed of 12 units, and is developed by the student and the Graduate Coordinator to include the following required module courses and other appropriate courses under departmental guidelines. Students may use 400-level planning courses with the permission of the Graduate Coordinator. Please see the undergraduate section of the catalog. With Graduate Coordinator approval, students may also use graduate and 400-level undergraduate courses in other departments and off campus courses to complete their module.

**Environmental Policy**

Environmental Policy for Planning . . . . .URP 537 (4)

**Land Use and Design**

Land Use Planning and Design . . . . .URP 538/538L (4)

**Community Development**

Community Development Theory and Process . . . .URP 434/434A (4)

**Transportation Policy**

Urban Transportation Planning . . . . .URP 488/488L (4)

Regional Transportation Planning and Policy . . . .URP 535 (4)

**URP GRADUATE ELECTIVES (12 units)**

Evolution of the Planning Process . . . . .URP 513 (4)

Housing and Community Development . . . . .URP 534 (4)

Directed Study . . . . .URP 691 1-2

Elective courses to complete the required minimum of 72 units may be selected from those listed above, 400-level planning courses or any 400, 500, or 600-level course of this university with the approval of the Graduate Coordinator. Specialization module courses may be used as electives. The student should select a group of electives that will help either to specialize in one area or to broaden the student's background and acquire a wider area of competence. There are no requirements for particular undergraduate degrees or preparation.

**GRADUATE COURSE DESCRIPTIONS****URP 501/501L Introduction to Graphic Communication and Physical Design Skills (1/2)**

Introduction to basic planning graphic and design techniques. Covers issues such as mapping, presentation and report graphics, site planning, development processes and computer applications. Concurrent enrollment required. 1 lecture discussion, 2 three-hour laboratories.

**URP 502L Urban Analysis Fundamentals (1)**

Intensive course focusing on a selected communication or analysis skill, the subject to be specified in advance. Topics may include listening and communication skills, report writing, negotiation/mediation processes, computer analysis, mapping or graphics, photography, etc. May be repeated for elective credit. 1 laboratory.

**URP 505 The Economic, Social and Environmental Context for Planning (4)**

Development of the economic and social structure of cities. Environmental factors in cities and regions. Historical development and current issues. Explores the forces that shape and affect possibilities for cities and regions. 4 lecture discussions.

**URP 506 Legal Foundations of Urban and Regional Planning (4)**

Legal and institutional framework for planning. Emphasis is placed on understanding federal and state requirements for planning, constitutional rights, and key legislation. 4 lecture discussions.

**URP 512 Urban and Regional Planning Theory and Practice (2/2)**

Application of planning theory to planning practice. Use of planning methods, research techniques, and decision theory in application to a range of urban problems. 2 lecture discussions, 2 seminars. Concurrent enrollment required.

**URP 513 Evolution of the Planning Process (4)**

Development of urban patterns in the context of planning. Introduction to the history of urban form and the contribution of the planning profession to civic improvement. 4 lecture discussions.

**URP 521/521L Urban and Regional Planning Research Methods (3/1)**

Introduction to the use of probability and statistics in urban and regional planning research. Basic planning techniques; data analysis and display; projection techniques; land use surveys and coding; simple models; economic base and locational analysis; electronic data processing. 3 lecture discussions, 1 three-hour laboratory. Concurrent enrollment required.

**URP 522/522L Urban and Regional Planning Data Analysis and Simulation (3/1)**

Introduction to data analysis and computers. Mathematical models related to land-use, and population projections and estimates. Application of data analysis in the solution of research problems, research design and project management. 3 lecture discussions, 1 three-hour laboratory. Concurrent enrollment required. Must be taken immediately following URP 521/521L. Prerequisite: URP 521/521L.

**URP 523/523L Policy Analysis, Implementation and Evaluation (3/1)**

Evaluation methods of public policies and private decisions on the public welfare, using quantitative and qualitative analytic tools. Emphasis is on application of statistical approaches, cost-benefit analysis, computer aided mapping and survey techniques to contemporary issues in planning. 3 lecture discussions, 1 three hour laboratory. Concurrent enrollment required. Prerequisite: URP 522/522L.

**URP 534 Urban Housing and Community Development (4)**

Housing requirements and prospects; local, state, and federal housing and community development policies; alternative solutions to housing problems. 4 lecture discussions. Prerequisite URP 505.

**URP 535 Regional Transportation Planning and Policy (4)**

Understanding factors in land use, travel behavior, politics and finance that shape regional transportation policy choices. Examination of policy issues in regional transportation planning. Planning and evaluation methods in regional transportation policy. 4 lecture discussions. Prerequisite: URP 505.

**URP 537 Environmental Policy for Planning (4)**

Theories, ethics and methods of environmental planning in an intergovernmental context. Analysis of environmental equity in facility siting and urban design. Review of environmental elements for general plans, risk analysis, and habitat conservation planning. 4 lecture discussions. Prerequisite: URP 512.

**URP 538/538L Land Use Planning and Design (3/1)**

Methods of analyzing how people use and perceive public space. Principles of land-use organization and design. Translating design concepts to guidelines and policy. Concurrent enrollment required. 3 seminars, 1 three-hour laboratory. Prerequisite: URP 501/501L.

**URP 641/641L Graduate Planning Studio I (2/2)**

Theory, process, design and method for strategic planning demonstrated by studio problems based on field studies. Synthesis of graduate planning coursework reviewed through practical application. 2 lecture discussions, 2 three-hour laboratories. Concurrent enrollment required. Prerequisite: URP 522/522L. Unconditional standing required.

**URP 642/642L Graduate Planning Studio II (2/2)**

Continuation and completion of the plan formulation begun in URP 641/641L. Must be taken immediately following URP 641/641L. 2 lecture discussions, 2 three-hour laboratories. Concurrent enrollment required. Unconditional standing required.

**URP 651 Social and Political Planning Policy (4)**

Survey of contemporary urban conditions from a social policy perspective. Basic principles and practices of contemporary social policy planning. Methods by which urban social trends are analyzed, social indicators developed and applied to program development and analysis. Established social, economic and political institutional considerations, centralized and decentralized social policy-decision models. 4 lecture discussions. Prerequisite: URP 512. Unconditional standing required.

**URP 652 Planning Administration and Professional Practice (2)**

Administration of planning agencies; development and administration of planning and community development programs; the place of planning in local government organization and structure; function of the professional planner in public and private practice; professional ethics and responsibilities. 2 lecture discussions. Prerequisites: URP 512. Unconditional standing required.

**URP 691 Directed Study (1-2)**

Independent investigation of an urban and regional planning topic selected by the student preparatory to enrollment in project or thesis and conducted under the direction of a graduate faculty member. May not be taken for credit/no credit. May be repeated for a maximum of 4 units. Unconditional standing required.

**URP 692 Independent Study with Comprehensive Examination (4)(2)**

A two-part terminal requirement. The first part includes study, research, and readings (not leading to a thesis or project) proposed by the student with consultation and approval and supervision of the Graduate Coordinator and graduate faculty members. The second part contains the written portion and examination conducted by the committee of faculty members. Advancement to Candidacy required.

**URP 695 Master's Degree Project (3) FWSp**

Development of a terminal research and/or design project on a topic selected by the student, approved by the graduate studies committee and conducted under the direction of a Project Committee chosen by the student. The Project Committee will consist of three graduate faculty members or, with the permission of the Project Committee Chair, two graduate faculty members and a third outside member who has recognized expertise in the subject topic. The examination may be taken no more than two times. Failure to complete it satisfactorily the second time will result in termination from the program. 6 units required. Advancement to Candidacy required.

**URP 696 Master's Degree Thesis (3) FWSp**

Development of a terminal research report on a topic selected by the student, approved by the graduate studies committee and conducted under the direction of a Thesis Committee chosen by the student. The Thesis Committee will consist of three graduate faculty or, with the permission of the Thesis Committee Chair, two graduate faculty and a third outside member who has recognized expertise in the thesis topic. 6 units required. Advancement to Candidacy required.

**URP 699 Master's Degree Continuation (0) FWSp**

Registration or an approved leave of absence is required for any quarter following the final assignment of the grade "SP" until the completion of thesis or project. The candidate must be enrolled in the university during the quarter in which she/he graduates. Advancement to Candidacy required.