The University of Northern California updates its catalog annually. If there are any changes in institutional policies and procedures or government agencies rules and regulations, the catalog will be updated to reflect these changes. All information contained in this Catalog is current, correct, and certified as true.

As a prospective student, you are encouraged to review this catalog prior to signing an enrollment agreement. You are also encouraged to review the School Performance Fact Sheet, which must be provided to you prior to signing an enrollment agreement.

The University of Northern California is a private university and is not affiliated with the University of California or California State University or any of their campuses.
GREETINGS FROM THE PRESIDENT

Creating a new university has been a dream of mine for many years. As a young man living in Asia, I received a full scholarship to study in America. This scholarship led me to a lifetime dedicated to the excitement and joy of academic study and research both for myself and also, later, for my students.

In my vision of the ideal university, the precision of technology and science would blend with the mastery of language for better communication of expertise and new ideas. At the same time, students would live in an atmosphere that was inspiring, stimulating and fun.

Here, in the Petaluma campus of the University of Northern California (UNC), my dream has become a reality. In our business park setting, UNC students are able to specialize in biomedical engineering, systems engineering, optical & photonic engineering, business administration, and languages & applied linguistics taught by experienced educators who are inspired by our multidisciplinary and multicultural approach to learning. Opportunities abound for enjoyable and rewarding extra-curricular activities in one of the most beloved bay areas of the world!

I know that UNC graduates will carry with them the culmination of my dream and the key to theirs.

Welcome to the University of Northern California!

Y. King Liu, Ph.D., L.Ac., President
# Contents

1. ACADEMIC CALENDAR.................................................................................................................. 5

2. THE UNIVERSITY OF NORTHERN CALIFORNIA.......................................................................... 6
   2.1. ABOUT UNIVERSITY OF NORTHERN CALIFORNIA (UNC) ..................................................... 6
   2.2. INSTITUTIONAL APPROVALS AND AUTHORIZATIONS .............................................................. 7
   2.3. MISSION STATEMENT .................................................................................................................. 7
   2.4. INSTITUTIONAL PURPOSE AND OBJECTIVES ........................................................................... 7
   2.5. PHYSICAL FACILITIES .............................................................................................................. 8
   2.6. ADMISSIONS ................................................................................................................................ 9
   2.7. FINANCIAL AID .......................................................................................................................... 14
   2.8. STUDENT HEALTH INSURANCE ................................................................................................. 15
   2.9. HOUSING INFORMATION .............................................................................................................. 15
   2.10. INTERNATIONAL STUDENTS .................................................................................................... 15
   2.11. BANKRUPTCY DISCLOSURE ...................................................................................................... 15

3. ACADEMIC PROGRAMS AND COURSE LISTINGS .................................................................. 17
   3.1. ASSOCIATE OF SCIENCE IN EMERGENCY HEALTH, AND SAFETY ........................................ 17
   3.2. ASSOCIATE OF SCIENCE IN MAGNETIC RESONANCE IMAGING (MRI) TECHNOLOGY ........ 21
   3.3. BACHELOR OF ARTS IN APPLIED LINGUISTICS .................................................................. 26
   3.4. BACHELOR OF ARTS IN CHINESE ............................................................................................ 31
   3.5. BACHELOR OF SCIENCE IN OPTICAL & PHOTONIC ENGINEERING ........................................ 39
   3.6. MASTER OF ARTS IN APPLIED LINGUISTICS [TEACHING ENGLISH TO SPEAKERS OF OTHER LANGUAGES (TESOL)] ................................................................. 45
   3.7. EXECUTIVE MASTER OF BUSINESS ADMINISTRATION IN BIOMEDICINE ............................. 49
   3.8. MASTER OF SCIENCE IN BIOMEDICAL ENGINEERING ............................................................. 53
   3.9. MASTER OF SCIENCE IN OPTICAL & PHOTONIC ENGINEERING ........................................... 60
   3.10. MASTER OF SCIENCE IN SYSTEMS ENGINEERING (EMPHASIS EMBEDDED SOFTWARE) ....... 64
   3.11. DOCTOR OF BIOMEDICAL ENGINEERING .............................................................................. 69
   3.12. DOCTOR OF PHILOSOPHY IN BIOMEDICAL ENGINEERING .................................................... 74
   3.13. ENGLISH AS A SECOND LANGUAGE (ESL) ............................................................................. 79

4. TUITION, FEES, AND OTHER CHARGES ................................................................................... 82
   4.1. TUITION FEES ............................................................................................................................... 82
   4.2. FEE PAYMENT .............................................................................................................................. 83
4.3. EXTENDED PAYMENT PLAN .................................................................................. 83
5. CANCELLATION AND REFUND POLICIES .................................................................. 84
  5.1. POLICIES ............................................................................................................. 84
  5.2. TUITION REFUNDS .............................................................................................. 84
  5.3. STUDENT TUITION RECOVERY FUND .................................................................. 84
6. STUDENT SERVICES .................................................................................................. 86
  6.1. ACADEMIC ADVISEMENT .................................................................................. 86
  6.2. CAREER PLANNING AND PLACEMENT ............................................................. 86
  6.3. STUDENT HEALTH AND SAFETY ....................................................................... 86
  6.4. ACADEMIC ACHIEVEMENT AND RECOGNITION ............................................. 86
  6.5. ACCENT MODIFICATION WORKSHOP .............................................................. 86
  6.6. STUDENT AND ALUMNI ORGANIZATIONS ...................................................... 87
7. POLICIES .................................................................................................................. 88
  7.1. ACADEMIC PERFORMANCE AND RECORDS ..................................................... 88
    7.1.1. ATTENDANCE, DROPOUT AND LEAVE-OF-ABSENCE POLICIES ................. 88
    7.1.2. GRADES ......................................................................................................... 88
    7.1.3. RETENTION OF STUDENT RECORDS ............................................................ 89
    7.1.4. STUDENT RECORDS AND RELEASE OF INFORMATION ............................. 90
    7.1.5. CHANGE OF STATUS .................................................................................... 90
  7.2. RIGHTS AND CONDUCT ...................................................................................... 90
    7.2.1. ACADEMIC FREEDOM ................................................................................. 90
    7.2.2. STUDENT RIGHTS ....................................................................................... 90
    7.2.3. PRINCIPLES OF ETHICAL CONDUCT .......................................................... 91
    7.2.4. POLICY CONCERNING PLAGIARISM ............................................................ 91
    7.2.5. REGULATIONS REGARDING HARASSMENT AND SEXUAL HARASSMENT .... 92
    7.2.6. POLICY ON STUDENT COMPLAINTS AND GRIEVANCES .......................... 92
    7.2.7. ADA AND DISABILITY POLICY ................................................................... 93
    7.2.8. NONDISCRIMINATION POLICY .................................................................. 93
    7.2.9. EQUAL OPPORTUNITY ................................................................................. 93
8. FACULTY ................................................................................................................... 94
9. UNIVERSITY OF NORTHERN CALIFORNIA GOVERNANCE ........................................ 96
1. ACADEMIC CALENDAR

2012 Academic Calendar by Semester

Spring Semester: January 9, 2012 - April 27, 2012
Spring Break: April 28, 2012 - May 6, 2012
Summer Session: May 7, 2012 - August 24, 2012
Summer Break: August 25, 2012 - September 2, 2012
Fall Semester: September 3, 2012 - December 21, 2012

Holidays

New Year’s Day: January 1, 2012
Memorial Day: May 28, 2012
Independent Day: July 4, 2012
Labor Day: September 3, 2012
Thanksgiving Holidays: November 22 & 23, 2012
Christmas Day: December 25, 2012
2. THE UNIVERSITY OF NORTHERN CALIFORNIA

2.1. ABOUT UNIVERSITY OF NORTHERN CALIFORNIA (UNC)

The University of Northern California (UNC) is a young private university welcoming students from around the world. UNC was established in May 1993, and opened to students in August 1995, in two colleges: Engineering and Languages & Applied Linguistics. Recently, UNC has added the College of Business Administration. At UNC, students enjoy small classes with ample individual attention from professors dedicated to quality teaching. UNC’s faculty members are committed to helping students to develop a solid academic foundation with a practical focus. Interdisciplinary studies are encouraged, and all of UNC’s academic programs emphasize the importance of effective communication for success in the 21st century.

The University of Northern California aspires to become a premiere engineering and technological university with substantial programs in the liberal arts and sciences. Its special focus is on programs in biomedical technology including the B.S., M.S., Ph.D. and professional doctoral degrees in biomedical engineering, M.S. in Systems Engineering (emphasis: embedded software) and B.S. and M.S. in Optical & Photonic Engineering. UNC also offers undergraduate and graduate degrees in Languages and Applied Linguistics as well as a graduate degree in Business Administration: Executive MBA in Biomedicine. UNC will grow its Colleges of Engineering, Languages & Applied Linguistics, Business Administration to include Liberal Arts, and Sciences.

In addition to degree programs in engineering, languages and applied linguistics, courses are currently available in biology, chemistry, communication, economics, intensive English as a second language (IEP/ESL), humanities, mathematics, music, physics, political and social sciences.

The University of Northern California is situated in a Business Park in Petaluma’s Telecom Valley. The location provides an ideal environment for learning. Petaluma is within the San Francisco Bay Area, one of the largest metropolitan regions of the United States. Beautiful beaches, redwood forests, wine country, mountain hiking trails, campgrounds, horseback riding facilities and golf courses are just minutes away. Also within easy access from UNC are outstanding museums, restaurants, performing arts companies, cultural festivals, and major-league sports teams.
2.2. INSTITUTIONAL APPROVALS AND AUTHORIZATIONS

The University of Northern California (UNC) is a private institution which received institutional approval to operate as a degree granting institution by the former Bureau for Private Postsecondary and Vocational Education (BPPVE) as well as its successor: the Bureau for Private Postsecondary Education (BPPE). Its institutional number is 4901161.

UNC is not accredited by an accrediting agency recognized by the United States Department of Education (USDE). A degree program that is unaccredited or a degree from an unaccredited institution is not recognized for some employment positions, including, but not limited to, positions with the State of California.

For more information, call the Bureau for Private Postsecondary Education at (916) 431-6959, or toll free at 1 (888) 370-7589, or visit its website @ www.bppe.ca.gov.

UNC is also authorized by the U.S. Citizenship and Immigration Services (USCIS) to issue SEVIS I-20 forms to international students to apply for their student visas.

Any questions a student may have regarding this Catalog that have not been satisfactorily answered by the institution may be directed to the Bureau for Private Postsecondary Education at 2535 Capitol Oaks Dr, Suite 400, Sacramento, CA 95833, www.bppe.ca.gov, toll-free telephone number (888) 370-7589 or by fax (916) 263-1897.

2.3. MISSION STATEMENT

The University of Northern California is dedicated to advancing scientific and technological innovations in engineering, languages, linguistics and business administration through its educational and research programs. All programs emphasize applications to biology and medicine.

2.4. INSTITUTIONAL PURPOSE AND OBJECTIVES

The University of Northern California (UNC) is a teaching and research university that seeks to make higher education available to students regardless of their country of origin or native language. UNC encourages a strong sense of multicultural and inter-disciplinary academic community among its students and staff. Its graduate and undergraduate programs in engineering, applied linguistics, languages and business administration are designed to foster technical, analytical and communicative skills. These skills enhance each student’s potential for personal and professional success in an increasingly technology-driven and communication interdependent world. UNC provides students with the skills and confidence to engage in interdisciplinary cooperation that is the hope for improving the long-range prospects for the human species.

College-level students of strong academic ability with minor deficiencies in prerequisite knowledge are also welcome. Students who require improved proficiency in English for successful enrollment
in the University’s degree programs, will be offered appropriate intensive short-term instruction in English as a second language (IEP/ESL). Academically strong students who require additional quantitative and analytical skills for successful enrollment in any degree program will be offered a program of study appropriate for their initial abilities and academic goals at UNC or at a neighboring institution.

To meet the foregoing mission, the University offers academic programs leading to B.S., M.S., Ph.D. and professional doctoral degrees in Biomedical Engineering, M.S. in Systems Engineering (emphasis: embedded software), B.S. & M.S. in Optical & Photonic Engineering, Executive Master in Business Administration (Executive MBA), B.A. degree in Chinese and B.A. & M.A. in Applied Linguistics. Intensive short-term IEP/ESL courses are offered to non-native speakers of English who wish to communicate better in English, be it for personal, professional or academic purposes. Additional degree programs will be added as UNC continues to grow.

To the extent that it is financially able, the University will assist qualified students in meeting the financial costs of their education. Such assistance will be based on a student’s academic ability and financial need, and presumes that students and their families have gone as far as they can in meeting these costs themselves.

The University of Northern California does not discriminate on the basis of race, national origin, color, religion, gender, sexual orientation, age, or physical disability.

2.5. PHYSICAL FACILITIES

University of Northern California campus is where academic vigor and innovative research interface with biomedical device development and the incubation of company spin-offs. Located in 1304 Southpoint Blvd, Suite 101 Petaluma, California, the campus’ physical facilities reside in a spacious 6,841 sq. ft. building and consist of classrooms, library, study areas, student cubicles, Research and Development laboratories, Community Clinic, administrative offices, and the research and business areas of the Science and Technology Innovation Center (STIC). The campus lay-out enables students and faculty the opportunity to study, conduct research, and work alongside the STIC start-up companies’ engineers, administrators, marketing, sales, quality, and regulatory personnel.

The address where on-campus class sessions are held is: 1304 Southpoint Blvd, Suite 101, Petaluma, CA 94954. (No on-campus attendance is required for courses offered through distance learning.)

Library Facilities
The library is housed in a centrally located part of the suites that include reading areas, study carrels and office space for the library staff. At present, the library contains approximately 5,600 volumes. The university plans to use this complement of materials as the basis for building core holdings in each disciplinary area as it develops. The university belongs to the North Bay Cooperative Library Service through which books can be made available to our students via interlibrary loan. The UNC library is also connected to the Ruben Salazar Library at Sonoma State University.
University in Rohnert Park, approximately ten miles north of the UNC campus. Additional library access capabilities are available via Internet connections.

**Computers and Data Base**

UNC’s Website address is: www.uncm.edu and the main e-mail address is: admits@uncm.edu. The University strongly encourages every student to purchase a computer that will permit the student to network with the campus’ local area network (LAN).

### 2.6. ADMISSIONS

The University of Northern California admits applicants on the basis of their standard examination scores and their previous academic record (including secondary school), letters of reference, and a personal essay. Transfer students with more than 24 semester credits and individuals wishing to enroll in short-term English as a Second Language (IEP/ESL) courses may apply for admission without submitting standard examination scores.

Non-native speakers of English must submit either an official Test of English as a Foreign Language (TOEFL), and score must be at least 500 for the paper-and-pencil test, at least 173 for the computer-based test, or at least 61 for the Internet-based test (iBT). For other students, a minimum score of 640 in the Japanese Society for Testing English Proficiency, Inc. (STEP) is required. In either case, the UNC ESL faculty will test international students for their speaking, listening, reading and writing abilities upon their arrival before they are allowed to enroll in regular university classes. For those students with ESL deficiencies, they must successfully complete ESL 003 at UNC, in order to enroll in courses other than IEP/ESL. Preference for admission and scholarships will be given to those applicants who have the highest standard examination scores, positive references and a secondary school record indicating they are most likely to succeed in the program for which they are applying.

**UNDERGRADUATE PROGRAMS**

To qualify for admission to an undergraduate program, a student must have completed a secondary educational program equivalent to that required for a high school diploma in the United States. The University of Northern California welcomes students who wish to transfer from other institutions of higher learning. Entrance examination scores on the Scholastic Aptitude Test (SAT) or the American College Test (ACT) are preferred for students who have completed less than 24 transferable semester credits of college level study. The following codes should be used for the reporting of test scores:

SAT - 1824, ACT - 0424, TOEFL - 4935
To enroll in an upper division program, a student must have successfully completed a lower division program equivalent to two years of college-level work, or the Associate (AA) degree, including the necessary prerequisites for the academic program in which they plan to study.

Advanced Placement (AP) examinations may be used to exempt a student from an equivalent course requirement. The appropriate faculty member determines a student’s exemption from a course due to performance on an AP examination. No units of academic credit will be given for AP examination scores.

Students applying for admission to an engineering program should have completed high school courses in algebra and trigonometry. A student without this background in mathematics may be admitted conditionally, with the requirement that he/she successfully complete UNC’s MAT100 (Algebra and Trigonometry) within one year of admission.

**Associate Degree Programs**

UNC will admit applicants to Associate Degree programs on the basis of their previous academic record, letters of recommendation, and a personal essay. Students must possess a high-school degree with good grades in physical and/or biological sciences or their equivalents in a related field, or present evidence of successfully passing the GED. Admission to an Associate Degree program requires a 2.00 minimum grade point average in high school and verification of graduation in the form of a diploma or official transcript. Students who do not provide evidence of the required high school graduation, may be considered as an “Ability to Benefit Student” by passing the Wonderlic standardized entrance examination with a minimum score of 17 or the CPAt standardized entrance examination with a minimum score of 130.

**Additional Admissions Requirements for Undergraduate Non-native Speakers of English**

Non-native speakers of English must submit an official Test of English as a Foreign Language (TOEFL) with a minimum score of at least 600 for the paper-and-pencil test, at least 250 for the computer-based test, or at least 100 for the Internet-based test (iBT). Students with an official Society for Testing English Proficiency (STEP) Pre-1 may also be required to take advanced IEP/ESL classes, e.g., ESL 030 Accent Modification, depending on their speaking and comprehension abilities as assessed by an English language placement examination. These English requirements are to insure that international students can benefit from either online or on-site class instructions. If enrollment is recommended in IEP/ESL, the student will be advised prior to signing an Enrollment Agreement.

**Applying for Admission**

1. Obtain an Application for Undergraduate Admission either by downloading the Application Form from our web site: [www.uncm.edu](http://www.uncm.edu) or by contacting the Office of Admissions at 707-331-1110 or by writing to the UNC Office of Admissions.
2. Fill out the application, being careful to answer all the applicable questions, and complete the essay.
3. Mail the completed application along with the nonrefundable $100.00 application fee to the Office of Admissions.
4. Have an official copy of your high school transcript sent to the Office of Admissions. If applying for transfer or upper-division admission, have an official copy of your junior college transcript sent to the Office of Admissions.
5. If applying for undergraduate admission, submit official results of the Scholastic Aptitude Test (SAT) or the American College Test (ACT). International students with appropriate credentials may be exempted from this requirement.

**Community College Transfers**

The University of Northern California accepts transfer credits and coursework taken at approved or accredited community colleges. New undergraduate degree candidates may wish to complete many of the requirements necessary towards their Bachelor’s Degree at a local community or junior college or while attending the University of Northern California. To this end, the University has established formal Articulation Agreements with local community colleges where students will be assisted in selecting courses that will meet the University’s Bachelor’s Degree requirements. Following is a current list of community colleges with which the University of Northern California has either established formal articulation and/or consortium agreements:

- Santa Rosa Junior College (SRJC)
- SRJC Petaluma Campus
- College of Marin
- Napa Valley College
- Sacramento City College
- BioHealth College
- International Technological University

Students interested in obtaining a copy of the course-by-course Articulation and/or Consortium Agreements with any of these colleges may do so by visiting the Transfer Office at the above colleges/universities or may contact the Admissions Office at the University of Northern California.

Students wishing to enroll in a community college, not currently on the list of colleges with formal Articulation Agreement with UNC, are encouraged to meet with an advisor at the University to obtain assistance in selecting courses that will satisfy their Bachelor’s Degree requirements.

To obtain an updated list of community colleges that have been added to the above list, contact the Director of Admissions at:

University of Northern California
1304 South Point Blvd., Suite 101, Petaluma, CA 94954

**GRADUATE PROGRAMS**

Students wishing to enroll in a program of graduate study leading to a master’s or Ph.D. or a professional doctorate degree must possess a bachelor’s degree or its equivalent. Students who have a bachelor’s degree in an engineering curriculum or in a curriculum in the mathematical or physical sciences, who have a 3.00 minimum grade-point average and an acceptable score on the Graduate Record Examination (GRE) General Test (combined verbal and quantitative score of 1,230), are eligible to be considered for admission to Master of Science studies. Students may, under exceptional circumstances, be considered for conditional admission with a lower grade-point
average and/or a lower GRE General Test score. Students on conditional status must achieve
regular status within 9 semester credit hours of initial registration by attaining a 3.00 minimum
grade-point average at the University of Northern California and regular acceptance by the
departmental faculty. Students who do not meet these requirements are subject to dismissal.

Reference letters, research interests, previous graduate study grade-point average, and other factors
may be considered in making admission decisions. Students qualified for graduate study are
eligible to apply for graduate teaching and/or research assistantships as well as internships at STIC
startup companies.

Applying for Graduate Admission

1. Obtain an Application for Graduate Admission either by downloading the Application Form
   from our web site: www.uncm.edu or by contacting the Office of Admissions at 707-331-
   1110 or by writing to the UNC Office of Admissions.
2. Fill out the application, being careful to answer all the applicable questions, and complete
   the essay.
3. Mail the completed application form along with the nonrefundable $100.00 application fee
   to the Office of Admissions.
4. Have official copies of your previous college transcripts sent to the Office of Admissions. If
   applying for transfer, upper division admission, or Graduate School, have official copies of
   your college transcripts sent to the Office of Admissions.
5. If applying for graduate admission, submit official results of your Graduate Record
   Examination (GRE). International students with appropriate credentials may be exempted
   from this requirement.

International students, whose first language is not English, must additionally submit official results
of either the Test Of English as a Foreign Language (TOEFL) or the Japanese Society for Testing
English Proficiency, Inc. (STEP). The following codes should be used for the reporting of test
scores:

TOEFL – 4935; GRE - must be directly submitted by applicant.

Note: All information, once submitted, becomes the property of the University of Northern
California and will not be returned.

WHEN TO APPLY

Application to the University can be made at any time of the year as we have rolling admission
dates. Students should allow reasonable time for the processing of their applications.

NOTIFICATION OF ADMISSION

The Office of Admissions will promptly acknowledge receipt once an application has been
received. However, the process of review of potential students will not begin until all documents
have been received and the $100.00 application fee paid. Once the review has been completed, a
letter will be sent to the applicant explaining his/her admission status. The letter will either be faxed or scanned and e-mailed to you. Students may anticipate receiving a decision from the Admissions Committee (admissions staff, academic chair, and Dean of Students) within three weeks.

ENROLLMENT DEPOSIT

Once a student has reviewed the UNC catalog, toured the campus and been accepted for admission, he/she will receive an enrollment agreement form which must be signed and returned with the enrollment deposit of $100.00 not less than four weeks before the first day of classes. Exceptionally, students who are unable to visit the campus prior to enrollment, e.g., applicants residing abroad, may sign the enrollment agreement form after their arrival on campus. This non-refundable enrollment deposit will be applied to the registration fee for the term of admission.

TRANSFERRING UNITS OF CREDIT

The Maximum credit that UNC will accept in transfer from another institution:

- Undergraduate: 75% max. toward the degree
- Master’s Program: 6 units max. toward the degree
- Doctoral Program: 30 units max. toward the degree

The University of Northern California grants semester credit units for certain courses completed at other colleges and universities. To receive credit units, the student must submit to the Registrar a written request and an official transcript from the institution(s) previously attended. The Registrar, in conjunction with the Chief Academic Officer, will make decisions regarding the acceptance of credit units earned elsewhere. The University does not award credits based on experiential learning.

Notice Concerning Transferability of Credits and Credentials Earned at Our institution: The transferability of credits you earn at University of Northern California is at the complete discretion of an institution to which you may seek to transfer. Acceptance of the degree, diploma, or certificate you earn in your program is also at the complete discretion of the institution to which you may seek to transfer. If the credits, degree, or diploma that you earn at this institution are not accepted at the institution to which you seek to transfer, you may be required to repeat some or all of your coursework at that institution. For this reason you should make certain that your attendance at this institution will meet your educational goals. This may include contacting an institution to which you may seek to transfer after attending the University of Northern California to determine if your credits, degree, diploma or certificate will transfer.
2.7. FINANCIAL AID

It is the goal of the University of Northern California to provide a package of financial assistance that will enable eligible undergraduate and graduate students to meet their tuition and living expenses. The University of Northern California Foundation (UNC Foundation) distributes funds on the basis of financial need and/or demonstrated potential for scholastic achievement in the following programs:

Scholarships
Work Study
Graduate Fellowships
Teaching and Research Assistantships
Internship at STIC-affiliated companies

Eligibility for Work Study is dependent on the ability of the applicants to demonstrate financial need. Candidates for Scholarships, Graduate Fellowships and Teaching Assistant and Research Assistant positions will be judged and awarded funding on the basis of scholarship and financial need. The University of Northern California does not participate in federal and state financial aid programs.

If a student obtains a private loan to pay for an educational program, the student will have the responsibility to repay the full amount of the loan plus interest, less the amount of any refund.

The University of Northern California Foundation offers Presidential Scholarships and Foundation Scholarships for undergraduate, graduate and transfer students with actual or demonstrated potential for academic excellence. Students who wish to be considered for these scholarships will submit:

Completed Application for Admission
Completed Application for Financial Assistance
Official SAT, ACT or other standardized test scores (Scores are not required for transfer students having over 24 transferable units.)
GRE test scores for Graduate Applicants.
TOEFL test scores for international applicants
Official High School transcripts and/or undergraduate transcripts
Three letters of reference

Students interested in applying for financial assistance need to obtain an application for Financial Assistance form by contacting:

Director of Financial Assistance
University of Northern California
1304 South Point Boulevard, Suite 101
Petaluma, CA 94954
707-331-1110
Upon Admission to UNC, the Application for Financial Assistance form will either be faxed or scanned and e-mailed to you when you request it.

2.8. STUDENT HEALTH INSURANCE

All full-time students are required to show proof of personal health insurance for each semester of enrollment. The University can provide basic health care policies for both domestic and international students. These policies are available at a competitive current market price. Once admitted to the University, students must also complete a medical history form including all information about prior immunizations.

2.9. HOUSING INFORMATION

Student housing is available either close to the campus or in southern Sonoma and northern Marin Counties. The average cost of a single room with a home-stay family ranges from $450-$550 per month. A two-bedroom townhouse or apartment rents for about $1,350 per month not including utilities. Food costs vary. A minimum of $200 per month for food should be expected.

2.10. INTERNATIONAL STUDENTS

One of the most effective ways to increase one’s understanding of other languages and cultures as well as improving one’s ability to function effectively in an interdependent world, is to take advantage of the educational opportunities available in other countries. Those international students who take advantage of this opportunity will broaden their global perspective and appreciation for different points of view by taking part in a dynamic interchange of diverse ideas and approaches while living and studying in another country. UNC has a home-stay program for international students studying in its Petaluma campus. Student exchange programs in the form of sophomore- or junior-year-abroad are available for students in the Chinese degree program.

After receipt and acceptance of the Application for Admission form and a $100.00 pre-registration tuition deposit, the University of Northern California will provide a United States Citizenship and Immigration Services (USCIS) SEVIS I-20 Form, which will allow a student to apply for a F-1 student visa. Students on a F-1 visa must enroll, maintain continuous attendance and satisfactorily complete each semester, at least 12 units of undergraduate study or 9 units of graduate study at UNC. Before registration, F-1 students transferring from a high school, college or university in the United States must submit a Transfer Verification Form that will be sent to them by the Office of Admissions either by fax or scanned and e-mailed to you.

2.11. BANKRUPTCY DISCLOSURE
The University of Northern California does NOT have pending a petition in bankruptcy, is NOT operating as a debtor in possession, has NOT filed a petition within the preceding five years, and has NOT had a petition in bankruptcy filed against it within the preceding five years that resulted in reorganization under Chapter 11 of the United States Bankruptcy Code.
3. ACADEMIC PROGRAMS AND COURSE LISTINGS

Each UNC course code is preceded by an abbreviation representing an academic subject area, as indicated below.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Subject Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>APL</td>
<td>Applied Linguistics</td>
</tr>
<tr>
<td>BME</td>
<td>Biomedical Engineering</td>
</tr>
<tr>
<td>CHI</td>
<td>Chinese Language</td>
</tr>
<tr>
<td>ESL</td>
<td>English as a Second Language</td>
</tr>
<tr>
<td>MAT</td>
<td>Mathematics</td>
</tr>
<tr>
<td>MUS</td>
<td>Music</td>
</tr>
<tr>
<td>PHY</td>
<td>Physics</td>
</tr>
<tr>
<td>BIO</td>
<td>Biology</td>
</tr>
<tr>
<td>CHE</td>
<td>Chemistry</td>
</tr>
<tr>
<td>ENC</td>
<td>Engineering Core Course</td>
</tr>
<tr>
<td>GEN</td>
<td>General Education</td>
</tr>
<tr>
<td>MGT</td>
<td>Management/Business Administration</td>
</tr>
<tr>
<td>OPE</td>
<td>Optical &amp; Photonic Engineering</td>
</tr>
<tr>
<td>SYE</td>
<td>Systems Engineering</td>
</tr>
</tbody>
</table>

Course codes that include the ‘W’ designation (e.g., GEN 110-W) are courses in which writing and other presentational skills are emphasized.

Any graduate of the degree program in UNC will NOT be eligible to sit for applicable licensure exam in California and other states.

3.1. ASSOCIATE OF SCIENCE IN EMERGENCY HEALTH, AND SAFETY

Program Description:
The Emergency Health, and Safety (EHS) Program is designed to embrace the emerging concepts of Comprehensive Emergency Management, the “Partnership” initiatives launched by FEMA (Federal Emergency Management Agency) and the concept of “community stakeholders” in the emergency management organization. The program will enhance the strategic knowledge base of those persons working in the emergency service field as well as the complete community of allied health and social groups, economic groups and political agencies. Utilizing a holistic approach, the program covers the social, psychological, environmental and physical aspects of the effects of the four basic emergency management disciplines of analysis, preparedness, response and mitigation. It also addresses the health and safety issues of victims, responders and the community environment.

Mission and Objectives:
The A.S. in EHS program has been developed to further the knowledge base and advancement of emergency service workers such as firefighters, EMT’s, trauma and other nurses, police/sheriffs and emergency management professionals. However, the program is also of extreme value to their emerging partners in the business, public administration, healthcare and hospital administrators responsible for emergency management. Specifically, the program enables persons in the emergency services sector to gain the academic training and credentials necessary for advancement and at the same time it enhances the strategic knowledge base of the community “stake holders” that they will be interfacing with in the newly formed emergency management partnerships.

Admission Requirements:
The A.S. in EHS program at the UNC will admit applicants on the bases of their previous academic record, standardized test scores, letters of recommendation, and a personal essay. Students should possess a Secondary School Diploma or equivalent degree with good grades in physical and/or biological sciences or their equivalent in a related field. Students with a good ACT and/or SAT scores may be considered for admission based upon previous coursework or experience in related fields. Admission to the EHS program requires a 2.00 minimum grade point average in high school with reasonable objective scores. Students may need to pass an entrance examination administered by UNC where doubts exist about their ability to succeed in the EHS program.

International Students:
Non-native speakers of English must submit an official Test of English as a Foreign Language (TOEFL) score of at least 500 for the paper-and-pencil test, at least 173 for the computer-based test, or at least 61 for the Internet-based test (iBT). Students with an official Society for Testing English Proficiency (STEP) Pre-1 may also be required to take advanced ESL classes, e.g., ESL 030 Accent Modification, depending on their speaking and comprehension abilities as assessed by an English language placement examination. These English requirements are to insure that international students can benefit from online class instructions.

Mode of Instruction:
All courses are taught by faculty affiliated with UNC. The predominant mode of instruction for the EHS program utilizes online methodology. Variations in instructional methodology will depend on the nature of the individual classes, and can utilize CD-ROM, videoconferencing, live instructor led chats, and discussion room formats, as well as the traditional lecture, instructor-led discussion, seminar-style student group discussion and case history studies. The instructor monitors the students' progress through the course by a variety of evaluation methods, including: 1) attendance, 2) his/her response to on-going assignments, 3) his/her response to independent study projects, 4) course participation, 5) quizzes and examinations.

Graduation Requirements:
The A.S. in EHS is a terminal degree. At least 64 semester credit hours of formal course work must be in any A.S. degree program (including 16 units in General Education Courses) and are in accord with the curriculum below. Based on the student’s high school results or other measures, the student may be required to take additional formal course work in order to strengthen areas of perceived weakness.

EHS Program Curriculum:
The A.S. in EHS program is four semesters and 64 credits in length, consisting of 960 lecture hours and 64 weeks of instruction. Each 16-week semester consists of two modules eight weeks in length. A module is composed of two 4-credit courses. Thus, there are 4 courses per semester: two courses are taken during the semester’s first 8-week module, and two courses during the semester’s second 8-week module. All A.S. in EHS program courses are offered through an online format.

All A.S. in EHS program courses can be taken without prerequisites. A semester is equal to two modules (4 courses). A listing of the A.S. in EHS program curriculum, along with a description of each course, follows:
General Education Courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEN 120-W</td>
<td>Oral &amp; Written Communication*</td>
<td>4</td>
</tr>
<tr>
<td>GEN 220-W</td>
<td>Quantization*</td>
<td>4</td>
</tr>
<tr>
<td>GEN 320-W</td>
<td>Economic Science*</td>
<td>4</td>
</tr>
<tr>
<td>GEN 410-W</td>
<td>Political Science*</td>
<td>4</td>
</tr>
</tbody>
</table>

* These courses are considered general education courses, which may be substituted by similar courses from another approved educational institution and may be transferable to UNC.

Program Core Courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EHS 121</td>
<td>Fundamentals of Emergency Management</td>
<td>4</td>
</tr>
<tr>
<td>EHS 123</td>
<td>Fundamentals of Homeland Security</td>
<td>4</td>
</tr>
<tr>
<td>EHS 125</td>
<td>Fundamentals Incident Command System</td>
<td>4</td>
</tr>
<tr>
<td>EHS 127</td>
<td>Fundamentals of Hazard Assessment</td>
<td>4</td>
</tr>
<tr>
<td>EHS 129</td>
<td>Fundamentals of Preparedness Planning</td>
<td>4</td>
</tr>
<tr>
<td>EHS 131</td>
<td>Creating Emergency Simulations</td>
<td>4</td>
</tr>
<tr>
<td>EHS 133</td>
<td>History of Victim Care during Disasters</td>
<td>4</td>
</tr>
<tr>
<td>EHS 135</td>
<td>Providing Victim Care in the Disaster Environment</td>
<td>4</td>
</tr>
<tr>
<td>EHS 137</td>
<td>Evacuation and Sheltering</td>
<td>4</td>
</tr>
<tr>
<td>EHS 141</td>
<td>Continuing Care for Disaster Victims</td>
<td>4</td>
</tr>
<tr>
<td>EHS 143</td>
<td>Providing Care for People with Special Needs</td>
<td>4</td>
</tr>
<tr>
<td>EHS 145</td>
<td>Creating and Exercising a Profession Specific Disaster Plan</td>
<td>4</td>
</tr>
</tbody>
</table>

Recommended Course Sequence:

**Semester I**
- EHS 121 Fundamentals of Emergency Management 4 units
- EHS 123 Fundamentals of Homeland Security 4 units
- GEN 120-W Oral & Written Communication 4 units
- GEN 220-W Quantization 4 units

**Semester II**
- EHS 125 Fundamentals Incident Command System 4 units
- EHS 127 Fundamentals of Hazard Assessment 4 units
- GEN 320-W Economic Science 4 units
- GEN 410-W Political Science 4 units

**Semester III**
- EHS 129 Fundamentals of Preparedness Planning 4 units
- EHS 131 Creating Emergency Simulations 4 units
- EHS 133 History of Victim Care during Disasters 4 units
- EHS 135 Providing Victim Care in the Disaster Environment 4 units

**Semester IV**
EHS 121 Fundamentals of Emergency Management  
Credits: 4 credits  
The student will learn the history of the development of the principles of Emergency Management, the methods used for evaluation, and the application of the lessons learned to future disasters. The student will be able to understand the structure used to assess, plan for, and respond to disasters by the Federal, State and Local authorities and to make use of information generally available to the public.

EHS 123 Fundamentals of Homeland Security  
Credits: 4 credits  
The student will understand the issues of providing security while protecting the rights of citizens, permanent residents and aliens. The student will appreciate the issues of combining victim care and the need for security. The student will be introduced to the problems of providing health care during periods of quarantine and martial law.

EHS 125 Fundamentals Incident Command System  
Credits: 4 credits  
The student will understand the structure and function of the management system used to manage disaster responses. The student will learn how to identify their point of contact with disaster management officials during a disaster. The student will apply the lessons learned from disaster management to everyday operations and functions.

EHS 127 Fundamentals of Hazard Assessment  
Credits: 4 credits  
The student will be able to conduct a basic hazard assessment of their work or living environment.

EHS 129 Fundamentals of Preparedness Planning  
Credits: 4 credits  
The student will be able to create an emergency plan for themselves, their workplace, and their living environment and be able to incorporate it into existing disaster plans.

EHS 131 Creating Emergency Simulations  
Credits: 4 credits  
The student will learn the methods and procedures to plan, execute, and evaluate a simulated emergency.

EHS 133 History of Victim Care during Disasters  
Credits: 4 credits  
The student will review the lessons learned from the history of disasters.

EHS 135 Providing Victim Care in the Disaster Environment
Credits: 4 credits
The student will be able to discuss and review the problems of providing routine and critical healthcare during disasters.

EHS 137 Evacuations and Sheltering
Credits: 4 credits
The student will evaluate the issues surrounding the problems associated with evacuating and sheltering. The student will learn the procedures and methods and be able to utilize available resources to conduct a sheltering and evacuation procedure.

EHS 141 Continuing Care for Disaster Victims
Credits: 4 credits
The student will be able to discuss the issues of the long term and continuing care of disaster victims.

EHS 143 Providing Care for People with Special Needs
Credits: 4 credits
The student will be able to discuss the issues and include in the planning process the needs of special populations of handicapped or indigent individuals.

EHS 145 Creating and Exercising a Specific Disaster Plan
Credits: 4 credits
The student will create a plan for a real or fictitious living or working environment and will exercise and revise the plan.

3.2. ASSOCIATE OF SCIENCE IN MAGNETIC RESONANCE IMAGING (MRI) TECHNOLOGY

Program Description
The Associate of Science in Magnetic Resonance Imaging (MRI) Technology program prepares students to work as technologist in the medical imaging modality of Magnetic Resonance Imaging. MRI is a medical imaging procedure that utilizes a computer coupled with radio waves and a powerful magnet to create detailed images of body structures for the purpose of qualitative and quantitative diagnostic accuracy. Thus, this training program recognizes MRI as a distinct and separate medical imaging discipline, which does not necessitate that the MRI technologists also have a background in other radiologic sciences. MRI technologists are highly trained personnel who utilize multi-million dollar equipment. They must have a solid understanding of MRI safety, instrumentation, physics, cross-sectional anatomy and patient care. Through this program students obtain the knowledge base, skill set, and hands-on training necessary to safely and proficiently perform MRI examinations of the human body within a medical imaging facility. In addition to providing students with the necessary technical expertise in MRI technology, the program also trains students in compassionate and effective patient-care interactions.

Mission and Objectives
The Associate of Science in Magnetic Resonance Imaging Technology degree program prepares students for work as MRI technologists in a variety of medical settings. Completion of the Program qualifies the student to sit for the American Registry of Magnetic Resonance Imaging Technologists (ARMRIT) Examination. Successful completion of the ARMRIT Examination (see www.armrit.org) certifies the student as a qualified/competent registered MRI Technologist.

**Admission Requirements**
The A.S. in MRIT degree program at the UNC will admit applicants on the basis of their previous academic record, letters of recommendation, and a personal essay. Students must possess a high-school degree with good grades in physical and/or biological sciences or their equivalents in a related field, or present evidence of successfully passing the GED. Admission to the A.S. in MRIT degree program requires a 2.00 minimum grade point average in high school and verification of graduation in the form of a diploma or official transcript. Students who do not provide evidence of the required high school graduation, may be considered as an “Ability to Benefit Student” by passing the Wonderlic standardized entrance examination with a minimum score of 17 or the CPAe standardized entrance examination with a minimum score of 130.

**International Students**
Non-native speakers of English must submit an official Test of English as a Foreign Language (TOEFL) with a minimum score of at least 600 for the paper-and-pencil test, at least 250 for the computer-based test, or at least 100 for the Internet-based test (iBT). Students with an official Society for Testing English Proficiency (STEP) Pre-1 may also be required to take advanced ESL classes, e.g., ESL 030 Accent Modification, depending on their speaking and comprehension abilities as assessed by an English language placement examination. These English requirements are to insure that international students can benefit from online class instructions. Twenty-six percent of the A.S. in MRIT program is taught online, which equals 24 credits (six courses) of the program’s total of 62 credits.
UNC will not admit an applicant into the A.S. in MRIT program until such time that the applicant has demonstrated English proficiency as determined by the above listed TOEFL or ESL proficiency.

**Mode of Instruction**
All courses are taught by UNC faculty. The predominant mode of instruction for the MRI program utilizes a blended curriculum, incorporating residential and online instructional methodology. Variations in the instructional methodology are determined by the nature of the individual classes. Online instruction can utilize Internet, DVD, CD-ROM, videoconferencing, including live instructor led chats, and discussion room formats. Residential courses utilize the traditional lecture, discussion, seminar-style student group discussion and case history studies. The instructor monitors the students' progress through the course by a variety of evaluation methods, including: 1) attendance, 2) response to on-going assignments, 3) response to independent study projects, 4) course participation, 5) quizzes and examinations.

**Graduation Requirements**
The A.S. in MRIT degree program is a terminal degree. To graduate from the degree program, the University of Northern California requires the following level of achievement:
• 62 total semester credits of course work including all general education and core course requirements (40 lecture / online credits in general education and core courses and 22 credits of supervised clinical internship).
• Must achieve a minimum grade point average of 2.00.
• Satisfy all financial obligations to the school.

Program Curriculum
The A.S. in MRIT degree program is four semesters and 62 credits in length, consisting of 1600 clock hours (i.e., 600 lecture and 1000 clinical internship hours) and 64 weeks of instruction. The first two semesters consist of core MRI courses that are taught residentially and general education courses that are taught online. The third and fourth semesters consist of a four-day-a-week clinical internship (i.e., 32 hours per week), an online MRI Topics or Professional Development course, and a once-a-month Clinical Practices residential course.

MRI Program Curriculum: Sequencing and Credit Allocation of Classes

General Education Courses:
GEN 120-W Oral & Written Communication* 4 units
GEN 220-W Quantization* 4 units
GEN 320-W Economic Science* 4 units
GEN 410-W Political Science* 4 units

* These courses are considered general education courses, which may be substituted by similar courses from another approved educational institution and may be transferable to UNC.

Program Core Courses:
MRI 132 Principles and Physics of MRI I 3 units
MRI 133 Principles and Physics of MRI II 3 units
MRI 142 MRI/CT Cross Sectional Anatomy I 3 units
MRI 143 MRI/CT Cross Sectional Anatomy II 3 units
MRI 152 Patient Care for MRI Technologists I 2 units
MRI 154 Patient Care for MRI Technologists II 2 units
MRI 256 MRI Clinical Practices I 1 units
MRI 257 MRI Clinical Practices II 1 units
MRI 262 MRI Topics* 3 units
MRI 282 MRI Internship I** 11 units
MRI 283 MRI Internship II** 11 units
MRI 295 Professional Development for the MRI Technologist* 3 units

Total program residential, online, and internship credits = 62

* Online Internet delivered, instructor-led course

**Clinical Internship
The clinical internship is an integral component to the A.S. in MRIT degree program. Through the internship students gain hands-on experience in the daily operation of the MRI equipment, the reading of MRI images, and the performing of patient care duties. The internship is placed in the
final two semesters of the program so that students will learn the practical application of the didactic instruction they received during the first two semesters.

Research conducted by UNC shows that there are approximately 120 independent MRI clinical facilities in the bay area. UNC plans to contract with 40 clinic sites to provide training for student internships. This number of clinics is twice the number needed to accommodate the 20 students the program will admit each year, thereby assuring a sufficient number of clinics for enrolled students.

Recommended Course Sequence:

**Semester I**
- MRI 132  Principles and Physics of MRI I
- MRI 142  MRI/CT Cross Sectional Anatomy I
- GEN 120-W Oral & Written Communication
- GEN 220-W Quantization

**Semester II**
- MRI 133  Principles and Physics of MRI II
- MRI 143  MRI/CT Cross Sectional Anatomy II
- GEN 320-W Economic Science
- GEN 410-W Political Science

**Semester III**
- MRI 152  Patient Care for MRI Technologists I
- MRI 256  MRI Clinical Practices I
- MRI 262  MRI Topics*
- MRI 282  MRI Internship I**

**Semester IV**
- MRI 154  Patient Care for MRI Technologists II
- MRI 257  MRI Clinical Practices II
- MRI 283  MRI Internship II**
- MRI 295  Professional Development for the MRI Technologist*

**MRI Core Courses**
- MRI 132  Principles and Physics of MRI I
  Credits: 3 credits
  This course begins with an introduction to the role and responsibilities of the MRI technologist. The course continues with a discussion of the following areas of MRI physics: the fundamental properties of electricity, magnetism, and electromagnetism in relation to MRI imaging, including the atomic structure, especially the nucleus and its properties that are of specific interest to MRI; the interaction between the atomic nucleus and the static magnetic, gradient magnetic, and RF fields of an MRI imager; and net magnetization, precession, and resonance. The course also presents information dealing with the purpose and function of MRI system components for the safe and effective performance of MRI examinations, as well as the interactions of the electromagnetic fields with metal objects and with the human body.

- MRI 133  Principles and Physics of MRI II
Credits: 3 credits
This course is a continuation of MRI 132 with lectures covering: the fundamental MRI principles of resonance and the relaxation of hydrogen protons after RF excitation; spin echo, gradient echo, and inversion recovery pulse sequences; the interactions between pulse sequence parameters and their effects on image contrast, signal-to-noise ratio (SNR), and scan time; explanations of basic pulse sequence diagrams, and; spatial localization of the MR signal. Safe and effective performances of MRI examinations are reviewed. (prerequisite: MRI 132)

MRI 142 MRI/CT Cross Sectional Anatomy I
Credits: 3 credits
MRI technologists are required to use anatomical knowledge on a daily basis. They use their knowledge of cross sectional anatomy in at least three ways:
1. To position the patient correctly within the magnet.
2. To ensure that the images show the anatomy of interest.
3. They review the images during the acquisition to look for pathology.
This course is taught directly from actual MRI and CT cross section images. Both normal and pathological images are utilized, allowing the student to recognize the difference. Students will be responsible for recognizing all relevant anatomical structures in all multi-planar directions and oblique. The course includes MRI case studies; MRI positioning; MRI terminology; cranial anatomy and anatomical structures of neck, and spine; presentation and application of MRI, and; biologic effects of MRI.

MRI 143 MRI/CT Cross Sectional Anatomy II
Credits: 3 credits
This course is a continuation of MRI 142. Emphasis is placed on students recognizing the anatomic structuring of the abdomen, pelvis, and extremities in cross section. The course utilizes actual MRI and CT images and includes MRI case studies; MRI positioning; MRI terminology; comparison of normal anatomy with pathology, and; biologic effects of MRI. (pre-requisite: MRI 142)

MRI 152 Patient Care for MRI Technologists I
Credits: 2 credits
The MRI technologist is required to communicate effectively with the patient, answer questions, assure the safety of the patient, and make the patient comfortable throughout the exam. Students learn in this course how to provide basic patient care in the MRI environment. The course is divided into two parts. During the first semester an emphasis is placed on general patient care skills relevant to all health care workers, including: patient rights, privacy issues and other ethical concerns; universal precautions and infection control; proper body mechanics and lifting techniques, and; empathetic communication skills.

MRI 154 Patient Care for MRI Technologists II
Credits: 2 credits
This course is a continuation of MRI 152 and includes specific application of patient care skills to the MRI clinical setting. Additional emphasis is placed on preparation of the student for clinical internship responsibilities. Students learn: how to prepare a patient for an MRI exam; patient assessment protocols; safety issues for MRI patients; and emergency procedures specifically related to a MRI imagine facility. Students are also trained in basic first aid and cardiac life support methods. (Prerequisite: MRI 152)
MRI 262  MRI Topics*
Credits: 3 credits
The first half of the course introduces students to current trends and research in the field of MRI imaging. During the last half of the course, students present research and report on an MRI topic of personal interest to their classmates.

MRI 295  Professional Development for the MRI Technologist*
Credits: 3 credits
This course includes an overview of job-hunting skills, including techniques of presentation, advertising, resume writing, job interviewing skills, and the integration of sound business practices for the MRI Technologist. Students also develop and present their personal philosophy of their role and responsibilities in working in the healthcare field. Mock interviews will be scheduled during a time that students are already at UNC for their residential MRI 257 course.

MRI 256  MRI Clinical Practices I
Credits: 1 credit
Students meet once a month to discuss their clinical internship experiences, present case studies, and review basic patient care and communication skills. (To be taken in conjunction with MRI 282)

MRI 257  MRI Clinical Practices II
Credits: 1 credit
Students meet once a month to discuss their clinical internship experiences, present case studies, and review basic patient care and communication skills. In addition, the course includes a basic program review to help prepare students for the ARMIRT licensing exam. (To be taken in conjunction with MRI 283)

MRI 282  MRI Internship I
Credits: 11 credits
This course provides the student with practical hands-on experience working in an MRI imaging facility, which enables the student to put into practice the learning and theory gained from the classroom during the previous two semesters. The student completes 500 hours of the required total 1000 hours of clinical internship during this course. (Prerequisite: successful completion of Semester One and Two course work)

MRI 283  MRI Internship II
Credits: 11 credits
This course is a continuation of MRI 152 and enables students to further master the skills and techniques required of MRI Technologists. Students complete the final 500 hours of the required 1000 hours of clinical internship experience. (Prerequisite: successful completion of MRI 282)

3.3. BACHELOR OF ARTS IN APPLIED LINGUISTICS

Program Description:
The Applied Linguistics major is offered through the University of Northern California’s School of Languages and Linguistics. Applied Linguistics majors may choose to specialize in Language Science or in Language Pedagogy, by tailoring their selection of upper-division electives to their particular interests and career goals. A major in Applied Linguistics provides an excellent foundation for students wishing to specialize in any of a vast array of fields, including the teaching of languages, translation and interpretation, speech-language pathology, communication, cognitive science, psycholinguistics, neurolinguistics, sociolinguistics or semiotics.

Mission and Objectives:
Opportunities for study in Applied Linguistics are offered to all University students, who are strongly encouraged to further their knowledge of the complexities of the structure and function of human language, the biological and psychological bases of language, theories, philosophies and research methodologies relevant to the study of language, and second language acquisition and teaching methodologies.

Admission Requirements:
The B.A. in Applied Linguistics degree program at the UNC will admit applicants on the basis of their previous academic record, letters of recommendation, and a personal essay. Students must have completed a secondary educational program equivalent to that required for a high school diploma in the United States. The University of Northern California welcomes students who wish to transfer from other institutions of higher learning. Entrance examination scores on the Scholastic Aptitude Test (SAT) or the American College Test (ACT) are preferred for students who have completed less than 24 transferable units of college level study.

International Students:
Non-native speakers of English must submit an official Test of English as a Foreign Language (TOEFL) score of at least 500 for the paper-and-pencil test, at least 173 for the computer-based test, or at least 61 for the Internet-based test (iBT). Students with an official Society for Testing English Proficiency (STEP) Pre-1 may also be required to take advanced ESL classes, e.g., ESL 030 Accent Modification, depending on their speaking and comprehension abilities as assessed by an English language placement examination.

Mode of Instruction:
Applied Linguistics majors are strongly encouraged to work closely with faculty members in the selection of elective courses. Opportunities for contact with and observation of professional engaged in applied linguistics professions off-campus may be arranged for advanced Applied Linguistics majors as part of their curriculum.

Graduation Requirements:
To receive this degree a student must complete 128 units of postsecondary instruction as follows:

- 32 General Education
- 42 Core Courses of Applied Linguistics
- 32 Other electives

Program Curriculum:
General Education Courses:
GEN 110-W Concurrent Education* 4 units
GEN 120-W Oral & Written Communication* 4 units
GEN 210-W Humanities I* 4 units
GEN 220-W Quantitation* 4 units
GEN 310-W Social Science* 4 units
GEN 320-W Economic Science* 4 units
GEN 410-W Political Science* 4 units
GEN 420-W Humanities II* 4 units
* These courses are considered general education courses, which may be substituted by similar courses from another approved educational institution and may be transferable to UNC.

Core Courses of Applied Linguistics:
APL 110-W Introduction to Linguistics 3 units
APL 120-W Phonology 3 units
APL 210-W Child Language Acquisition 3 units
APL 220-W Seminar in Cross-Cultural Communications 3 units
APL 310-W Introduction to Communication Disorders 3 units
APL 320-W Experimental Methods of Statistics for Language Science Research 3 units
APL 410-W Psycholinguistics 3 units
APL 420-W Neurolinguistics 3 units
APL 430-W Second Language Pedagogy 3 units
APL 440-W Advanced Independent Readings in Language Science 1 to 3 units
APL 450-W Field Observation in Language Science 1 to 3 units
APL 460-W Advanced Independent Research in Language Science 1 to 3 units

Additionally, Applied Linguistics majors must earn at least 12 units in the study of a modern language other than English. At UNC, it will be Chinese. Students, who wish to study other languages in a certificate program, may do so by arrangements with nearby academic institutions.

Recommended Course Sequence:
Semester I
GEN 110-W Concurrent Education
APL 110-W Introduction to Linguistics
APL 120-W Phonology
CHI 110 Beginning Chinese I

Semester II
GEN 120-W Oral & Written Communication
APL 220-W Seminar in Cross-Cultural Communications
APL 310-W Introduction to Communication Disorders
CHI 111 Beginning Chinese II
CHI 112 Beginning Chinese III

Semester III
GEN 210-W Humanities I
APL 310-W Introduction to Communication Disorders
APL 320-W Experimental Methods of Statistics for Language Science Research
CHI 210 Intermediate Chinese I
CHI 211 Intermediate Chinese II

Semester IV
GEN 420-W Humanities II
APL 410-W Psycholinguistics
APL 420-W Neurolinguistics
CHI 212 Intermediate Chinese III
CHI 310 Conversational Chinese I

Semester V
GEN 220-W Quantitation
APL 430-W Second Language Pedagogy
APL 440-W Advanced Independent Readings in Language Science
CHI 311 Conversational Chinese II

Semester VI
GEN 310-W Social Science
APL 450-W Field Observation in Language Science
CHI 320-W Chinese Composition I
CHI 321-W Chinese Composition II

Semester VII
GEN 320-W Economic Science
APL 460-W Advanced Independent Research in Language Science
CHI 330-W Chinese Dialects
CHI 430 Special Topics in Chinese Language, Literature and Civilization
CHI 410-W Advanced Independent Research in Language Science

Semester VIII
GEN 410-W Political Science
CHI 420-W The Art and Science of Translation (Chinese-English/English-Chinese)
CHI 440-W Advanced Independent Readings in Chinese
CHI 450 Field Observation in the Teaching of Chinese
CHI 460 Field Experience in the Teaching of Chinese

Applied Linguistics Program Core Course Descriptions:
APL 110-W Introduction to Linguistics
Credits: 3 units
An introduction to the philosophical, historical, analytical, anthropological and scientific study of language.
APL 120-W Phonology  
Credits: 3 units  
An introduction to the philosophical, analytical, anthropological and scientific study of language.

APL 210-W Child Language Acquisition  
Credits: 3 units  
An exploration of the normal development of language in children, encompassing psychological, sociological, and neurological theories of the acquisition of many aspects of linguistic and metalinguistic competence in children across cultures.  
Prerequisite: APL 110, Introduction to Linguistics

APL 220-W Seminar in Cross-Cultural Communication  
Credits: 3 units  
A practical course in socio-linguistics including the study of dialects, sociolinguistics, linguistic prejudice, theories of linguistic differences between genders, cross-cultural differences in language and use, and the politics of language.  
Prerequisite: APL 110, Introduction to Linguistics

APL 310-W Introduction to Communication Disorders  
Credits: 3 units  
Examination of child, adolescent and adult disorders of speech and language. An introduction to the theory and practice of prevention and treatment of speech and language disorders.  
Prerequisite: APL 110, Introduction to Linguistics

APL 320-W Experimental Methods and Statistics for Language Science Research  
Credits: 3 units  
An introduction to experimental design, hypothesis testing, probability theory, parametric and non-parametric statistics for research in the language sciences.  
Prerequisite: APL 110, Introduction to Linguistics

APL 410-W Psycholinguistics  
Credits: 3 units  
Examination of theories and research regarding language and the mind. Models of human information processing and studies of the relationship between language and cognition are explored.  
Prerequisite: APL 110, Introduction to Linguistics

APL 420-W Neurolinguistics  
Credits: 3 units  
Exploration of the biological foundations of human language. Theories and research regarding the relationship between language function, brain structure, and models of information processing in the brain. Includes an introduction to instrumentation for the study of brain structure and function.
Prerequisite: APL 110, Introduction to Linguistics

APL 430-W Second Language Pedagogy
Credits: 3 units
Exploration of theories of second language acquisition and the history of second language pedagogy practice and research with particular emphasis on developing student’s appreciation for the importance of communicative competence as the focus of language teaching. Includes the study of: individual differences in second language learning, issues in foreign language competency assessment and test design, lesson planning, classroom management and class dynamics, specific foreign language teaching techniques, and the study of teaching of English as a second or foreign language.
Prerequisites: APL 110, Introduction to Linguistics, and competency in at least one foreign language (study beyond the intermediate level as defined in modern language course descriptions).

APL 440-W Advanced Independent Readings in Language Science
Credits: 1 to 3 units
Students independently propose and follow an approved ‘contract’ with the instructor for readings, discussion and independent written assignments relevant to a specific topic in sociolinguistics, psycholinguistics, neurolinguistics, and/or second language acquisition.
Prerequisites: APL110, Introduction to Linguistics and at least two other upper-division courses in Applied Linguistics, and prior approval of the instructor.

APL 450-W Field Observation in Language Science
Credits: 1 to 3 units
Opportunities for individual students to observe professionals engaged in an aspect of language science of particular interest to themselves. Students independently propose and follow an approved ‘contract’ with the instructor and with an off-campus language science professional.
Prerequisite: APL110, Introduction to Linguistics and at least two other upper-division courses in Applied Linguistics and prior approval of the instructor.

APL 460-W Advanced Independent Research in Language Science
Credits: 1 to 3 units
Students independently propose and follow a ‘contract’ with the instructor for the development and completion of an empirical research project relevant to a specific topic in sociolinguistics, psycholinguistics, neurolinguistics, second language acquisition or speech-language pathology.
Prerequisite: APL 110, Introduction to Linguistics, APL320, Experimental Methods and Statistics for Language Science Research, at least two other upper-division courses in Applied Linguistics and prior approval of the instructor.

3.4. BACHELOR OF ARTS IN CHINESE

Program Description:
The global community is growing ever closer. There are global problems to solve, goods to trade, technology to share and cultural wealth to enjoy. People are becoming increasingly mobile and
open to new ideas and they need each other more and more. Communication is a key that will open worlds. It is one of the keys to peace, successful trade and to improving the quality of life.

Being proficient in more than one language gives tremendous joy. Bilingual and multilingual people enjoy dimensions, which enrich their lives in many ways. They also have tools that allow them to participate more fully in the global community.

The UNC School of Languages offers a B.A. degree program in Chinese (Mandarin and/or Cantonese). Additionally, it has intensive proficiency-based courses in Chinese (Mandarin and/or Cantonese), Japanese, French, Spanish, Dutch, German and Russian. Students can study a combination of languages, one language intensively, or one language on a part-time basis.

The UNC Faculty assists students with appropriate placement in language courses on an individual basis. Proficiency levels for the language courses described in the following pages are defined according to the standards of the American Council on the Teaching of Foreign Languages.

**Mission and Objectives:**
There is a wide variety of careers in which second language skills are either a prerequisite or an essential asset. International commerce, the media, public relations, government, the travel industry, teaching, interpreting and translating is just a few of the opportunities open to bilingual or multilingual individuals. Additionally, hiring preference may be given to a candidate who is proficient in another language, even when second language fluency is not a prerequisite.

**Curriculum and Instruction**

The School of Languages at the University of Northern California offers modern language instruction with the aim of communicative competence integrated with a deep appreciation for the cultural and interpersonal contexts in which each language is used. The University’s modern language faculty is committed to quality teaching of languages through effective, innovative, interactive approaches with an emphasis on the active use of language in communicative contexts.

All aspects of language proficiency are taught: speaking, reading, writing and listening comprehension. While reading and writing assignments are given as homework, class time is mainly devoted to developing oral skills. Students are constantly encouraged to speak the target language in a great variety of situations created by their instructors. Considerable time is spent practicing grammatical constructions to enable students to communicate correctly and easily. Pronunciation is taught thoroughly so that students speak with a pleasant accent. Literature is introduced as an effective means of expanding vocabulary, improving fluency and becoming intimate with the relevant cultures. However, there is less emphasis on literature and history in UNC language programs than at many institutions.

**Admission Requirements:**
The B.A. in CHINESE degree program at the UNC will admit applicants on the basis of their previous academic record, letters of recommendation, and a personal essay. Students must have completed a secondary educational program equivalent to that required for a high school diploma in the United States. The University of Northern California welcomes students who wish to transfer from other institutions of higher learning. Entrance examination scores on the Scholastic Aptitude
Test (SAT) or the American College Test (ACT) are preferred for students who have completed less than 24 transferable units of college level study.

**International Students:**
Non-native speakers of English must submit an official Test of English as a Foreign Language (TOEFL) score of at least 500 for the paper-and-pencil test, at least 173 for the computer-based test, or at least 61 for the Internet-based test (iBT). Students with an official Society for Testing English Proficiency (STEP) Pre-1 may also be required to take advanced ESL classes, e.g., ESL 030 Accent Modification, depending on their speaking and comprehension abilities as assessed by an English language placement examination.

**Mode of Instruction:**
Lecture, class participation, language laboratory experiences, films, audio and video analysis, participation in supplemental special interest reading groups, conversation groups and field observations and field experiences.

**Graduation Requirements:**
To receive this degree a student must complete 128 units of postsecondary instruction as follows:

<table>
<thead>
<tr>
<th>Units</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>General Education</td>
</tr>
<tr>
<td>42</td>
<td>Core Courses of Applied Linguistics</td>
</tr>
<tr>
<td>32</td>
<td>Other electives</td>
</tr>
</tbody>
</table>

**Program Curriculum:**
General Education Courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEN 110-W</td>
<td>Concurrent Education*</td>
<td>4</td>
</tr>
<tr>
<td>GEN 120-W</td>
<td>Oral &amp; Written Communication*</td>
<td>4</td>
</tr>
<tr>
<td>GEN 210-W</td>
<td>Humanities I*</td>
<td>4</td>
</tr>
<tr>
<td>GEN 220-W</td>
<td>Quantitation*</td>
<td>4</td>
</tr>
<tr>
<td>GEN 310-W</td>
<td>Social Science*</td>
<td>4</td>
</tr>
<tr>
<td>GEN 320-W</td>
<td>Economic Science*</td>
<td>4</td>
</tr>
<tr>
<td>GEN 410-W</td>
<td>Political Science*</td>
<td>4</td>
</tr>
<tr>
<td>GEN 420-W</td>
<td>Humanities II*</td>
<td>4</td>
</tr>
</tbody>
</table>

*These courses are considered general education courses, which may be substituted by similar courses from another approved educational institution and may be transferable to UNC.

Program Core Courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHI 110</td>
<td>Beginning Chinese I</td>
<td>2</td>
</tr>
<tr>
<td>CHI 111</td>
<td>Beginning Chinese II</td>
<td>2</td>
</tr>
<tr>
<td>CHI 112</td>
<td>Beginning Chinese III</td>
<td>2</td>
</tr>
<tr>
<td>CHI 210</td>
<td>Intermediate Chinese I</td>
<td>3</td>
</tr>
<tr>
<td>CHI 211</td>
<td>Intermediate Chinese II</td>
<td>3</td>
</tr>
<tr>
<td>CHI 212</td>
<td>Intermediate Chinese III</td>
<td>3</td>
</tr>
<tr>
<td>CHI 310</td>
<td>Conversational Chinese I</td>
<td>3</td>
</tr>
<tr>
<td>CHI 311</td>
<td>Conversational Chinese II</td>
<td>3</td>
</tr>
<tr>
<td>CHI 320-W</td>
<td>Chinese Composition I</td>
<td>3</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Units</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>CHI 321-W</td>
<td>Chinese Composition II</td>
<td>3</td>
</tr>
<tr>
<td>CHI 330-W</td>
<td>Chinese Dialects</td>
<td>3</td>
</tr>
<tr>
<td>CHI 410-W</td>
<td>Advanced Independent Research in Language Science</td>
<td>3</td>
</tr>
<tr>
<td>CHI 420-W</td>
<td>The Art and Science of Translation (Chinese-English/English-Chinese)</td>
<td>3</td>
</tr>
<tr>
<td>CHI 430</td>
<td>Special Topics in Chinese Language, Literature and Civilization</td>
<td>3</td>
</tr>
<tr>
<td>CHI 440-W</td>
<td>Advanced Independent Readings in Chinese</td>
<td>3</td>
</tr>
<tr>
<td>CHI 450</td>
<td>Field Observation in the Teaching of Chinese</td>
<td>1-3</td>
</tr>
<tr>
<td>CHI 460</td>
<td>Field Experience in the Teaching of Chinese</td>
<td>1-3</td>
</tr>
</tbody>
</table>

**Elective Courses:**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>APL 110-W</td>
<td>Introduction to Linguistics</td>
<td>3</td>
</tr>
<tr>
<td>APL 120-W</td>
<td>Phonology</td>
<td>3</td>
</tr>
<tr>
<td>APL 210-W</td>
<td>Child Language Acquisition</td>
<td>3</td>
</tr>
<tr>
<td>APL 220-W</td>
<td>Seminar in Cross-Cultural Communications</td>
<td>3</td>
</tr>
<tr>
<td>APL 310-W</td>
<td>Introduction to Communication Disorders</td>
<td>3</td>
</tr>
<tr>
<td>APL 320-W</td>
<td>Experimental Methods of Statistics for Language Science Research</td>
<td>3</td>
</tr>
<tr>
<td>APL 410-W</td>
<td>Psycholinguistics</td>
<td>3</td>
</tr>
<tr>
<td>APL 420-W</td>
<td>Neurolinguistics</td>
<td>3</td>
</tr>
<tr>
<td>APL 430-W</td>
<td>Second Language Pedagogy</td>
<td>3</td>
</tr>
<tr>
<td>APL 440-W</td>
<td>Advanced Independent Readings in Language Science</td>
<td>1-3</td>
</tr>
<tr>
<td>APL 450-W</td>
<td>Field Observation in Language Science</td>
<td>1-3</td>
</tr>
<tr>
<td>APL 460-W</td>
<td>Advanced Independent Research in Language Science</td>
<td>1-3</td>
</tr>
</tbody>
</table>

**Recommended Course Sequence:**

**Semester I**

- GEN 110-W Concurrent Education
- CHI 110 Beginning Chinese I
- CHI 111 Beginning Chinese II
- CHI 112 Beginning Chinese III
- APL 110-W Introduction to Linguistics
- APL 120-W Phonology

**Semester II**

- GEN 120-W Oral & Written Communication
- CHI 210 Intermediate Chinese I
- CHI 211 Intermediate Chinese II
- CHI 212 Intermediate Chinese III
- APL 220-W Seminar in Cross-Cultural Communications
- APL 310-W Introduction to Communication Disorders

**Semester III**

- GEN 210-W Humanities I
- CHI 310 Conversational Chinese I
- CHI 311 Conversational Chinese II
- APL 310-W Introduction to Communication Disorders
APL 320-W Experimental Methods of Statistics for Language Science Research

Semester IV
GEN 420-W Humanities II
CHI 320-W Chinese Composition I
CHI 321-W Chinese Composition II
APL 410-W Psycholinguistics
APL 420-W Neurolinguistics

Semester V
GEN 220-W Quantitation
CHI 330-W Chinese Dialects
CHI 430 Special Topics in Chinese Language, Literature and Civilization
APL 430-W Second Language Pedagogy

Semester VI
GEN 310-W Social Science
CHI 410-W Advanced Independent Research in Language Science
CHI 420-W The Art and Science of Translation (Chinese-English/English-Chinese)
APL 440-W Advanced Independent Readings in Language Science

Semester VII
GEN 320-W Economic Science
CHI 440-W Advanced Independent Readings in Chinese
CHI 450 Field Observation in the Teaching of Chinese
APL 450-W Field Observation in Language Science

Semester VIII
GEN 410-W Political Science
CHI 460 Field Experience in the Teaching of Chinese
APL 460-W Advanced Independent Research in Language Science

Courses in Chinese:
CHI 110 Beginning Chinese I
Credits: 2 units
Introduction to the Chinese language, with an emphasis on the contextual use of Chinese for listening, speaking, reading and writing, and cultural understanding of the Chinese-speaking world. The use of Pinyin, a system for romanizing Chinese characters, for pronunciation. History of Chinese character formation from pictograms to ideograms. Intensive language laboratory requirement. Students are expected to attain a novice midlevel of competency in reading, writing, speaking and listening comprehension in Chinese upon completion of this course. No prior study of Chinese is assumed.

CHI 111 Beginning Chinese II
Credits: 2 units
Intermediate introduction to Chinese, with an emphasis on the contextual use of Chinese for listening, speaking, reading and writing, and cultural understanding of the Chinese-speaking world.
Includes intensive language laboratory requirement. Students are expected to attain a novice high level of competency in reading, writing, speaking and listening comprehension in Chinese upon completion of this course.
Prerequisite: CHI 110, Beginning Chinese I, or prior approval of the instructor.

CHI 112 Beginning Chinese III
Credits: 2 units
Advanced introduction to the Chinese language, with an emphasis on the contextual use of Chinese for listening, speaking, reading and writing, and cultural understanding of the Chinese-speaking world. Includes language laboratory requirement. Students are expected to attain intermediate low-to-mid levels of competency in reading, writing, speaking and listening comprehension in Chinese upon completion of this course.
Prerequisite: CHI 111, Beginning Chinese II, or prior approval of the instructor

CHI 210 Intermediate Chinese I
Credits: 2 units
Emphasis on continued expansion of student’s speaking, listening, reading and writing competence in Chinese and enrichment of student’s understanding of Chinese culture. Includes language laboratory requirement. Students are expected to attain an intermediate mid level of competency in reading, writing, speaking and listening comprehension in Chinese upon completion of this course.
Prerequisite: CHI 111, Beginning Chinese II, or prior approval of the instructor

CHI 211 Intermediate Chinese II
Credits: 2 units
Emphasis on continued expansion of student’s speaking, listening, reading and writing competence in Chinese and enrichment of student’s understanding of Chinese culture. Includes language laboratory requirement. Students are expected to attain an intermediate-high level of competency in reading, writing, speaking and listening comprehension in Chinese upon completion of this course.
Prerequisite: CHI 111, Intermediate Chinese I, or prior approval of the instructor

CHI 212 Intermediate Chinese II
Credits: 2 units
Emphasis on continued expansion of student’s speaking, listening, reading and writing competence in Chinese and enrichment of student’s understanding of Chinese culture. Includes language laboratory requirement. Students are expected to attain an advanced-low level of competency in reading, writing, speaking and listening comprehension in Chinese upon completion of this course.
Prerequisite: CHI 211, Intermediate Chinese II, or prior approval of the instructor

CHI 310 Conversational Chinese I
Credits: 3 units
Advanced practice in Chinese listening and speaking skills. The use of Pinyin in the pronunciation of Mandarin Chinese. An emphasis is placed on enhancing student’s confidence in interpersonal
communication in Chinese, with a focus on the expansion of student’s knowledge of Chinese vocabulary and idioms, on increased conversational fluency, and on nonverbal and cultural skills that will enhance student’s use of the Chinese language. Students are expected to attain an advanced-low level of competency in speaking and listening comprehension in Chinese upon completion of this course.

Prerequisite: CHI 212, Intermediate Chinese III, or prior approval of the instructor

CHI 311 Conversational Chinese II  
Credits: 3 units  
Continued advanced practice in Chinese listening and speaking skills. An emphasis is placed on enhancing student’s confidence in interpersonal communication in Chinese, with a focus on the expansion of student’s knowledge of Chinese idioms and vocabulary, on increased conversational fluency and on nonverbal and cultural skills that will enhance student's use of the Chinese language. Students are expected to attain an advanced level of competency in speaking and listening comprehension in Chinese upon completion of this course.

Prerequisite: CHI 310, Conversational Chinese I, or prior approval of the instructor

CHI 320-W Chinese Composition I  
Credits: 3 units  
Advanced practice in Chinese writing, grammar and stylistics for functional use of written Chinese. Students are expected to attain an advanced level of competency in writing in Chinese upon completion of this course.

Prerequisite: CHI 212, Intermediate Chinese III, or prior approval of the instructor

CHI 321-W Chinese Composition II  
Credits: 3 units  
Continued advanced practice in Chinese writing, grammar and stylistics for functional use of written Chinese. Students are expected to attain an advanced-plus level of competency in writing in Chinese upon completion of this course.

Prerequisite: CHI 212, Intermediate Chinese II, or prior approval of the instructor

CHI 330-W Chinese Dialects  
Credits: 3 units  
An introductory exploration of history, literature and civilization of the Chinese-speaking world. The unity of written Chinese and the diversity of its dialects. Introduction of Cantonese, Sichuanese and other major dialects.

Prerequisite: CHI 311, Chinese Conversation II and CHI 321, Chinese Composition II, or prior approval of the instructor

CHI 410-W The Art and Science of Translation (Chinese-English/English-Chinese)  
Credits: 3 units  
Multiple aspects of Chinese and English stylistics are compared and contrasted. ‘Rules’ and linguistic equivalences are explored and balanced by experiences to develop student’s appreciation for the ‘art’ of effective translation. Includes training in the analysis and application of specific translation techniques.
Prerequisite: CHI 311, Chinese Conversation II and CHI 321, Chinese Composition II, or prior approval by the instructor

CHI 420-W Introduction to Chinese Literature
Credits: 3 units
Readings and discussion of classic literary works in Chinese. Specific topics to be announced by the instructor, as the content of this course will vary.
Prerequisite: CHI 311, Chinese Conversation II and CHI 321, Chinese Composition II, or prior approval of the instructor

CHI 430-W Special Topics in Chinese Language, Literature and Civilization
Credits: 3 units
Advanced reading, writing and discussion in Chinese. Specific topic to be announced by instructor, as content of this course will vary. May be taken repeatedly for credit when course content is not similar to that of previous CHI 430-W offerings in which the student has enrolled.
Prerequisite: CHI 420-W, Introduction to Chinese Literature

CHI 440-W Advanced Independent Readings in Chinese
Credits: 1 to 3 units
Students independently propose and follow a ‘contract’ with the instructor for readings, discussion and independent written assignments relevant to a specific theme in Chinese-speaking literature or civilization.
Prerequisites: CHI 311, Chinese Composition II and CHI 321, Chinese Conversation II, and prior approval of the instructor

CHI 450 Field Observation in the Teaching of Chinese
Credits: 1 to 3 units
Students observe and analyze the active teaching of Chinese, on or off campus. Written assignments required. May be taken repeatedly for credit.
Prerequisite: Prior approval of the instructor, and successful completion of, or concurrent enrollment in CHI 410, Second Language Pedagogy

CHI 460 Field Experience in the Teaching of Chinese
Credits: 1 to 3 units
Students actively participate in supervised, applied teaching or tutoring programs in Chinese, on or off campus. Written assignments required. May be taken repeatedly for credit.
Prerequisite: Prior approval of the instructor, and CHI 450, Field Observation in the Teaching of Chinese.

THE UNC/TLI STUDY ABROAD PROGRAM
University of Northern California is a particularly good place to study Chinese, not only because the UNC Chinese Language Program is excellent, but also because it is a place where you inevitably get to know people from various parts of China. UNC has a large contingent of Chinese students with whom you will interact at meals, recreational activities, etc. You can receive a Bachelor’s Degree in Chinese Language and practice speaking Chinese with native speakers without leaving the UNC campus. And for complete immersion in Chinese language and culture,
consider UNC’s Study Abroad Program in partnership with the Taipei Language Institute in Taipei and Beijing.

Through immersion in a society that is vastly different from your own, you will experience firsthand the customs, values and way of life, which will place your own in perspective. China is widely acknowledged to be the future engine for economic growth in the Pacific Rim region. In recent years, China’s opening to the outside world spearheads the emergence of unprecedented opportunities. Understanding the language and culture will give you an edge in a variety of professional fields, including technology, trade and finance. Beijing, Shanghai, Hong Kong and Taipei serve as centers for the vast majority of China’s national and international business. Students who are interested in careers in international trade can use UNC’s Study Abroad Program as an opportunity to establish important contacts and increase awareness of how the Chinese function in the global community. Through the UNC/TLI Study Abroad Program you can enjoy an intensive Chinese language training experience with a blend of traditional Chinese culture. There is no better time for going to China to immerse oneself in the life, language and culture of the Chinese. China is emerging as a world economic and political power, which is already playing a critical role in determining the future of Asia and the 21st-century world. In partnership with the Taipei Language Institute, the University of Northern California works closely with its second- and third-year Chinese Language majors to identify their academic goals and design a one-year study abroad program that will assist them in realizing those goals.

Students enrolled in the University of Northern California’s Bachelors Degree program in Chinese Language are encouraged to complete their second or third year of coursework at the Taipei Language Institute either in Taiwan or the Chinese Language Center in Beijing. Twenty-four units of credit will be granted by UNC toward the completion of the remaining upper division requirements. The Chair of the Languages Department at the University of Northern California, in consultation with the Taipei Language Institute, has designed a student-specific curriculum and cultural immersion experience to insure that students are provided with a plan of study consistent with their educational objectives and the mission of the Department.

3.5. BACHELOR OF SCIENCE IN OPTICAL & PHOTONIC ENGINEERING

Program Description:
Optics is a branch of physics concerned with the study of light, its production, propagation, measurement, and properties. The application of optical science and mathematics by which the properties of matter and energy are made useful to people is the province of the Optical & Photonic Engineer.

During the past 30 years, three major developments are responsible for renaissance of optics and its increasing importance in modern technology: 1) the invention of the laser, 2) the fabrication of the low-loss optical fibers and 3) the advent of semiconductor optical devices. In recent years, the term, photonics, was coined, in analogy with electronics, to reflect the growing ties between optics and electronics. Electronics involves the flow of electrons and photonics, the flow of photons. The two disciplines are intertwined since often electrons control the flow of photons and vice-versa.
The design and manufacture of complex and sophisticated optical devices in the generation, transmission, modulation, amplification and detection of light is the job of the Optical & Photonic Engineer.

**Mission and Objectives:**
Every day, new applications of optical & photonic engineering are found in biomedical engineering, optical communications, signal analysis & processing, computing, sensing, display, printing, and energy transport. The optics industry is experiencing a shortage of skilled optical & photonic technicians, engineers and scientists. Biomedical optics is a booming field: laser surgery, computer-aided tomography (CT), magnetic-resonance imaging (MRI) & positron emission tomography (PET) technology, digital monitoring of life support systems, non-invasive equipment for fetal monitoring and glucose testing, and the optical detection of cancers and tumors. The international space program is built around the importance of photonics. With new designs for telescopes and other imaging systems, we are learning about our universe and are applying that knowledge to improve discovery and innovation. Computer technology is another growing and in-demand optical & photonic specialty. In the near future, conventional computer technology will have exhausted its ability to build smaller and smaller chips to perform its work, so we are looking to optical technology -- specifically quantum physics -- for solutions. In theory, a quantum computer could simultaneously perform a thousand billion billion billion different computations. Salaries in the optics industry are extraordinarily high and jobs are plentiful for the well-qualified optical and photonic technicians and engineers.

**Admission Requirements:**
The B.S. in Optical & Photonic Engineering degree program at the UNC will admit applicants on the basis of their previous academic record, letters of recommendation, and a personal essay. Students must have completed a secondary educational program equivalent to that required for a high school diploma in the United States. The University of Northern California welcomes students who wish to transfer from other institutions of higher learning. Entrance examination scores on the Scholastic Aptitude Test (SAT) or the American College Test (ACT) are preferred for students who have completed less than 24 transferable units of college level study. Students applying for this program should have completed high school courses in algebra and trigonometry. A student without this background in mathematics may be admitted conditionally, with the requirement that he/she successfully complete MAT100 (Algebra and Trigonometry) within one year of admission.

**International Students:**
Non-native speakers of English must submit an official Test of English as a Foreign Language (TOEFL) score of at least 500 for the paper-and-pencil test, at least 173 for the computer-based test, or at least 61 for the Internet-based test (iBT). Students with an official Society for Testing English Proficiency (STEP) Pre-1 may also be required to take advanced ESL classes, e.g., ESL 030 Accent Modification, depending on their speaking and comprehension abilities as assessed by an English language placement examination.
Mode of Instruction:
The mode of instruction varies depending on the nature of the individual classes, and is based on traditional lecture, instructor-led discussion, seminar-style student group discussion, laboratory projects.

Graduation Requirements:
To receive a bachelor’s degree from the University of Northern California, a student must complete the following:

1. A minimum of 128 total semester hours including all general education and major requirement.
2. A minimum of 32 semester hours at UNC.
3. A minimum of 44 semester hours of core courses study.
4. A student in Optical & Photonic Engineering must complete 32 semester hours in the field of which 16 must be core courses study.

Program Curriculum:
Students enjoy close working relationships with the faculty, promoted by small class size and joint research and design projects. The core curriculum provides students with the necessary foundation of knowledge in the discipline. The general education courses are followed by a series of required and/or elective classes that allow students to focus on the essential foundations of optical & photonic engineering. The students in optical & photonic engineering are strongly encouraged to work closely with faculty members in the selection of elective courses.

Optics & Photonics Research Laboratory
Pentium IV computers, 100 x to 1000 x medical grade microscope, black and white CCD camera, color camera, HeNe laser, laser diode, photo detector, lenses, optical rails, optical cube beam splitter, opto-mechanical holders, linear translation and rotation stages, oscilloscopes, image processing software, optical tables, 3-D camera system and optical power meter system.

General Education Courses:
<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEN 110-W</td>
<td>Concurrent Education*</td>
<td>4</td>
</tr>
<tr>
<td>GEN 120-W</td>
<td>Oral &amp; Written Communication*</td>
<td>4</td>
</tr>
<tr>
<td>GEN 210-W</td>
<td>Humanities I*</td>
<td>4</td>
</tr>
<tr>
<td>GEN 220-W</td>
<td>Quantization*</td>
<td>4</td>
</tr>
<tr>
<td>GEN 310-W</td>
<td>Social Science*</td>
<td>4</td>
</tr>
<tr>
<td>GEN 320-W</td>
<td>Economic Science*</td>
<td>4</td>
</tr>
<tr>
<td>GEN 410-W</td>
<td>Political Science*</td>
<td>4</td>
</tr>
<tr>
<td>GEN 420-W</td>
<td>Humanities II*</td>
<td>4</td>
</tr>
<tr>
<td>GEN 510-W</td>
<td>History and Philosophy of Science*</td>
<td>3</td>
</tr>
</tbody>
</table>

* These courses are considered general education courses, which may be substituted by similar courses from another approved educational institution and may be transferable to UNC.
Program Core Courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPE 100</td>
<td>Introduction to Laser Sciences</td>
<td>3 units</td>
</tr>
<tr>
<td>OPE 102</td>
<td>Laser Optics</td>
<td>4 units</td>
</tr>
<tr>
<td>OPE 110</td>
<td>Holography</td>
<td>3 units</td>
</tr>
<tr>
<td>OPE 204</td>
<td>Diffraction Optics</td>
<td>4 units</td>
</tr>
<tr>
<td>OPE 206</td>
<td>Basic Opto-Electronics</td>
<td>4 units</td>
</tr>
<tr>
<td>OPE 208</td>
<td>Radiometry &amp; Photometry</td>
<td>3 units</td>
</tr>
<tr>
<td>OPE 302</td>
<td>E-M Wave Foundations of Optics</td>
<td>3 units</td>
</tr>
<tr>
<td>OPE 310</td>
<td>Fiber Optical Communications</td>
<td>3 units</td>
</tr>
<tr>
<td>OPE 314</td>
<td>Optical &amp; Photonic Engineering Mathematics</td>
<td>4 units</td>
</tr>
<tr>
<td>OPE 320</td>
<td>Optical System Design</td>
<td>4 units</td>
</tr>
<tr>
<td>OPE 410</td>
<td>Thin Film Optics</td>
<td>3 units</td>
</tr>
<tr>
<td>OPE 420</td>
<td>Advanced Optical System Design</td>
<td>3 units</td>
</tr>
<tr>
<td>OPE 424</td>
<td>Advanced Diffraction Optics</td>
<td>3 units</td>
</tr>
<tr>
<td>OPE 440</td>
<td>Optical Shop Testing and Measurement</td>
<td>4 units</td>
</tr>
<tr>
<td>OPE 480</td>
<td>Senior Projects in Optical &amp; Photonic Engineering (Variable)</td>
<td>12-15 units</td>
</tr>
</tbody>
</table>

Elective Courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHE 110</td>
<td>Introduction to Inorganic Chemistry</td>
<td>4 units</td>
</tr>
<tr>
<td>ENC 120</td>
<td>Engineering II</td>
<td>3 units</td>
</tr>
<tr>
<td>ENC 310</td>
<td>Electric Circuits</td>
<td>4 units</td>
</tr>
<tr>
<td>MAT 110</td>
<td>Differential Calculus</td>
<td>3 units</td>
</tr>
<tr>
<td>MAT 111</td>
<td>Integral Calculus</td>
<td>4 units</td>
</tr>
<tr>
<td>MAT 210</td>
<td>Differential Equations</td>
<td>4 units</td>
</tr>
<tr>
<td>MAT 310</td>
<td>Vector Calculus</td>
<td>4 units</td>
</tr>
<tr>
<td>MAT 410</td>
<td>Introduction to Biostatistics</td>
<td>4 units</td>
</tr>
<tr>
<td>PHY 110</td>
<td>Introduction to Mechanics</td>
<td>4 units</td>
</tr>
<tr>
<td>PHY 111</td>
<td>Introduction to Electricity &amp; Magnetism &amp; Heat</td>
<td>4 units</td>
</tr>
</tbody>
</table>

Recommended Course Sequence:

**Semester I**
- OPE 100 Introduction to Laser Sciences
- OPE 110 Holography
- MAT 110 Differential Calculus
- ENC 120 Engineering II
- GEN 110-W Concurrent Education*

**Semester II**
- OPE 102 Laser Optics
- ENC 310 Electric Circuits
- MAT 111 Integral Calculus
- GEN 120-W Oral and Written Communication*

**Semester III**
- OPE 204 Diffraction Optics
- OPE 208 Radiometry & Photometry
PHY 110 Introduction to Mechanics
GEN 210-W Humanities I*

Semester IV
OPE 206 Basic Opto-Electronics
MAT 210 Differential Equations
PHY 111 Introduction to Electricity & Magnetism & Heat
GEN 220 Quantitation*

Semester V
OPE 320 Optical System Design
CHE 110 Introduction to Inorganic Chemistry
OPE 314 Advanced Mathematics for Optical Engineers or
MAT 310 Vector Calculus
GEN 310-W Social Science*

Semester VI
OPE 302 E-M Wave Foundations of Optics
OPE 310 Fiber Optical Communications
MAT 410 Introduction to Biostatistics
GEN 320-W Economic Science*
GEN 420-W Humanities II or electives*

Semester VII
OPE 420 Advanced Optical System Design
OPE 440 Optical Shop Testing and Measurement
OPE 424 Advanced Diffraction Optics
GEN 410-W Political Science*
OPE 410 Thin Film Optics

Semester VIII
OPE 480 Senior Projects in Optical & Photonic Engineering (Variable)
GEN 510-W History & Philosophy of Science

B.S. in Optical & Photonic Engineering Program Core Course Descriptions:
OPE 100 Introduction to Laser Sciences
Credits: 3 Credits
Elements, classifications and operation of light amplification by stimulated emission of radiation. Optical power measurements, theory of light, operating modes, coherence, gas laser case studies, safety. GEPS.

OPE 102 Laser Optics
Credits: 4 Credits
OPE 110 Holography
Credits: 3 Credits

OPE 204 Diffraction Optics
Credits: 4 Credits
Standard laser instruments and measurement techniques: spectral measurements, interferometric measurement, and spatial resolutions. Lab.

OPE 206 Basic Optic-Electronics
Credits: 4 Credits
Theory and operation of devices to measure laser output parameters, manipulate laser beams, and to modulate lasers. Applications of lasers by specialized groupings. Lab.

OPE 208 Radiometry & Photometry
Credits: 3 Credits
Basic relationships and the mathematics of optical radiation and opto-electronics. Photometric and radiation units. Radiation sources, types of detectors, measurements and applications.

OPE 302 E-M Wave Foundation of Optics
Credits: 3 Credits

OPE 310 Fiber Optical Communications
Credits: 3 Credits

OPE 314 Optical & Photonic Engineering Mathematics
Credits: 4 Credits
Mathematical methods of solution for geometrical optics, optical imaging, and diffraction optics problems. Includes ordinary and partial differential equations, matrices operations, complex analytic functions, sequences and series, probability and statistics, Fourier series, and transforms in optical applications. Prerequisite: MAT 210, co-requisite: MAT 310.

OPE 320 Optical System Design
Credits: 4 Credits
Optical system and configuration design procedures for various types of lenses, mirrors, catadiptic laser electro-optics and telescope systems. Lab.
OPE 410 Thin Film in Optics  
Credits: 3 Credits  
Optics of dielectric layers and basic design units. Optics of metals systems of layers, general theorems and metal/dielectric design units. Synthesis of tuned multilayers, inhomogeneous layers and thick layer consideration.

OPE 420 Advanced Optical System Design  
Credits: 3 Credits  
Advanced systems consideration and design. Optimization techniques and image evaluation in Code V. Laser raster output scanner system, optical disk system, imaging spectrometer system, gradient index optical system, holographic optical elements system design, MTF analysis. LAB Prerequisite: OPE 320.

OPE 424 Advanced Diffraction Optics and Optical Signal Processing  
Credits: 3 Credits  
Diffraction studies with application using Fourier Synthesis techniques. Constructs theory of image formation, optical data processing, and holography based upon diffraction and Fourier series. Stresses practical design applications of theory.

OPE 440 Optical Testing and Measurement  
Credits: 4 Credits  
General concepts and procedures utilized in optical testing and measurements with emphasis on individual components and complete lenses or systems. Lab.

OPE 480 Senior Project in Optical & Photonic Engineering  
Credits: 12-15 Credits  
Individual project for senior Optical & Photonic Engineering students. Projects include laboratory studies, engineering design projects analysis and simulation, embedded computer software development and basic research.

3.6. MASTER OF ARTS IN APPLIED LINGUISTICS [TEACHING ENGLISH TO SPEAKERS OF OTHER LANGUAGES (TESOL)]

Program Description:  
The University of Northern California offers coursework leading to a Master of Arts Degree in Applied Linguistics with a concentration in Teaching English to Speakers of Other Languages (MAAL/TESOL).

The MAAL/TESOL prepares both native English speakers and nonnative English speakers to teach English as a second or foreign language. Students will gain an understanding of the linguistic structure of English, current theories about how languages are learned and taught, and about linguistic and cultural diversity in the English-speaking world. An important aspect of the program is ongoing field experience, which will allow students to directly apply what they are learning.
The program is on an intensive one-year schedule, requiring full-time enrollment. Students who need to attain the required level of English before beginning the M.A. program will need an additional quarter or semester of study.

Mission and Objectives:
Opportunities for study in Applied Linguistics are offered to all University students, who are strongly encouraged to further their knowledge of the complexities of the structure and function of human language, the biological and psychological bases of language, theories, philosophies and research methodologies relevant to the study of language, and second language acquisition and teaching methodologies.

Admission Requirements:
The M.S. program in Applied Linguistics with a concentration in Teaching English to Speakers of Other Languages at the University of Northern California admits applicants on the basis of their previous academic record, standardized test scores, letters of recommendation, and a personal essay. Students must possess a Bachelor’s degree in Applied Linguistics or in its equivalent in a related field. Students with a Master’s degree in other fields may be considered for admission based upon previous coursework or experience in the related fields. Admission to the M.S. program requires a 3.00 minimum grade point average in previous undergraduate and/or professional studies.

International Students:
Non-native speakers of English must submit either an official Test Of English as a Foreign Language (TOEFL) must be at least 500 for the paper-and-pencil test, at least 173 for the computer-based test, or at least 61 for the Internet-based test (iBT). For other students, a minimum score of 640 in the Japanese Society for Testing English Proficiency, Inc. (STEP) is required. In either case, the UNC ESL faculty will test international students for their speaking, listening, reading and writing abilities upon their arrival before they are allowed to enroll in regular university classes. For those students with ESL deficiencies, they must successfully complete ESL 003 at UNC, in order to enroll in courses other than ESL.

Mode of Instruction:
Applied Linguistics majors are strongly encouraged to work closely with faculty members in the selection of elective courses. Opportunities for contact with and observation of professional engaged in applied linguistics professions off-campus may be arranged for advanced Applied Linguistics majors as part of their curriculum.

Graduation Requirements:
The M.S. in Applied Linguistics is a terminal degree. At least 30 credit hours of formal course work must be post Bachelor’s (or equivalent), and, if so desired, up to 9 credit hours can be in M.S. thesis research. A 3.00 minimum grade point average must be maintained throughout M.S. course studies. Upon completion of some course work and upon the advisor’s recommendation, students
may opt to write their 3-9 credit-hour M.S. research thesis. The student must submit a prospectus to his/her M.S. thesis committee for approval before beginning his/her research work. Upon completion of the thesis research, the student must successfully defend his/her thesis at the final examination.

**Program Curriculum:**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>APL 470</td>
<td>Introduction to Linguistics for Teachers of English to Speakers of Other Languages (ESOL)</td>
<td>3</td>
</tr>
<tr>
<td>APL 480-W</td>
<td>Sociolinguistics for ESOL Teachers</td>
<td>3</td>
</tr>
<tr>
<td>APL 490-W</td>
<td>Intercultural Communication</td>
<td>3</td>
</tr>
<tr>
<td>APL 500-W</td>
<td>Theories and Methods in Teaching English to Speakers of Other Languages</td>
<td>3</td>
</tr>
<tr>
<td>APL 510-W</td>
<td>First and Second Language Acquisition</td>
<td>3</td>
</tr>
<tr>
<td>APL 520</td>
<td>English Syntax for ESOL Teachers</td>
<td>3</td>
</tr>
<tr>
<td>APL 530</td>
<td>Materials Development</td>
<td>3</td>
</tr>
<tr>
<td>APL 540</td>
<td>Teaching Oral Communication</td>
<td>3</td>
</tr>
<tr>
<td>APL 550</td>
<td>Teaching Literacy</td>
<td>3</td>
</tr>
<tr>
<td>APL 560</td>
<td>Classroom Research Practicum</td>
<td>3</td>
</tr>
<tr>
<td>APL 570</td>
<td>Teaching Practicum</td>
<td>3</td>
</tr>
</tbody>
</table>

**Recommended Course Sequence:**

**Semester I**

- APL 470 Introduction to Linguistics for Teachers of English to Speakers of Other Languages (ESOL)
- APL 480-W Sociolinguistics for ESOL Teachers
- APL 490-W Intercultural Communication

**Semester II**

- APL 500-W Theories and Methods in Teaching English to Speakers of Other Languages
- APL 510-W First and Second Language Acquisition
- APL 520 English Syntax for ESOL Teachers

**Semester III**

- APL 530 Materials Development
- APL 540 Teaching Oral Communication
- APL 550 Teaching Literacy

**Semester IV**

- APL 560 Classroom Research Practicum
- APL 570 Teaching Practicum
- APL 610 M.S. Thesis Research

**Applied Linguistics (TESOL) Program Core Course Description:**
APL 470 Introduction to Linguistics for Teachers of English to Speakers of Other Languages (ESOL)
Credits: 3 units
Introduction to the theories and methods of contemporary linguistics relevant to teachers of English to speakers of other languages. Includes study of phonetics, phonology, morphology, syntax, semantics, typology, and pidgins and creoles.

APL 480-W Sociolinguistics for ESOL Teachers
Credits: 3 units
Examination of some current issues involving particular social and cultural concerns of language use relevant to teachers of English to speakers of other languages. Includes study of dialect variation, social and cultural attitudes towards language, and bilingualism and multilingualism.

APL 490-W Intercultural Communication
Credits: 3 units
An exploration of the relationship between communication and culture and the development of intercultural communicative competence.

APL 500-W Theories and Methods in Teaching English to Speakers of Other Languages
Credits: 3 units
An introduction to theories of second language acquisition, various teaching approaches and teaching methodologies for teachers of English as a second or foreign language.

APL 510-W First and Second Language Acquisition
Credits: 3 units
An introduction to theories of first and second language acquisition, with an emphasis on classroom learning and child bilingualism.
Prerequisite: APL 470, Introduction to Linguistics for ESOL Teachers

APL 520 English Syntax for ESOL Teachers
Credits: 3 units
An introduction to the syntactic structure of English, with special emphasis on areas relevant to learners of English as a second or foreign language.
Prerequisite: APL 470, Introduction to Linguistics for ESOL Teachers (may be taken concurrently)

APL 530 Materials Development
Credits: 3 units
The design, development, evaluation, and adaptation of materials for language instruction. Also covered are needs analysis, syllabus design, and lesson planning, as well as practical techniques for presentation and practice of language structure and functions.
Prerequisite: APL 500, Theories and Methods in TESOL (may be taken concurrently)

APL 540 Teaching Oral Communication
Credits: 3 units
Theories and methods for development of listening and speaking skills, including a variety of
instructional strategies, activities, and materials for teaching pronunciation, speaking, and listening. Focus on effective ways to facilitate oral communication practice in a variety of group and cooperative learning formats.
Prerequisite: APL 500, Theories and Methods in TESOL (may be taken concurrently)

APL 550 Teaching Literacy
Credits: 3 units
Theories and methods for development of developing reading and writing skills, including a variety of instructional strategies, activities, and materials for teaching reading and writing. Also covered are assessment of literacy skills, materials evaluation and adaptation, and vocabulary/grammar development in literacy instruction.
Prerequisite: APL 520, English Syntax for ESOL Teachers (may be taken concurrently)

APL 560 Classroom Research Practicum
Credits: 3 units
Practicum in designing and implementing a classroom research project, including analysis and report of the results.

APL 570 Teaching Practicum
Credits: 3 units
Ongoing observation of an English as a Second Language classroom, followed by preparation and teaching of a lesson. Lesson will be observed and videotaped for an evaluation session.

3.7. EXECUTIVE MASTER OF BUSINESS ADMINISTRATION IN BIOMEDICINE

Program Description:
All business, whether private or public, uses the principles of modern management to plan, administer, produce and market goods and services. The global community is growing ever closer. International trade and its management is one of the pillars of this globalization drive. The Executive MBA graduate degree program provides its students with a solid and fundamental understanding of the various functions of modern business and then emphasizes these principles and techniques to international trade where culture, language, politics and economics are crucial to success.

Mission and Objectives:
The Executive MBA in Biomedicine program at the University of Northern California is designed to serve the growing numbers of managers, biomedical engineers and technologists that require state-of-the-art business education and acumen in the biomedical arena. It also serves as a cross-over degree for those engineers, biologists, and medical professionals in related disciplines that wish to move into a business-oriented career in biomedicine.
Admissions Requirements:
The Executive MBA program in business administration at the University of Northern California admit applicants on the bases of their previous academic record, standardized test scores, e.g., GMAT, GRE, letters of recommendation, and a personal essay. Students should possess a Bachelor’s degree or its equivalent in related fields such as BBA, B.S. in engineering etc. Students with a Master’s degree in other fields may be considered for admission based upon previous coursework or experience in related fields. Students must have a 3.00 minimum grade point average in previous graduate programs to qualify for admission to the Executive MBA degree program.

International Students
Non-native speakers of English must submit either an official Test Of English as a Foreign Language (TOEFL) must be at least 500 for the paper-and-pencil test, at least 173 for the computer-based test, or at least 61 for the Internet-based test (iBT). For other students, a minimum score of 640 in the Japanese Society for Testing English Proficiency, Inc. (STEP) is required. In either case, the UNC ESL faculty will test international students for their speaking, listening, reading and writing abilities upon their arrival before they are allowed to enroll in regular university classes. For those students with ESL deficiencies, they must successfully complete ESL 003 at UNC, in order to enroll in courses other than ESL.

Mode of Instruction:
The mode of instruction varies depending on the nature of the individual classes, and is based on traditional lecture, instructor-led discussion, seminar-style student group discussion and case history studies.

Graduation Requirements
The Executive MBA degree is a terminal degree. At least 30 credit hours of formal course work must be post Bachelor’s (or equivalent). Based on the student’s undergraduate results or other measures, the student’s graduate committee may require additional formal course work in order to strengthen areas of perceived weakness.

A 3.00 minimum grade point average must be maintained throughout Executive MBA studies. Upon completion of the course work and upon the advisor’s recommendation, students are admitted to their qualifying examination. The verbal qualifying examination is to insure that the student has the comprehensive knowledge of international trade to function in that arena. Requirements for Executive MBA generally can be completed in about 3-4 trimesters or one plus calendar year(s) beyond the Bachelor’s degree. The Executive MBA is designed to prepare the student to be a management service provider of distinction.

Program Curriculum:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MGT 500</td>
<td>Management Accounting</td>
<td>3</td>
</tr>
<tr>
<td>MGT 510</td>
<td>Management Economics and Decision Models</td>
<td>3</td>
</tr>
<tr>
<td>MGT 520</td>
<td>Financial Management, Strategy and Policy</td>
<td>3</td>
</tr>
<tr>
<td>MGT 530</td>
<td>Business Management and Entrepreneurship</td>
<td>3</td>
</tr>
<tr>
<td>MGT 540</td>
<td>Marketing Management in Biomedicine</td>
<td>3</td>
</tr>
<tr>
<td>MGT 550</td>
<td>Statistics &amp; Management of Information Systems</td>
<td>3</td>
</tr>
</tbody>
</table>
MGT 560  International Marketing in Biomedicine  3 units
MGT 570  International Business in Biomedicine  3 units
MGT 580  International Business Management in Biomedicine  3 units
MGT 590  Graduate Project  3 units
MGT 600  Entrepreneurship in Biomedical Engineering  3 units
MGT 610  Win-Win Vendor Management in Biomedicine  3 units

Elective Courses:
Any student in the Executive MBA in Biomedicine program may, with the approval of the Chair of the Department, elect to enroll in courses other than those given above. For example, any Executive MBA in Biomedicine student may choose to enroll in MGT 600: Entrepreneurship in Biomedical Engineering and MGT 610: Win-Win Vendor Management, and High Performance Leadership. Students interested in research may choose to take the series in research methodology, i.e., MAT 410: Introduction to Biostatistics and MAT 420: Design and Analysis of Experiments.

Recommended Course Sequence:
Semester I
MGT 500 Management Accounting
MGT 510 Management Economics and Decision Models
MGT 520 Financial Management, Strategy and Policy
MAT 410: Introduction to Biostatistics

Semester II
MGT 530 Business Management and Entrepreneurship
MGT 560 International Marketing in Biomedicine
MGT 570 International Business in Biomedicine
MAT 420: Design and Analysis of Experiments

Semester III
MGT 540 Marketing Management in Biomedicine
MGT 550 Statistics & Management of Information Systems
MGT 580 International Business Management in Biomedicine

Semester IV
MGT 610 Win-Win Vendor Management in Biomedicine
MGT 600 Entrepreneurship in Biomedical Engineering
MGT 590 Graduate Project

Executive MBA in Biomedicine Core Courses Descriptions:
MGT 500 Management Accounting
Credit: 3 Credits
The applications of appropriate techniques and concepts in processing historical and projected economic data to assist managers to plan, control, and make decisions for business. Selected topics include reading financial statements, relevant revenue and cost analysis as well as contribution margins.
MGT 510 Management Economics and Decision Models  
Credit: 3 Credits  
This course enhances students understanding of economic analysis to managerial decision-making. The focus is on the crucial role of the manager in the context of economics. Topics covered are optimization techniques, supply and demand theory, demand estimation, business and economic forecasting, theory of production and cost, market structures, risk analysis and capital budgeting, and government-business relations.

MGT 520 Financial Management, Strategy and Policy  
Credit: 3 Credits  
This course provides students with first-hand experience in applying the tools and techniques from financial management to business decision-making and strategy formulation. This is accomplished by emphasizing a problem-solving approach to the study of key financial concepts. Topics include techniques of financial analysis, working capital management, capital budgeting, and short and long-term sources of capital.

MGT 530 Business Management and Entrepreneurship  
Credit: 3 Credits  
Comprehensive overview of management functions and processes from a systems perspective. Framework for macro-level trade-offs among and between competing economic, social, ethical, political and legal forces. The major functions of planning, organizing, leading and controlling will be examined. Primary focus will be on organizational climate and performance. This course provides a global outlook to prospective managers, with topics including organizational goal setting and planning, decision-making, structural designs, teamwork, and communication and process improvement.

MGT 540 Marketing Management in Biomedicine  
Credit: 3 Credits  
Comprehensive overview of the fundamental principles of global marketing management. Topics include marketing concepts and market coverage strategies, strategic planning, marketing environment, and market segmentation, targeting and positioning. The individual elements of the marketing mix are discussed from a domestic and global point of view. Particular attention will be focused on biomedical products present special problems as health care systems differ greatly from the developed world to the developing and underdeveloped world as well as from country to country. Case histories will be used to illustrate the global marketing management in biomedicine.

MGT 550 Statistics & Management of Information Systems  
Credit: 3 Credits  
This course presents fundamental concepts that all managers need for the effective use and management of information technology in the business environment. Topics include basic technology concepts, data communications and networking, role of information in organizations, impact of telecommunications, information flow, strategic uses of information technology, acquisition of technology, implications of end-user computing management, and control of information systems.

MGT 560 International Marketing in Biomedicine
Credit: 3 Credits
Study of opportunities, distinctive characteristics, and emerging trends in foreign markets. This course includes an exploration of alternative methods and control; impact of social, cultural, economic, and political strategies; organizational planning differences; and problems of adapting American marketing concepts and methods to foreign markets. The marketing of biomedical products present special problems as health care systems differ greatly from the developed world to the developing and underdeveloped world as well as from country to country.

MGT 570 International Business in Biomedicine
Credit: 3 Credits
The study of international business by integrating theory, policy and application and using this knowledge to understand how business firms function in a global setting. Topics include the new theories of international trade and different types of investment, exchange rates, international finance, government intervention in trade and investment, and the role of global institution in promoting world trade and trade blocs. Biomedical products present special business problems as health care systems differ greatly from the developed world to the developing and underdeveloped world as well as from country to country. Government interventions are particularly strong where health and safety issues are concerned.

MGT 580 International Business Management in Biomedicine
Credit: 3 Credits
In this course, the student will learn to consolidate the diverse strands of international business theory into a coherent synthesis that is the essential foundation for effective business action. Through use of the case method, the course stresses the application of international business theory to the solution of real-world business problems. Case histories will be used to illustrate the global business management in biomedicine.

MGT 590 Graduate Project
Credit: 3 Credits
Introduction to the sequence of steps followed during the identification and delineation of a research project that leads to successful development of a Graduate Project for Master of Business Administration degree study. The complete research project includes introduction, review of literature, research methodology, analysis and findings and, conclusion and recommendation.

Elective Courses
Any student in the Executive MBA program may, with the approval of the Chair of the Department, elect to enroll in courses other than those given above. For example, any Executive MBA student may choose to enroll in BME 530 Entrepreneurship in Biomedical Engineering. Students interested in research may choose to take the series in research methodology, i.e., MAT 410 Introduction to Biostatistics and MAT 420 Design and Analysis of Experiments.

3.8. MASTER OF SCIENCE IN BIOMEDICAL ENGINEERING

Program Description:
The past five decades have seen tremendous growth of technological activity in biology and medicine. Engineers are increasingly becoming involved in the life and health sciences.
Accordingly, they have a great need to become more familiar with these fields in order for them to apply the tools of engineering and physics to biology and medicine. Conversely, students of biomedicine are required to become conversant with physics, mathematics and engineering in addition to chemistry. Recognition of this need brought about the emergence of a new interdisciplinary engineering activity known as biomedical engineering that was designed to bridge the gaps between life sciences, medicine and engineering.

**Mission and Objectives:**
The goal of graduate studies at the M.S. levels is to educate students in the disciplines of biomedical engineering. The goal is to enable students to use contemporary methods at an advanced level for a professional career in biomedical engineering design, development, and research.

Each student’s course of study is based on individual background, career objectives and sound academic practice. Department and faculty members have teaching and research expertise in areas of biomechanics (biosolid and biofluid mechanics), biomaterials, biomedical image analysis, bioinstrumentation, biophotonics, therapeutic biomedical devices, tissue engineering and biosystems.

The various branches of Biomedical Engineering are concerned with fields such as biomechanics, biomaterials, biomedical electronics, medical imaging, medical instrumentation, biochemical engineering and tissue engineering. The undergraduate and graduate degree programs of the University of Northern California prepare our students for careers in medicine and medical instrumentation, diagnostic aids, tissue engineering, safety engineering, rehabilitation engineering, life support systems, human-machine systems, prosthetics and orthotics. Graduates can find employment in the biomedical device industry and/or biotechnology. Graduates may also pursue careers in government, e.g., Veterans Administration, National Institutes of Health, Environmental Protection Agency, Food and Drug Administration, and Centers for Disease Control. Many biomedical engineering graduates elect to continue their formal education in the engineering, dental, medical or legal professions.

**Admission Requirements:**
The M.S. program in Biomedical Engineering at the University of Northern California admits applicants on the basis of their previous academic record, standardized test scores, letters of recommendation, and a personal essay. Students must possess a Bachelor’s degree in Engineering or in its equivalent in a related field such as mathematical or physical sciences. Students with a Master’s degree in other fields may be considered for admission based upon previous coursework or experience in the related fields. Admission to the M.S. program requires a 3.00 minimum grade point average in previous undergraduate and/or professional studies.

**International Students:**
Non-native speakers of English must submit either an official Test Of English as a Foreign Language (TOEFL) must be at least 500 for the paper-and-pencil test, at least 173 for the computer-based test, or at least 61 for the Internet-based test (iBT). For other students, a minimum score of 640 in the Japanese Society for Testing English Proficiency, Inc. (STEP) is required. In either case, the UNC ESL faculty will test international students for their speaking, listening,
reading and writing abilities upon their arrival before they are allowed to enroll in regular university classes. For those students with ESL deficiencies, they must successfully complete ESL 003 at UNC, in order to enroll in courses other than ESL.

**Mode of Instruction:**
The mode of instruction varies depending on the nature of the individual classes, and is based on traditional lecture, instructor-led discussion, seminar-style student group discussion, laboratory projects and investigations leading to completion of M.S. thesis research project, if appropriate.

**Graduation Requirements:**
The M.S. in biomedical engineering requires a minimum of 30 units of course work and research beyond the bachelor’s level. Students may choose either a thesis or non-thesis program; the latter must include six unit hours of 400-600 level courses. Students who choose the thesis program may count between six and nine unit hours for thesis research towards satisfying the 30-semester hour M.S. degree requirement. The M.S. degree may be a terminal degree or an intermediate step toward a Ph.D. degree. A tentative plan of study for each student is worked out through consultation with an adviser. The department chair appoints an M.S. committee of at least three graduate faculty advisers, including at least two from the biomedical engineering faculty. The committee reviews the student’s plan of study before the student has completed 18 hours of required course work. The plan of study is then submitted for review to the department chair. To earn the M.S., students are required to attain a 3.00 minimum grade-point average on a minimum of 30 semester hours of graduate work, and to complete successfully the final examination by their committee. The requirements for the M.S. degree may be completed in one calendar year consisting of 3 trimesters. However, students with Research or Teaching Assistantship duties may need up to two academic years to complete the degree.

**Program Curriculum:**
Students in the M.S. program follow a curriculum of at least 30 credit hours that is designed in consultation with an advisor. Each M.S. student is required to complete at least two of the following courses as part of his/her curriculum.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATHEMATICS 410</td>
<td>Introduction to Biostatistics (3 credits)</td>
<td></td>
</tr>
<tr>
<td>MATHEMATICS 420</td>
<td>Design and Analysis of Experiments (3 credits)</td>
<td></td>
</tr>
<tr>
<td>BIOMEDICAL ENGINEERING 530</td>
<td>Advanced Biomechanics (3 units)</td>
<td></td>
</tr>
<tr>
<td>BIOMEDICAL ENGINEERING 620</td>
<td>Advanced Cardiovascular Biomechanics (3 units)</td>
<td></td>
</tr>
<tr>
<td>BIOMEDICAL ENGINEERING 630</td>
<td>Biological Systems Analysis II (3 units)</td>
<td></td>
</tr>
</tbody>
</table>

**Program Core Courses:**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BME 310 I</td>
<td>Medical Terminology for Biomedical Engineers</td>
<td>3 units</td>
</tr>
<tr>
<td>BME 310 II</td>
<td>Anatomy &amp; Physiology for Biomedical Engineers</td>
<td>3 units</td>
</tr>
<tr>
<td>BME 320</td>
<td>Introduction to Biomechanics</td>
<td>3 units</td>
</tr>
<tr>
<td>BME 410</td>
<td>Biological Systems Analysis I</td>
<td>3 units</td>
</tr>
</tbody>
</table>
Recommended Course Sequence:

Semester I
BME 310 I Medical Terminology for Biomedical Engineers
BME 310 II Anatomy & Physiology for Biomedical Engineers

Semester II
MAT 410 Introduction to Biostatistics
BME 410 Biostatistics
BME 320 Introduction to Biomechanics

Semester III
MAT 420 Design and Analysis of Experiment
BME 530 Advanced Biomechanics
BME 580 Curriculum Practical Training in Biomedical Engineering

Semester IV
BME 410 Advanced Cardiovascular Biomechanics
BME 580 Curriculum Practical Training in Biomedical Engineering

M. S. in Biomedical Engineering Program Core Course Descriptions:
BME 310 I Medical Terminology for Biomedical Engineers
Credits: 3 units
Cell function, organ systems, and principles of functional anatomy. Open only to biomedical engineering students.
Prerequisites: Consent of course instructor

BME 310 II Anatomy & Physiology for Biomedical Engineers
Credits: 3 units
Cell function, organ systems, and principles of functional anatomy. Open only to biomedical engineering students.
Prerequisites: Consent of course instructor

BME 320 Introduction to Biomechanics
Credits: 3 units
Principles of solid mechanics applied to biomedical systems: emphasis on analytical and experimental applications to the human musculoskeletal system.
Prerequisite: ENC 330, Dynamics, and ENC 230, Mechanics of Deformable Bodies
Corequisite: BME 310 II, Anatomy and Physiology for Biomedical Engineers
BME 330 Biotransport Processes  
Credits: 3 units  
Application of momentum, heat and mass transfer principles to biological systems; fluid mechanics of time dependent flows in the human circulatory system, heat exchange between the biological system and its environment, mass transfer in membranes.  
Prerequisite: ENC 370 Fluid Mechanics, and BME 310 II, Anatomy and Physiology for Biomedical Engineers  
BME 340 Cardiovascular Biomechanics  
3 units  
Anatomy and physiology of the human circulatory system, pressure-flow relationship in arteries, elastic properties of the arterial wall, pulsatile flow dynamics, flow dynamics past valve prostheses, flow through capillaries, force velocity studies of the heart muscle, force-deformation analysis of left ventricle, application of imaging techniques on left ventricular dynamics.  
Prerequisites: ENC 230, Mechanics of Deformable Bodies, ENC 370, Fluid Mechanics, and BME 310 II Anatomy and Physiology for Biomedical Engineers

BME 410 Biological Systems Analysis I  
Credits: 3 units  
Principles of linear control systems theory applied to the analysis of biological systems. Development of computer simulation techniques to study the dynamic response of physiological systems.  
Prerequisite: BME 310, Anatomy/Physiology & Medical Terminology for Biomedical Engineers  
ENC 360, Linear Systems Analysis

BME 420 Biomaterials  
Credits: 4 units Material properties, biocompatibility characteristics, performance requirements of materials for in vivo implants.  
Prerequisite: CHE 110, Introduction to Inorganic Chemistry  
Corequisite: BME 310, Anatomy/Physiology & Medical Terminology for Biomedical Engineers

BME 430 Biomedical Measurements I  
Credits: 3 units  
Concepts of analog and digital circuit design, with emphasis on circuits for biomedical applications using operational amplifiers, active filter, data acquisition, conversion and interface to microcomputers; patient safety; clinical circuits; laboratory project.  
Prerequisite: ENC 350, Principles of Electronic Instrumentation  
Corequisite: BME 310 II, Anatomy and Physiology for Biomedical Engineers

BME 440 Biomedical Engineering Systems Design  
Credits: 3 units  
Design of system elements; prostheses; biomaterials; case study of biomechanical systems, computer-aided design methods, design of sub-systems, product reliability, medicolegal considerations.  
Prerequisite: ENC 410, Principles of Design I  
Corequisite: BME 420, Biomaterials, and BME 430, Biomedical Measurements I
BME 450 Biomechanics of Orthopedic Devices
Credits: 3 units
Functional anatomy, pathomechanics of the appendicular musculoskeletal system; contemporary total hip, total knee designs; endoprosthesis fixation techniques; shoulder, elbow, wrist, finger reconstructive implants; bio-mechanics of fracture healing, fracture stabilization implants; external fixators. Prerequisite: ENC 330, Dynamics, and ENC 230, Mechanics of Deformable Bodies
Corequisite: BME 310 II, Anatomy and Physiology for Biomedical Engineers
BME 460 Biomedical Engineering Design Project
Credits: 3 units
Creative design projects, usually involving actual current problems in biomedical engineering; projects are interdisciplinary, including both engineering and health science cooperation. Emphasizes the practice of concurrent engineering. Prerequisite: BME 440, Biomedical Engineering Systems Design, and senior standing. May be taken repeatedly for credit.

BME 470 Biomechanics of Aging
Credits: 3 units
Techniques to quantify biomechanical/bioelectrical characteristics of hard and soft tissues in aging; kinematics, kinetics of body segments during daily activities, effect of age on hard and soft tissues, joints, nervous system, hearing, vision, cardiovascular system, spine; surgical procedures to alleviate pain and restore joint functions; preventive measures to reduce fracture. Prerequisite: ENC 330, Dynamics
Corequisite: BME 310 II, Anatomy and Physiology for Biomedical Engineers

BME 480 Optical Engineering in Biomedicine
Credits: 3 units
Introduction of optical and photonic engineering to biomedicine. Concepts of interference and coherence, Fourier transform and Fourier optics, image and signal processing, holography, fiber optics, lasers, instrumentation. Case study in biomedical optics. Prerequisite: PHY111, Introduction to Electricity & Magnetism, MAT 210, Differential Equations

BME 510 Individual Investigations in Biomedical Engineering
Credits: By arrangement with instructor
Individual projects for biomedical engineering graduate students. Investigations could be: laboratory studies, engineering design projects, analysis and simulation of a bioengineering system, computer software development, research. Prerequisite: Consent of instructor. May be taken repeatedly for credit.

BME 520 Biomedical Engineering Graduate Labs
Credits: 3-9 units
Introduction to the research laboratories associated with faculty members of the Department of Biomedical Engineering; laboratory experience in cardiovascular and respiratory control, hemodynamics, biomaterials, biomechanics and biomedical image analysis and processing. Graduate standing required. Prerequisite: BME 310 II, Anatomy and Physiology for Biomedical Engineers, senior/graduate-student standing
BME 530 Advanced Biomechanics  
Credits: 3 units  
Anatomy and physiology of the human musculoskeletal system; biomechanical bases of joint degeneration; mechanical properties of hard and soft tissues; three dimensional kinematics and kinetics of human joints. Nonlinear effects in locomotion; optimization methods for the determination of joint forces; spinal biomechanics; design and analysis of artificial joints.  
Prerequisites: BME 320, Introduction to Biomechanics

BME 540 Biomedical Measurements II  
Credits: 3 units  
Signals and noise, types of measurements, measurement errors; applications of biomedical transducers to measure temperature, flow, force, strain; image processing; computer applications.  
Prerequisite: BME 430, Biomedical Measurements I or Graduate Biomedical Measurements

BME 550 Research in Biomedical Engineering, M.S. Thesis  
Credits: By arrangement with instructor  
Experimental and/or analytical investigation of an approved topic for partial fulfillment of the requirements for the M.S. with thesis in biomedical engineering.  
Prerequisite: Graduate standing and consent of adviser

BME 610 Advanced Biofluid Mechanics  
Credits: 3 units  
Theoretical and experimental studies of pulsatile flow in large vessels; wave propagation in arteries; microcirculation; peristaltic pumping; design and analysis of artificial implant devices.  
Prerequisite: BME 330, Biotransport Processes

BME 620 Advanced Cardiac Mechanics  
Credits: 3 units  
Functional anatomy and physiology of the human heart; cardiac muscle mechanics; advanced imaging techniques for cardiac structures; three-dimensional reconstruction of the human left ventricle, finite element modeling of the left ventricle; experimental techniques in cardiology.  
Prerequisite: BME 340, Cardiovascular Biomechanics

BME 630 Biological Systems Analysis II  
Credits: 3 units  
Application of modern control and systems analysis to study of biological systems; identification and optimization techniques utilizing linear and non-linear, deterministic and stochastic models; selected aspects of cardio-respiratory system used as examples and problems.  
Prerequisite: BME 410, Biological Systems Analysis I or Graduate Biological Systems Analysis

BME 640 Physics and Analysis of Biomedical Images  
Credits: 3 units  
Interaction of radiation with matter, physical principles of medical imaging modalities (X-rays, CT, nuclear medicine, PET, MRI, ultrasound), medical image reconstruction and digital analysis, clinical interpretations.
Prerequisite: BME 410, Biological Systems Analysis I or Graduate Biological Systems Analysis or equivalent; MAT 310, Vector Calculus or Mathematical Methods in Engineering or equivalent; and ENC 340, Computers in Engineering

BME 650 Advanced Biological Systems Analysis
Credits: 3 units
Analysis techniques from systems identification, sensitivity analysis; signal processing using time series analysis, matched filters, and adaptive estimation; information theory applied to the cardiovascular and oculomotor system.
Prerequisite: BME 630, Biological Systems Analysis II or consent of instructor.

3.9. MASTER OF SCIENCE IN OPTICAL & PHOTONIC ENGINEERING

Program Description:
Optics is a branch of physics concerned with the study of light, its production, propagation, measurement, and properties. The application of optical science and mathematics by which the properties of matter and energy are made useful to people is the province of the Optical & Photonic Engineer.

During the past 30 years, three major developments are responsible for renaissance of optics and its increasing importance in modern technology: 1) the invention of the laser, 2) the fabrication of the low-loss optical fibers and 3) the advent of semiconductor optical devices. In recent years, the term, photonics, was coined, in analogy with electronics, to reflect the growing ties between optics and electronics. Electronics involves the flow of electrons and photonics, the flow of photons. The two disciplines are intertwined since often electrons control the flow of photons and vice-versa. The design and manufacture of complex and sophisticated optical devices in the generation, transmission, modulation, amplification and detection of light is the job of the Optical & Photonic Engineer.

Mission and Objectives:
Every day, new applications of optical & photonic engineering are found in biomedical engineering, optical communications, signal analysis & processing, computing, sensing, display, printing, and energy transport. The optics industry is experiencing a shortage of skilled optical & photonic technicians, engineers and scientists. Biomedical optics is a booming field: laser surgery, computer-aided tomography (CT), magnetic-resonance imaging (MRI) & positron emission tomography (PET) technology, digital monitoring of life support systems, non-invasive equipment for fetal monitoring and glucose testing, and the optical detection of cancers and tumors. The international space program is built around the importance of photonics. With new designs for telescopes and other imaging systems, we are learning about our universe and are applying that knowledge to improve discovery and innovation. Computer technology is another growing and in-
demand optical & photonic specialty. In the near future, conventional computer technology will have exhausted its ability to build smaller and smaller chips to perform its work, so we are looking to optical technology -- specifically quantum physics -- for solutions. In theory, a quantum computer could simultaneously perform a thousand billion billion different computations. Salaries in the optics industry are extraordinarily high and jobs are plentiful for the well-qualified optical and photonic technicians and engineers.

**Admissions Requirements:**
The M.S. program in Optical & Photonic Engineering at the University of Northern California admits applicants on the basis of their previous academic record, standardized test scores, letters of recommendation, and a personal essay. Students must possess a Bachelor’s degree in Optical & Photonic Engineering or a Bachelor’s degree or its equivalent in a related field such as electronic engineering, mechanical engineering, physical science and mathematics. Students with a Master’s degree in other fields may be considered for admission based upon previous coursework or experience in the related fields. Admission to the M.S. program requires a 3.00 minimum grade point average in previous undergraduate and/or professional studies.

**International Students:**
Non-native speakers of English must submit either an official Test Of English as a Foreign Language (TOEFL) must be at least 500 for the paper-and-pencil test, at least 173 for the computer-based test, or at least 61 for the Internet-based test (iBT). For other students, a minimum score of 640 in the Japanese Society for Testing English Proficiency, Inc. (STEP) is required. In either case, the UNC ESL faculty will test international students for their speaking, listening, reading and writing abilities upon their arrival before they are allowed to enroll in regular university classes. For those students with ESL deficiencies, they must successfully complete ESL 003 at UNC, in order to enroll in courses other than ESL.

**Mode of Instruction:**
The mode of instruction varies depending on the nature of the individual classes, and is based on traditional lecture, instructor-led discussion, seminar-style student group discussion, laboratory projects and investigations leading to completion of M.S. thesis research project, if appropriate.

**Graduation Requirements:**
The M.S. in Optical & Photonic Engineering is a terminal degree. At least 30 credit hours of formal course work must be post Bachelor’s (or equivalent), and, if so desired, up to 9 credit hours can be in M.S. thesis research. A 3.00 minimum grade point average must be maintained throughout M.S. course studies. Upon completion of some course work and upon the advisor’s recommendation, students may opt to write their 3-9 credit-hour M.S. research thesis. The student must submit a prospectus to his/her M.S. thesis committee for approval before beginning his/her research work. Upon completion of the thesis research, the student must successfully defend his/her thesis at the final examination.

**Optics & Photonics Research Laboratory:**
Pentium IV computers, 100 x to 1000 x medical grade microscope, black and white CCD camera, color camera, HeNe laser, laser diode, photo detector, lenses, optical rails, optical cube beam splitter, opto-mechanical holders, linear translation and rotation stages, oscilloscopes, image processing software, optical tables, 3-D camera system and optical power meter system.

Program Curriculum:
Students enjoy close working relationships with the faculty, promoted by small class size and joint research and design projects. The core curriculum provides students with the necessary foundation of knowledge in the discipline. The general education courses are followed by a series of required and/or elective classes that allow students to focus on the essential foundations of optical & photonic engineering. The students in optical & photonic engineering are strongly encouraged to work closely with faculty members in the selection of elective courses.

Program Core Courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPE 500</td>
<td>Quantum Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>OPE 510</td>
<td>Solid State Physics</td>
<td>3</td>
</tr>
<tr>
<td>OPE 520</td>
<td>Semiconductor Lasers</td>
<td>3</td>
</tr>
<tr>
<td>OPE 530</td>
<td>Optical Storage</td>
<td>3</td>
</tr>
<tr>
<td>OPE 540</td>
<td>Optical Display</td>
<td>3</td>
</tr>
<tr>
<td>OPE 550</td>
<td>Photodetector Devices</td>
<td>3</td>
</tr>
<tr>
<td>OPE 560</td>
<td>Ophthalmic Optics</td>
<td>3</td>
</tr>
<tr>
<td>OPE 570</td>
<td>Digital Image Processing</td>
<td>3</td>
</tr>
<tr>
<td>OPE 580</td>
<td>Biomedical Instrumentation</td>
<td>3</td>
</tr>
<tr>
<td>OPE 590</td>
<td>Nonlinear Optics</td>
<td>3</td>
</tr>
<tr>
<td>OPE 600</td>
<td>Microlithography</td>
<td>3</td>
</tr>
<tr>
<td>OPE 610</td>
<td>M.S. Thesis Research</td>
<td>3-12</td>
</tr>
</tbody>
</table>

Elective Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BME 480</td>
<td>Optical Engineering in Biomedicine</td>
<td>3</td>
</tr>
</tbody>
</table>

Recommended Course Sequence:

**Semester I**
- OPE 500 Quantum Mechanics
- OPE 510 Solid State Physics
- OPE 520 Semiconductor Lasers

**Semester II**
- OPE 530 Optical Storage
- OPE 540 Optical Display
- OPE 550 Photodetector Devices

**Semester III**
- OPE 560 Ophthalmic Optics
- OPE 570 Digital Image Processing
- OPE 580 Biomedical Instrumentation
Semester IV
OPE 590 Nonlinear Optics
OPE 600 Microlithography
OPE 610 M.S. Thesis Research

M.S. in Optical & Photonic Engineering Core Course Description:
OPE 500 Quantum Mechanics
Credits: 3 Credits
Harmonic oscillator, path integral formulation of quantum theory, the Heisenberg uncertainty, systems with N degrees of freedom, symmetries, angular momentum, hydrogen atom, spin, the WKB method, perturbation theory, scattering, the Dirac equation.

OPE 510 Solid State Physics
Credits: 3 Credits
Atom in crystals, waves in crystals, defects and disorder in crystals, dislocations in crystals, vibrations of the crystal lattice, phonons, thermal conductivity, free electrons in crystals, band theory, semiconductors, p-n junction, magnetisms, dielectric properties, superconductivity, amorphous materials.

OPE 520 Semiconductor Lasers
Credits: 3 Credits
Fermi energy and carrier density and leakage, optical modes, modal gain, modal loss, and confinement factors, periodic structure and the transmission matrix, electronic states in semiconductors, Langevin noise, electro-optic effect.

OPE 530 Optical Storage
Credits: 3 Credits
Diffraction optics, optics of multilayers, polarization optics, optical system design, magnetism and magnetic materials, domains, magnetization dynamics, coercivity, thermomagnetic, magneto-optic materials.

OPE 540 Optical Display
Credits: 3 Credits
CRT, liquid crystal display, digital mirror device display, plasma display, laser scanning display, projection display, optics of projection display, illumination systems, electro-optic properties.

OPE 550 Photodetector Devices
Credits: 3 Credits
Photocathodes, photomultipliers, semiconductor photodetectors, thermal detectors, solar cells, photodetection techniques, image detectors, CCD.
OPE 560 Ophthalmic Optics  
Credits: 3 Credits  
Ophthalmic lenses, prism and decentration, correction of ametropia, aberrations and ophthalmic lens design, multifocal lenses, anisometropia and aniseikonia, lenses for high refractive error, lenses for low vision, optics of contact lenses.

OPE 570 Digital Image Processing  
Credits: 3 Credits  
Image enhancements in spatial and frequency domain, image restoration, color image processing, wavelet and multi-resolution processing, image compression, morphological image processing, image segmentation, object recognition.

OPE 580 Biomedical Instrumentation  
Credits: 3 Credits  
Basic theory of measurement, signals and noise, electrodes, sensors and transducers, ultrasonography, fiber optics and laser, radiology and nuclear medicine equipment.

OPE 590 Nonlinear Optics  
Credits: 3 Credits  
Nonlinear optical susceptibility, nonlinear optic interactions, intensity-dependent refractive index, stimulated Brillouin scattering, stimulated Rayleigh scattering, stimulated Raman scattering, stimulated Rayleigh-Wing scattering, photorefractive effect.

OPE 600 Microlithography  
Credits: 3 Credits  
Optical steppers and scanners, optics for photolithography, lasers for advanced microlithography, alignment and overlay, e-beam lithography, chemistry and process of photoresist materials, dry etching, nanolithography.

3.10. MASTER OF SCIENCE IN SYSTEMS ENGINEERING (EMPHASIS EMBEDDED SOFTWARE)

Program Description:  
What is Systems Engineering? Open and look inside a digital camera and you will see: 1) little motors driving the zoom lenses, the multi-megapixels CCD, LCD screen, tiny resistors, capacitors, the microprocessor, DSP, ASIC chips, fine connectors as well as densely arranged PCBs and 2) the structural frame holding all the small pieces together without any error. However, something essential but cannot be seen is the software running inside the microprocessor and directing all the hardware components to work in unison. The integration of software tools and machines into a good-looking product at a reasonable price is the job of a Systems Engineer.
The semiconductor process has gone from 1.0 µm to 0.1 µm during the past 10 years; the electronics industry has changed greatly. Entire systems go onto a chip; the main frequency goes to 1 GHz and PCBs go to several tens of layers. Hardware and software mix together. There are more and more choices for the designer and manufacturer. Most undergraduate students seldom have a chance to gain any design experience at handling these complex modern engineering problems.

Starting from first principles and ending with intensive application design laboratory projects, students use current reference designs and tools from leading industrial vendors to master UNC’s graduate program in Systems Engineering. UNC will provide the Systems Engineering students with a very practical, hands-on learning environment. They can get first-hand knowledge directly from the original equipment manufacturing (OEM) industry to implement their own designs and/or product ideas. They will graduate from the Program with all the essential technology for producing useful real products with confidence.

**Mission and Objectives:**
The IT industry is at a new critical stage. Today, microprocessors are everywhere. Internet grows exponentially; everything is becoming connected. Every new product needs systems engineering. Systems engineers are facing new challenges everyday tackling complex engineering problems: hardware, firmware, software, tradeoffs, tools, and integration of electrical, mechanical, optical and photonic components. The demand for systems engineers is ever increasing in the global marketplace.

**Admission Requirements:**
The M.S. program in Systems Engineering at the University of Northern California admits applicants on the basis of their previous academic record, standardized test scores, letters of recommendation, and a personal essay. Students must possess a Bachelor’s degree or its equivalent in a related field such as electronic engineering, mechanical engineering, physical science and mathematics. Students with a Master’s degree in other fields may be considered for admission based upon previous coursework or experience in a related fields. Admission to the M.S. program requires a 3.00 minimum grade point average in previous undergraduate and/or professional studies.

**International Students:**
Non-native speakers of English must submit either an official Test Of English as a Foreign Language (TOEFL) must be at least 500 for the paper-and-pencil test, at least 173 for the computer-based test, or at least 61 for the Internet-based test (iBT). For other students, a minimum score of 640 in the Japanese Society for Testing English Proficiency, Inc. (STEP) is required. In either case, the UNC ESL faculty will test international students for their speaking, listening, reading and writing abilities upon their arrival before they are allowed to enroll in regular university classes. For those students with ESL deficiencies, they must successfully complete ESL 003 at UNC, in order to enroll in courses other than ESL.

**Mode of Instruction:**
The mode of instruction varies depending on the nature of the individual classes, and is based on traditional lecture, instructor-led discussion, seminar-style student group discussion, intense hands-on laboratory projects and in completion of M.S. thesis research project, if so desired.
**Graduation Requirements:**
The M.S. in Systems Engineering is a terminal degree. At least 30 credit hours of formal course work must be post Bachelor’s (or equivalent), and, if so desired, up to 9 credit hours can be in M.S. thesis research. A 3.00 minimum grade point average must be maintained throughout M.S. course studies. Upon completion of some course work and upon the advisor’s recommendation, students may opt to write their 3-9 credit-hour M.S. research theses. The student must submit a prospectus to his/her M.S. thesis committee for approval before beginning his/her research work. Upon completion of the thesis research, the student must successfully defend his/her thesis at the final examination.

**Program Curriculum:**
Program Core Courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYS 400</td>
<td>RTOS and Embedded Systems Software Design I</td>
<td>3</td>
</tr>
<tr>
<td>SYS 410</td>
<td>RTOS and Embedded Systems Software Design II</td>
<td>3</td>
</tr>
<tr>
<td>SYS 420</td>
<td>Principle and Design of Advanced Microprocessor Systems</td>
<td>3</td>
</tr>
<tr>
<td>SYS 430</td>
<td>Fundamentals of Hardware Design</td>
<td>3</td>
</tr>
<tr>
<td>SYS 440</td>
<td>Mixed Signal Systems Design</td>
<td>3</td>
</tr>
<tr>
<td>SYS 450</td>
<td>Digital Logic, Buses and Interface Technology</td>
<td>3</td>
</tr>
<tr>
<td>SYS 460</td>
<td>Board Level Technology</td>
<td>3</td>
</tr>
<tr>
<td>SYS 470</td>
<td>Consumer Electronics and Portable Device Design</td>
<td>3</td>
</tr>
<tr>
<td>SYS 480</td>
<td>Wireless Technology for Embedded Systems</td>
<td>3</td>
</tr>
<tr>
<td>SYS 490</td>
<td>Introduction to Telecommunication</td>
<td>3</td>
</tr>
<tr>
<td>SYS 500</td>
<td>Introduction to Data Communication</td>
<td>3</td>
</tr>
<tr>
<td>SYS 510</td>
<td>M.S. Thesis Research</td>
<td>3</td>
</tr>
</tbody>
</table>

Recommended Course Sequence:

**Semester I**
- SYE 400: RTOS and Embedded Systems Software Design I
- SYE 420: Principle and Design of Advanced Microprocessor Systems
- SYE 430: Fundamentals of Hardware Design

**Semester II**
- SYE 410: RTOS and Embedded Systems Software Design II
- SYE 440: Mixed Signal Systems Design
- SYE 450: Digital Logic, Buses and Interface Technology

**Semester III**
- SYE 460: Board Level Technology
- SYE 470: Consumer Electronics and Portable Device Design
- SYE 480: Wireless Technology for Embedded Systems

**Semester IV**
- SYE 490: Introduction to Telecommunication
- SYE 500: Introduction to Data Communication
- SYE 510: M.S. Thesis Research
M.S. in Systems Engineering Program Core Course Descriptions:

SYE 400: RTOS and Embedded Systems Software Design I
Credits: 3 units
Real Time Operation System (RTOS) concepts, requirements, implementation techniques and configurations. Real time events handling, multi-thread multi-task scheduling, synchronizing, data exchange. RTOS: VxWorks, QNX, Windows CE, and Embedded/Real-time Linux, and their software developing tools and environment. Basic components of a RTOS besides the kernel such as NFS, TCP/IP.

SYE 410: RTOS and Embedded Systems Software Design II
Credits: 3 units
Object-Oriented Programming (OOP) techniques using C++ and Java with RTOS for specific applications. Common components of popular RTOS such as VxWorks, QNX, Windows CE, and Embedded/Real-time Linux, and their compilers, debuggers, and IDE’s. Basic programming techniques for writing device driver for a RTOS. Master the combined message- driven and non-message-driven process for multithreading and multitasking, data exchanging and synchronization to implement a specific real-time application.

SYE 420: Principles and Design of Advanced Microprocessor Systems
Credits: 3 units
The architecture of most current 32bit microprocessors and microcontrollers such as MIPS, ARM, PowerPC, SH3/4 and their unique factors and instruction sets. Principles and functionality of the basic units in a microprocessor such as ALU, MMU, Cache. Learning the basic parts for the construction of a microprocessor system. Study the complete process of developing a microprocessor system, using analysis of basic system requirements, debug support and developing tools. Getting familiar with the popular chip peripherals, BSC, DMAC, INTC, RTC, TMU, et al. Developing basic skills for estimating the performance of a microprocessor system, design an efficient system for a specific application with maximum flexibility at lowest cost.

SYE 430: Fundamentals of Hardware Design
Credits: 3 units
Basic knowledge and design techniques of CMOS-LSIC, FPGA, CPLD. Learning CMOS logic circuit (gates, flip-flops), functional block, digital logic design methods (equation, schematic, diagram, state-machine), popular standard cells, structure of FPGA and CPLD. Understanding HDL (Hardware Description Language), VHDL, VerilogHDL, and using them to implement logic design. Introducing the popular FGPA and CPLD device and their design tools, such as CUPL, MAX-PLUS II.

SYE 440: Mixed Signal Systems Design
Credits: 3 units
Linking the real world to any complex digital processing system. Understanding the analog signals from the real world, the commonly used sensors, the property of signals, the essential conditioning for the analog signals (amplifying, filtering); and the method of reacting to the real word from the digital system perspective. Getting familiar with the devices (operational amplifiers, voltage
references, comparators, AD, DA, motors/electromagnetic parts and their drivers), and their parameters, using them to design proper systems. Learning basic design techniques and considerations needed for a specific application.

SYE 450: Digital Logic, Buses and Interface Technology
Credits: 3 units
General concept of buses for digital systems; interface between digital systems and devices; and digital logic for bus control and arbitration. Introduction to industrial standard buses such as ISA, PCI, USB, IDE/ATAPI, CAN, I2C, SPI, and some commonly used local buses. Techniques of implementing a bus or interface by using digital logic, an interface or bridge or glue logic for the different bus type; design techniques for a functional unit with a bus. Getting an overall idea for writing proper software or drivers to operate a bus under an operation system.

SYE 460: Board Level Technology
Credits: 3 units
General concepts of all current Printed Circuit Boards (PCB’s). Design and the manufacturing process for all kinds of components’ packaging technology. PCB design using EDA tools and signal integrity simulation.

SYE 470: Consumer Electronics and Portable Device Design
Credits: 3 units
Overall guidelines to the design procedure and methodology of consumer electronics and portable devices. Learning up-down design flow; 3D structural layout; miniature interconnection; dense assembling; high-speed, low power consumption, battery-operated designs. Understanding the basic EMC and safety requirement. Getting familiar with distributed design, manufacturing, assembling, accessories’ support environment; design optimization trade-offs with functionality constraints, components’ availability and cost.

SYE 480: Wireless technology for embedded systems
Credits: 3 units
Introduction to wireless technology, including IrDA and RF. Learning the IrDA protocols and their implementation on 8-bit or 16-bit microprocessors. RF technology for point-to-point, one-way and two-way data links. Basic concepts of wireless LAN, cellular phone and broadband wireless communication.

SYE 490: Introduction to Telecommunication
Credits: 3 units
Telephone network system and circuit switch concepts. Introduction to the architecture, switching scheme, signaling services’ process, and transportation technology. Basic data-communication-service technology starting from point-to-point modem to Internet access, such as dial-up access server, ISDN, T1/E1, T-series carrier.

SYE 500: Introduction to Data Communication
Credits: 3 units
Focusing on LAN, package switching, and backbone transmission systems. Learning network protocols such as TCP/IP, IPX/SPX, DLC and TCP/IP implementation on embedded systems.
Introducing routing technology, small routers, gateways; Internet security, firewalls. Basic concept of broadband networking: ATM, SONET and SDH.

SYE 510: M.S. Thesis research
Credits: 3 – 9 units
Research topic much be approved by supervisor and thesis committee.

3.11. DOCTOR OF BIOMEDICAL ENGINEERING

Program Description:
The goal of graduate studies at the doctoral levels is to educate students in the disciplines of biomedical engineering. The goal is to enable students to use contemporary methods at an advanced level for a professional career in biomedical engineering design, development, and research.

Each student’s course of study is based on individual background, career objectives and sound academic practice. Department and faculty members have teaching and research expertise in areas of biomechanics (biosolid and biofluid mechanics), biomaterials, biomedical image analysis, bioinstrumentation, biophotonics, therapeutic biomedical devices, tissue engineering and biosystems.

Professional doctorate programs center on any one of the previously described areas through an appropriate choice of course work and research topics.

Mission and Objectives:
The various branches of Biomedical Engineering are concerned with fields such as biomechanics, biomaterials, biomedical electronics, medical imaging, medical instrumentation, biochemical engineering and tissue engineering. The undergraduate and graduate degree programs of the University of Northern California prepare our students for careers in medicine and medical instrumentation, diagnostic aids, tissue engineering, safety engineering, rehabilitation engineering, life support systems, human-machine systems, prosthetics and orthotics. Graduates can find employment in the biomedical device industry and/or biotechnology. Graduates may also pursue careers in government, e.g., Veterans Administration, National Institutes of Health, Environmental Protection Agency, Food and Drug Administration, and Centers for Disease Control. Many biomedical engineering graduates elect to continue their formal education in the engineering, dental, medical or legal professions.

Admission Requirements:
Students wishing to enroll in Doctor of Biomedical Engineering program must possess a bachelor’s degree or its equivalent. Students who have a bachelor’s degree in an engineering curriculum or in a curriculum in the mathematical or physical sciences, who have a 3.00 minimum grade-point average and an acceptable score on the Graduate Record Examination (GRE) General Test (combined verbal and quantitative score of 1,230), are eligible to be considered for admission to this program.
For students entering with a masters degree at least 36 credit hours of formal course work must be completed past the masters degree level, and at least 12 credit hours must be dissertation research credit hours.

Admission to the doctorate program is conditional until students successfully complete a qualifying examination, which is administered by the biomedical engineering faculty. The decision on whether the student’s performance on this examination is adequate for admission to the Ph.D. program is made by the biomedical engineering faculty.

**International Students:**
Non-native speakers of English must submit either an official Test Of English as a Foreign Language (TOEFL) must be at least 500 for the paper-and-pencil test, at least 173 for the computer-based test, or at least 61 for the Internet-based test (iBT). For other students, a minimum score of 640 in the Japanese Society for Testing English Proficiency, Inc. (STEP) is required. In either case, the UNC ESL faculty will test international students for their speaking, listening, reading and writing abilities upon their arrival before they are allowed to enroll in regular university classes. For those students with ESL deficiencies, they must successfully complete ESL 003 at UNC, in order to enroll in courses other than ESL.

**Mode of Instruction:**
The mode of instruction varies depending on the nature of the individual classes, and is based on traditional lecture, instructor-led discussion, seminar-style student group discussion, laboratory projects and investigations leading to completion of doctorate Dissertation.

**Graduation Requirements:**
The doctoral program, including acceptable transfer unit hours, requires a minimum of 72 credit hours of graduate work beyond the Bachelor’s degree. Of these 72 hours, at least 60 credit hours must be in formal course work taken after the baccalaureate degree is awarded, and at least 12 credit hours must be in dissertation research credit hours. For students entering with an M.S., at least 36 credit hours of formal course work must be completed past the M.S., and at least 12 credit hours must be dissertation research credit hours. Based on research progress, examination results or other measures, the student’s graduate committee may require additional formal course work in order to strengthen areas of perceived weakness.

A 3.25 minimum grade-point average must be maintained throughout doctorate studies. Upon completion of the course work specified in the plan of study, with the grade-point average stipulated above, and upon the adviser’s recommendation, students are admitted to the comprehensive examination to be administered by their committee. Having satisfactorily completed these examinations, students must complete and defend their dissertation before their committee and their peers. Requirements for the doctorate degree generally can be completed in about three years beyond the master’s degree.

**Examples of Major Biomedical Engineering Equipment at UNC**
MTS Materials Testing Machine
This major piece of equipment allows students and researchers to get hands-on experience on all the experimental aspects of the mechanics of materials testing in general and biomechanics and biomaterials in particular.

Fume Hoods
In research and development of biomaterials often volatile fume are generated. By conducting these experiments inside the hoods the mildly toxic fumes will be vented outside the roof top of the building rendering it essentially harmless. UNC possess two of these to allow simultaneous experiments to occur simultaneously.

Morphometer
This instrument allows for the conversion of a point on a 3D object (with irregular geometry) into its Cartesian coordinates.

Center of Gravity Apparatus
Small and large board and scale apparatus used to determine the surface intercepts of the center of gravity (CG) of irregular 3-D objects including the CG of the human body.

Pressure Measuring Mat
The pressure-measuring mat, consisting of a 28 by 28 array of capacitance-type pressure transducers, converts changes in capacitance to changes in pressure.

Drop Tower
The drop tower is a device used to test the dynamic structural and/or material properties of objects.

Bone Processing Laboratory
Equipment used to separate inorganic bone from its organic phase by means of a bone saw, a freezer mill, particle-sorting sieves and a laboratory refrigerator.

Bio-Photonics Research Laboratory
Pentium IV computers, 100 x to 1000 x medical grade microscope, black and white CCD camera, color camera, HeNe laser, laser diode, photo detector, lenses, optical rails, optical cube beam splitter, opto-mechanical holders, linear translation and rotation stages, oscilloscopes, image processing software.

Video-conferencing Setup
Using a T-1 line, all UNC lectures can be transmitted to any location in the world where there is a similar setup and vice-versa.

Program Curriculum:
Students enjoy close working relationships with the faculty, promoted by small class sizes and joint research projects. The core curriculum provides students with the necessary foundation of knowledge in the discipline. The core is followed by a series of required and elective classes that allow students to focus on a particular aspect of Biomedical Engineering that is of special interest to them. Biomedical Engineering majors are strongly encouraged to work closely with faculty members in the selection of elective courses.
Program Core Courses:
BME 310 I Medical Terminology for Biomedical Engineers 3 units
BME 310 II Anatomy & Physiology for Biomedical Engineers 3 units
BME 320 Biomechanics 3 units
BME 410 Biological Systems Analysis I 3 units
MAT 420 Design and Analysis of Experiment 3 units
BME 580 Curriculum Practical Training in Biomedical Engineering 3-9 units
BME 660 Professional Doctorate Dissertation 3-9 units

Elective Courses:
BME 420 Biomaterials 3 units
BME 480 Optical Engineering in Biomedicine 3 units
BME 510 Individual Investigations in Biomedical Engineering 3-9 units
BME 520 Biomedical Engineering Graduate Lab 3-9 units
MGT 530 Business Management and Entrepreneurship 3 units
MGT 630 Management of Quality in Biomedicine 3 units

Recommended Course Sequence:
Semester I
BME 310 I Medical Terminology for Biomedical Engineers
BME 310 II Anatomy & Physiology for Biomedical Engineers

Semester II
BME 410 Biological Systems Analysis I
BME 320 Introduction to Biomechanics
BME 420 Biomaterials

Semester III
MAT 420 Design and Analysis of Experiment
BME 480 Optical Engineering in Biomedicine
BME 510 Individual Investigations in Biomedical Engineering

Semester IV
BME 580 Curriculum Practical Training in Biomedical Engineering
MGT 530 Business Management and Entrepreneurship
MGT 630 Management of Quality in Biomedicine

Semester V
BME 580 Curriculum Practical Training in Biomedical Engineering
BME 660 Professional Doctorate Dissertation

Semester VI
BME 580 Curriculum Practical Training in Biomedical Engineering
BME 660 Professional Doctorate Dissertation

Semester VII
BME 580 Curriculum Practical Training in Biomedical Engineering
BME 660 Professional Doctorate Dissertation

Semester VIII
BME 580 Curriculum Practical Training in Biomedical Engineering
BME 660 Professional Doctorate Dissertation

**Doctor of Biomedical Engineering Program Core Course Descriptions:**

**BME 310 I Medical Terminology for Biomedical Engineers**
Credits: 3 units
Cell function, organ systems, and principles of functional anatomy. Open only to biomedical engineering students.
Prerequisites: Consent of course instructor

**BME 310 II Anatomy & Physiology for Biomedical Engineers**
Credits: 3 units
Cell function, organ systems, and principles of functional anatomy. Open only to biomedical engineering students.
Prerequisites: Consent of course instructor

**BME 320 Introduction to Biomechanics**
Credits: 3 units
Principles of solid mechanics applied to biomedical systems: emphasis on analytical and experimental applications to the human musculoskeletal system.
Prerequisite: ENC 330, Dynamics, and ENC 230, Mechanics of Deformable Bodies
Corequisite: BME 310 II, Anatomy and Physiology for Biomedical Engineers

**BME 410 Biological Systems Analysis I**
Credits: 3 units
Principles of linear control systems theory applied to the analysis of biological systems.
Development of computer simulation techniques to study the dynamic response of physiological systems.
Prerequisite: BME 310, Anatomy/Physiology & Medical Terminology for Biomedical Engineers
ENC 360, Linear Systems Analysis

**BME 420 Biomaterials**
Credits: 4 units Material properties, biocompatibility characteristics, performance requirements of materials for in vivo implants.
Prerequisite: CHE 110, Introduction to Inorganic Chemistry
Corequisite: BME 310, Anatomy/Physiology & Medical Terminology for Biomedical Engineers

**BME 480 Optical Engineering in Biomedicine**
Credits: 3 units
Introduction of optical and photonic engineering to biomedicine. Concepts of interference and coherence, Fourier transform and Fourier optics, image and signal processing, holography, fiber optics, lasers, instrumentation. Case study in biomedical optics.
Prerequisite: PHY111, Introduction to Electricity & Magnetism, MAT 210, Differential Equations

BME 510 Individual Investigations in Biomedical Engineering
Credits: By arrangement with instructor
Individual projects for biomedical engineering graduate students. Investigations could be: laboratory studies, engineering design projects, analysis and simulation of a bioengineering system, computer software development, research. Prerequisite: Consent of instructor. May be taken repeatedly for credit.

BME 520 Biomedical Engineering Graduate Labs
Credits: 3-9 units
Introduction to the research laboratories associated with faculty members of the Department of Biomedical Engineering; laboratory experience in cardiovascular and respiratory control, hemodynamics, biomaterials, biomechanics and biomedical image analysis and processing. Graduate standing required. Prerequisite: BME 310 II, Anatomy and Physiology for Biomedical Engineers, senior/graduate-student standing

BME 660 Research in Biomedical Engineering, professional doctorate Dissertation
Credits: By arrangement with instructor.
Experimental and/or analytical investigation of an approved topic for partial fulfillment of the requirements for the professional doctorate dissertation in biomedical engineering.
Prerequisite: Consent of adviser

3.12. DOCTOR OF PHILOSOPHY IN BIOMEDICAL ENGINEERING

Program Description:
The goal of graduate studies at the Ph.D. levels is to educate students in the disciplines of biomedical engineering. The goal is to enable students to use contemporary methods at an advanced level for a professional career in biomedical engineering design, development, and research.

Each student’s course of study is based on individual background, career objectives and sound academic practice. Department and faculty members have teaching and research expertise in areas of biomechanics (biosolid and biofluid mechanics), biomaterials, biomedical image analysis, bioinstrumentation, biophotonics, therapeutic biomedical devices, tissue engineering and biosystems.
Ph.D. programs center on any one of the previously described areas through an appropriate choice of course work and research topics.

Mission and Objectives:
The various branches of Biomedical Engineering are concerned with fields such as biomechanics, biomaterials, biomedical electronics, medical imaging, medical instrumentation, biochemical engineering and tissue engineering. The undergraduate and graduate degree programs of the University of Northern California prepare our students for careers in medicine and medical instrumentation, diagnostic aids, tissue engineering, safety engineering, rehabilitation engineering, life support systems, human-machine systems, prosthetics and orthotics. Graduates can find employment in the biomedical device industry and/or biotechnology. Graduates may also pursue careers in government, e.g., Veterans Administration, National Institutes of Health, Environmental Protection Agency, Food and Drug Administration, and Centers for Disease Control. Many biomedical engineering graduates elect to continue their formal education in the engineering, dental, medical or legal professions.

Admission Requirements:
Students wishing to enroll in Doctor of Philosophy in Biomedical Engineering program must possess a bachelor’s degree or its equivalent. Students who have a bachelor’s degree in an engineering curriculum or in a curriculum in the mathematical or physical sciences, who have a 3.00 minimum grade-point average and an acceptable score on the Graduate Record Examination (GRE) General Test (combined verbal and quantitative score of 1230), are eligible to be considered for admission to this program.
For students entering with a masters degree, at least 36 credit hours of formal course work must be completed past the masters degree level, and at least 12 credit hours must be dissertation research credit hours.
Admission to the Ph.D. program is conditional until students successfully complete a qualifying examination, which is administered by the biomedical engineering faculty. The decision on whether the student’s performance on this examination is adequate for admission to the Ph.D. program is made by the biomedical engineering faculty.

International Students:
Non-native speakers of English must submit either an official Test Of English as a Foreign Language (TOEFL) must be at least 500 for the paper-and-pencil test, at least 173 for the computer-based test, or at least 61 for the Internet-based test (iBT). For other students, a minimum score of 640 in the Japanese Society for Testing English Proficiency, Inc. (STEP) is required. In either case, the UNC ESL faculty will test international students for their speaking, listening, reading and writing abilities upon their arrival before they are allowed to enroll in regular university classes. For those students with ESL deficiencies, they must successfully complete ESL 003 at UNC, in order to enroll in courses other than ESL.

Mode of Instruction:
The mode of instruction varies depending on the nature of the individual classes, and is based on traditional lecture, instructor-led discussion, seminar-style student group discussion, laboratory projects and investigations leading to completion of Ph.D. dissertation.

Graduation Requirements:
The doctoral program, including acceptable transfer unit hours, requires a minimum of 72 credit hours of graduate work beyond the Bachelor’s degree. Of these 72 hours, at least 60 credit hours must be in formal course work taken after the baccalaureate degree is awarded, and at least 12 credit hours must be in dissertation research credit hours. For students entering with an M.S., at least 36 credit hours of formal course work must be completed past the M.S., and at least 12 credit hours must be dissertation research credit hours. Based on research progress, examination results or other measures, the student’s graduate committee may require additional formal course work in order to strengthen areas of perceived weakness.

A 3.25 minimum grade-point average must be maintained throughout Ph.D. studies. Upon completion of the course work specified in the plan of study, with the grade-point average stipulated above, and upon the adviser’s recommendation, students are admitted to the comprehensive examination to be administered by their committee. Having satisfactorily completed these examinations, students must complete and defend their dissertation before their committee and their peers. Requirements for the Ph.D. generally can be completed in about three years beyond the master’s degree.

**Program Curriculum:**
Students enjoy close working relationships with the faculty, promoted by small class sizes and joint research projects. The core curriculum provides students with the necessary foundation of knowledge in the discipline. The core is followed by a series of required and elective classes that allow students to focus on a particular aspect of Biomedical Engineering that is of special interest to them. Biomedical Engineering majors are strongly encouraged to work closely with faculty members in the selection of elective courses.

**Program Core Courses:**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BME 310 I</td>
<td>Medical Terminology for Biomedical Engineers</td>
<td>3</td>
</tr>
<tr>
<td>BME 310 II</td>
<td>Anatomy &amp; Physiology for Biomedical Engineers</td>
<td>3</td>
</tr>
<tr>
<td>BME 320</td>
<td>Biomechanics</td>
<td>3</td>
</tr>
<tr>
<td>BME 410</td>
<td>Biological Systems Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>MAT 420</td>
<td>Design and Analysis of Experiment</td>
<td>3</td>
</tr>
<tr>
<td>BME 580</td>
<td>Curriculum Practical Training in Biomedical Engineering</td>
<td>3-9</td>
</tr>
<tr>
<td>BME 660</td>
<td>Professional Doctorate Dissertation</td>
<td>3-9</td>
</tr>
</tbody>
</table>

**Elective Courses:**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BME 420</td>
<td>Biomaterials</td>
<td>3</td>
</tr>
<tr>
<td>BME 480</td>
<td>Optical Engineering in Biomedicine</td>
<td>3</td>
</tr>
<tr>
<td>BME 510</td>
<td>Individual Investigations in Biomedical Engineering</td>
<td>3-9</td>
</tr>
<tr>
<td>BME 520</td>
<td>Biomedical Engineering Graduate Lab</td>
<td>3-9</td>
</tr>
<tr>
<td>MGT 530</td>
<td>Business Management and Entrepreneurship</td>
<td>3</td>
</tr>
<tr>
<td>MGT 630</td>
<td>Management of Quality in Biomedicine</td>
<td>3</td>
</tr>
</tbody>
</table>

**Recommended Course Sequence:**

**Semester I**

BME 310 I  Medical Terminology for Biomedical Engineers
BME 310 II  Anatomy & Physiology for Biomedical Engineers
Semester II
BME 410 Biological Systems Analysis I
BME 320 Introduction to Biomechanics
BME 420 Biomaterials

Semester III
MAT 420 Design and Analysis of Experiment
BME 480 Optical Engineering in Biomedicine
BME 510 Individual Investigations in Biomedical Engineering

Semester IV
BME 580 Curriculum Practical Training in Biomedical Engineering
MGT 530 Business Management and Entrepreneurship
MGT 630 Management of Quality in Biomedicine

Semester V
BME 580 Curriculum Practical Training in Biomedical Engineering
BME 660 Professional Doctorate Dissertation

Semester VI
BME 580 Curriculum Practical Training in Biomedical Engineering
BME 660 Professional Doctorate Dissertation

Semester VII
BME 580 Curriculum Practical Training in Biomedical Engineering
BME 660 Professional Doctorate Dissertations

Semester VIII
BME 580 Curriculum Practical Training in Biomedical Engineering
BME 660 Professional Doctorate Dissertations

Doctor of Philosophy in Biomedical Engineering Program Core Course Descriptions:
BME 310 I Medical Terminology for Biomedical Engineers
Credits: 3 units
Cell function, organ systems, and principles of functional anatomy. Open only to biomedical engineering students.
Prerequisites: Consent of course instructor

BME 310 II Anatomy & Physiology for Biomedical Engineers
Credits: 3 units
Cell function, organ systems, and principles of functional anatomy. Open only to biomedical engineering students.
Prerequisites: Consent of course instructor

BME 320 Introductions to Biomechanics
Credits: 3 units
Principles of solid mechanics applied to biomedical systems: emphasis on analytical and experimental applications to the human musculoskeletal system.
Prerequisite: ENC 330, Dynamics, and ENC 230, Mechanics of Deformable Bodies
Corequisite: BME 310 II, Anatomy and Physiology for Biomedical Engineers

BME 410 Biological Systems Analysis I
Credits: 3 units
Principles of linear control systems theory applied to the analysis of biological systems. Development of computer simulation techniques to study the dynamic response of physiological systems.
Prerequisite: BME 310, Anatomy/Physiology & Medical Terminology for Biomedical Engineers
ENC 360, Linear Systems Analysis

BME 420 Biomaterials
Credits: 4 units Material properties, biocompatibility characteristics, performance requirements of materials for in vivo implants.
Prerequisite: CHE 110, Introduction to Inorganic Chemistry
Corequisite: BME 310, Anatomy/Physiology & Medical Terminology for Biomedical Engineers

BME 480 Optical Engineering in Biomedicine
Credits: 3 units
Introduction of optical and photonic engineering to biomedicine. Concepts of interference and coherence, Fourier transform and Fourier optics, image and signal processing, holography, fiber optics, lasers, instrumentation. Case study in biomedical optics.
Prerequisite: PHY111, Introduction to Electricity & Magnetism, MAT 210, Differential Equations

BME 510 Individual Investigations in Biomedical Engineering
Credits: By arrangement with instructor
Individual projects for biomedical engineering graduate students. Investigations could be: laboratory studies, engineering design projects, analysis and simulation of a bioengineering system, computer software development, research. Prerequisite: Consent of instructor. May be taken repeatedly for credit.

BME 520 Biomedical Engineering Graduate Labs
Credits: 3-9 units
Introduction to the research laboratories associated with faculty members of the Department of Biomedical Engineering; laboratory experience in cardiovascular and respiratory control, hemodynamics, biomaterials, biomechanics and biomedical image analysis and processing. Graduate standing required. Prerequisite: BME 310 II, Anatomy and Physiology for Biomedical Engineers, senior/graduate-student standing
BME 660 Research in Biomedical Engineering, professional doctorate Dissertation
Credits: By arrangement with instructor.
Experimental and/or analytical investigation of an approved topic for partial fulfillment of the
requirements for the professional doctorate dissertation in biomedical engineering.
Prerequisite: Consent of adviser

3.13. ENGLISH AS A SECOND LANGUAGE (ESL)

Program Description:
English as a Second Language is a section of the School of Languages at the University of
Northern California and is one of the School’s specialties.

UNC’s ESL program has the flexibility to provide courses at all levels and for many different
purposes. Various aspects of language learning can be emphasized. Some students may need extra
help with improving their accent; some may need extra reinforcement in practicing grammatical
structures, while others may need to strengthen their vocabulary. Some may want to learn
international business English while others wish to prepare for taking a degree in engineering.
UNC instructors work in teams to provide a well-balanced program for each student, taking into
consideration the student’s needs and goals. The common thread that binds all the language skills
taught at the University of Northern California is the emphasis on communication. Irrespective of
the motives for learning ESL, all students will communicate effectively as a consequence
of participation in the program. They will speak with confidence and fluency, and they will be
understood.

Mission and Objectives:
One distinguishing aspect of English as a Second Language at UNC is the tailoring of the program
to meet different needs and purposes. ESL may be studied as intensive short courses or more
comprehensive 12-week, 18-week or 36-week courses. Students, professionals and corporate
employers interested in short courses, vacation/study courses, specialized corporate training
programs or accent modification training may contact the Director of ESL at (707) 331-1110.

Admission Requirements:
Students of all ages, of all levels of English knowledge and with many different purposes are
welcome to study ESL at the University of Northern California. Students are not required to
submit SAT or GRE test scores, but must submit an application to the University.

Mode of Instruction:
At the University of Northern California, English is taught both as the language of the United
States and as a world language. A familiarization with American culture is integrated into our
instruction and students at UNC also benefit from the international atmosphere generated by the
faculty and student body.
Outside of structured classes, ESL students continue to practice their English skills. Students and faculty within the School of Languages may establish informal conversational groups. During meals, study sessions, trips, and leisure activities arranged by UNC staff, international students will have many opportunities to make friends with American students, professionals and families. Additionally, ESL students are encouraged to take advantage of, and contribute to, the University community at large through participation in extracurricular intercultural activities on campus.

**Completion Requirements:**
ESL students are required to pass tests of proficiency in oral and written expression as well as reading and listening comprehension in order to progress from one intensive ESL course to another. Prior to enrollment in other degree programs within the University, nonnative speakers of English must receive a score of at least 500 on the TOEFL, or a minimum score of 640 in the Japanese Society for Testing English Proficiency, Inc. (STEP) or a passing grade for ESL 003 (Advanced Intensive English as a Second Language) and also meet all other admissions requirements.

**Program Curriculum:**
Beginning, intermediate and advanced intensive ESL courses (ESL 001, ESL 002 and ESL 003, respectively) each include, at least, 25 hours per week of intensive English study. ESL placement test scores determine placement of students into specific ESL courses. Classes are small to allow for appropriate intensity of instruction and individual attention for each student.

Course credit is given for the intensive IEP/ESL classes. Students who pass any intensive IEP/ESL course at UNC will receive an appropriate UNC Certificate of Competence, and a record of each student’s successful completion of each IEP/ESL course will be made on his or her UNC transcript.

Advanced IEP/ESL courses, primarily designed for nonnative speakers of English already enrolled at UNC, include Advanced English Grammar and Composition (ESL 010), Advanced English Conversation (ESL 020), and Accent Modification Workshop (ESL 030). Students earn course credit for the advanced ESL courses (ESL 010, ESL 020 and ESL 030).

Proficiency levels for each IEP/ESL course listed are defined according to the American Council on the Teaching of Foreign Languages. IEP/ESL courses are taught in English, in keeping with an intensive communicative approach in which the target language is considered the optimal language of instruction. Students with a variety of native languages are combined for IEP/ESL classes.

**English as a Second Language Program Core Course Descriptions:**

**ESL 001 Beginning Intensive English as a Second Language**
Practical intensive training in English for nonnative speakers at the beginning to low-intermediate level of English proficiency. Development of speaking, listening, reading and writing skills, with emphasis on oral communication skills. Students successfully completing this course will receive a UNC certificate of beginning-level competence in English.

**ESL 002 Intermediate Intensive English as a Second Language**
Practical intensive training in English for nonnative speakers at the intermediate to high-intermediate level of English proficiency. Continued development of speaking, listening, reading
and writing skills, with emphasis on oral communication skills. Students successfully completing this course will receive a UNC certificate of intermediate-level competence in English.

Prerequisite: ESL 001 or ESL placement test and approval of the instructor

ESL 003 Advanced Intensive English as a Second Language
Practical intensive training in English for nonnative speakers at the advanced level of English proficiency. Development of advanced speaking, listening, reading and writing skills, with emphasis on oral communication skills. Students successfully completing this course will receive a UNC certificate of advanced-level competence in English.

Prerequisite: ESL 002 or ESL placement test and approval of the instructor

ESL 010-W Advanced ESL Grammar and Composition
Advanced practice in the reading and writing of English for nonnative speakers of English. An emphasis is placed on the expansion and application of English skills for academic and professional purposes.

ESL 020 Advanced ESL Conversation
Advanced practice in English listening and speaking skills for nonnative speakers of English. An emphasis is placed on enhancing student’s confidence in interpersonal communication in English, with a focus on the expansion of student’s knowledge of vocabulary and idioms of American English, on increased conversational fluency, and on nonverbal and cultural skills that will enhance students’ use of English.

ESL 030 Accent Modification Workshop
Individualized analysis, training and practice of spoken English with a focus on increasing the functional English speech intelligibility of advanced nonnative speakers of English.

In keeping with its specialty of tailoring courses and programs to varying needs and purposes, the University of Northern California also offers special courses and programs to meet student’s needs in particular areas. These areas and tracks include English for Academic Purposes, English combined with Practical Computer Skills, TOEFL Preparation, English combined with Touring, Corporate English Training, and Intensive Training for Teachers of English as a Foreign Language. Each track may be combined with another track (e.g., Corporate Training with Touring) or with general English coursework. Courses in other areas, such as English for a Specific Purpose (nursing, banking, etc.) can be designed and developed according to the needs and specifications of particular groups, institutions or companies. Courses and programs in these tracks are contingent on sufficient enrollment.
4. TUITION, FEES, AND OTHER CHARGES

4.1. TUITION FEES

UNDERGRADUATE TUITION: $472.00 per unit

GRADUATE TUITION: $650.00 per unit

**Minimum** undergraduate tuition/semester; full time (12 units): $5,664.00

**Minimum** graduate tuition/semester; full time (9 units): $5,850.00

MINIMUM TUITION FOR A FULL-TIME STUDENT, FOR ONE ACADEMIC YEAR

UNDERGRADUATE TUITION: $11,328.00

GRADUATE TUITION: $11,700.00

OTHER FEES:

- Health Insurance (mandatory) $350.00 (approximate)
- Textbooks (9 months mandatory) $500.00 (approximate)
- Computer (optional) $600.00 (approximate)
- Instructional Supplies (9 months) $50.00 (approximate)
- Application $100.00
- Enrollment Deposit $100.00 (applied to tuition)
- Late Registration $25.00
- Add/Drop (after 14 days) $10.00
- Returned Checks $20.00
- Late Tuition $50.00
- Transcription Fees $10.00 for the first and $5.00 for each additional one

A student who has not paid the tuition bill by the close of the course will not be allowed to register for additional courses and credit for courses will be withheld. Transcripts will not be issued to students with delinquent accounts.

- Key Deposit (per key, refundable) $5.00
- Language Lab User (one-time) $20.00
- Library Use (per year) $20.00
- Activities (per semi-term) $50.00
- Audit (per unit) $150.00
- Graduation $25.00
No audit fee will be charged to students who are enrolled full-time or for the equivalent of 6 units per semi-term. Students who are responsible for college items that are lost or broken will be charged the replacement cost. Students are cautioned to protect and secure personal items. The University is not responsible for personal items that are lost or damaged.
Note: There is no differential between the costs of domestic (in-state, out-of-state) and international students. Students may wish to budget approximately $20.00 to $60.00 per week for leisure expenses.

All fees are subject to change at any time.

4.2. FEE PAYMENT

Tuition, room and board and all other fees incurred at University of Northern California are due in full on the first day of each semi-term. Fees are due on the first day of each course lasting more than one semi-term.

4.3. EXTENDED PAYMENT PLAN

A semi-term payment plan allows for the division of expenses into three payments, each due on the first day of each six-week semi-term. This provides for six equal payments to be made during the nine-month school year. This payment plan is available only to students enrolled full-time.
5. CANCELLATION AND REFUND POLICIES

5.1. POLICIES

A student may cancel an enrollment agreement and the notice of cancellation must be in writing. University of Northern California will refund 100 percent of the amount paid for institutional charges, less the non-refundable Registration Fee of $100.00, if written notice of cancellation is made through attendance at the first on-campus class session, or the seventh day after enrollment, whichever is later. Students withdrawing from a course after 60% of the course has been completed will not be eligible for a tuition refund. University of Northern California will pay or credit refunds within 45 calendar days of a student's cancellation or withdrawal. Cancellation shall occur when the student gives written notice of cancellation at the address of the school. This can be done by US postal mail, hand delivery or e-mail. The written notice of cancellation is effective when received by the college. The written notice of cancellation need not take any particular form and, however expressed, it is effective if it shows that the student no longer wishes to be bound by the enrollment agreement.

5.2. TUITION REFUNDS

The following formula will be used to determine the amount of refund granted when a student withdraws from a course after having received 60% or less of the instruction:

\[
\frac{\text{amount paid}}{\text{clock hours of instruction paid for by student}} \times \frac{\text{clock hours of instruction paid for but not received}}{\text{clock hours of instruction}} = \text{refund amount}
\]

5.3. STUDENT TUITION RECOVERY FUND

The Student Tuition Recovery Fund (STRF) was established by the California Legislature to protect any California resident who attends a private postsecondary institution from losing money if the California student prepaid tuition and suffered a financial loss as a result of the school closing, failing to live up to its enrollment agreement, or refusing to pay a court judgment.

You must pay the state-imposed assessment for the Student Tuition Recovery Fund (STRF) if all of the following applies to you:
1. You are a student, who is a California resident, or are enrolled in a residency program, and prepay all or part of your tuition either by cash, guaranteed student loans, or personal loans, and 2. Your total charges are not paid by any third-party payer such as an employer, government program or other payer unless you have a separate agreement to repay the third party.

You are not eligible for protection from the STRF and you are not required to pay the STRF assessment, if either of the following applies:
1. You are not a California resident or enrolled in a residency program, or
2. Your total charges are paid by a third party, such as an employer, government program or other payer, and you have no separate agreement to repay the third party.

The State of California created the Student Tuition Recovery Fund (STRF) to relieve or mitigate economic losses suffered students who are California residents, or are enrolled in a residency program attending certain schools regulated by the Bureau for Private Postsecondary Education.

You may be eligible for STRF if you are a California resident or are enrolled in a residency program, prepaid tuition, paid the STRF assessment fee, and suffered an economic loss as a result of any of the following:
1. The school closed before the course of instruction was completed.
2. The school’s failure to pay refunds or charges on behalf of a student to a third party for license fees or any other purpose, or to provide equipment or materials for which a charge was collected within 180 days before the closure of the school.
3. The school’s failure to pay or reimburse loan proceeds under a federally guaranteed student loan program as required by law or to pay or reimburse proceeds received by the school prior to closure in excess of tuition and other costs.
4. There was a material failure to comply with the Act or this Division within 30 days before the school closed or, if the material failure began earlier than 30 days prior to closure, the period determined by the Bureau.
5. An inability after diligent efforts to prosecute, prove and collect on a judgment against the institution for a violation of the Act.

No claim can be paid to any student without a social security number or a taxpayer identification number.
6. STUDENT SERVICES

6.1. ACADEMIC ADVISEMENT

Prior to each student’s arrival at UNC, he/she is assigned a faculty adviser. The faculty adviser counsels the student with regard to the student’s academic program, helps the student plan a course of study and discusses with the student any other issues related to the University. Students are encouraged to utilize the services of their adviser. Faculty, in their classes and through advising, will encourage students to form study groups.

6.2. CAREER PLANNING AND PLACEMENT

Career planning and placement, coordinated through the Office of the Dean of Students, is part of the academic advising function of the faculty. The individual faculty adviser assists the student in the assessment of his or her potentials for placement. The Office of the Dean of Students arranges such services as C.V./resume workshops, employer visits to the campus and interviews with students.

6.3. STUDENT HEALTH AND SAFETY

The office of the Dean of Students provides on campus first aid supplies for general health care needs. The office can also provide students with health insurance information and information about local clinics and private health care providers within the Southpoint Business Park. Excellent 24-hour emergency medical care is available 4 blocks away at Petaluma Valley Hospital in Petaluma.

6.4. ACADEMIC ACHIEVEMENT AND RECOGNITION

The establishment of student scholarships, prizes and other awards for outstanding academic achievement is the priority program of the University of Northern California Foundation. The Chief Academic Officer will review all such official programs of recognition for appropriateness and financial sufficiency, before being presented to the faculty for approval. Members of the faculty periodically recommend students for honors and other recognitions of academic achievement.

6.5. ACCENT MODIFICATION WORKSHOP

UNC has made special collaborative arrangements with the Institute of Language and Phonology, located in nearby Petaluma, CA, for those international students whose English speech is perceived to be difficult to understand. The Workshop is highly individualized to assist in modifying accents to the point where the student’s speech patterns are clearly understandable to a native speaker of American English. There is an additional charge above normal tuition for this Workshop, due to the extremely small class size (a maximum of 5 students) and intensive individual attention.
6.6. STUDENT AND ALUMNI ORGANIZATIONS

UNC Alumni Association
Wei CHENG, President
2292 Faraday Ave.
Carlsbad, CA 92008
Telephone: (706) 603-3807
e-mail: wcheng@isisph.com

Students are encouraged to develop on-campus student organizations.
7. POLICIES

7.1. ACADEMIC PERFORMANCE AND RECORDS

7.1.1. ATTENDANCE, DROPOUT AND LEAVE-OF-ABSENCE POLICIES

ATTENDANCE

Instructors will keep records of each student’s attendance. Students are expected to attend all scheduled activities in every course in which they are enrolled. Instructors may excuse a student from no more than 10% of the scheduled activities in a course. Students who are absent from more than 10% of a course must have the approval of the Dean of Students before they are eligible for credit for the course.

DROPOUT AND LEAVE OF ABSENCE

Students wishing to take a leave of absence with the intent of returning may do so by writing a letter of intent to the Dean of Students. This letter should include reasons for withdrawal and plans for returning.

Students who withdraw from school without giving notice to the Dean of Students will be removed from the roster of active students and will be required to reapply for entry into their program. Refunds for such students will be calculated based on the last date of actual attendance. For information regarding the refund schedule, see the Enrollment Agreement at the back of this catalog or ‘Tuition Refunds,’ above.

A student may withdraw from a course no later than the end of the 11th week of the semester and receive a grade of W. After this date, a student who withdraws from a course normally will receive a grade of F.

7.1.2. GRADES

Grades (and grade points) in courses are A=4.0, B=3.0, C=2.0, D=1.0, and F=0.0. Instructors, at their individual discretion, may refine these grades by indicating + (+ = 0.3) or - (- = 0.3). However, in order to maintain the 4.0 rating scale, the highest GPA a student may receive is 4.0, such that there is no ‘A+'.

Each student’s level of achievement is evaluated according to the following grade scale:

- A or A- = Excellent
- B+, B, or B- = Above Average
- C+, C, or C- = Good
- D+, D+ or D = Below Average
- F = Unsatisfactory
- I = Incomplete
The grades of F and I do not yield credit. An F grade is considered in computing a student’s grade point average, an I grade is not. The grade of I may be given only if the student submits a Petition for Grade of Incomplete form to the instructor that has already been authorized by the Department Chair; it must be approved by the instructor and submitted to the Registrar prior to the end of the given term. The work must be made up in accordance with the specifications outlined on the Petition form, within the first six weeks of the following semester, quarter or semi-term. Failure to do so will result in a final course grade of F.

STUDENT PERFORMANCE

A student who consistently performs below average (< C) may be referred to the Dean of Students. A student whose cumulative grade point average (GPA) is below 2.0 may be subject to suspension. A student re-admitted after academic suspension, whose cumulative academic average (calculated from the date of re-admission) falls below 2.0 may be subject to dismissal. A graduate student who consistently performs below average (GPA < B) may be referred to the Dean of Students. A graduate student whose cumulative grade point average is below 3.0 may be subject to suspension. A graduate student re-admitted after academic suspension, whose cumulative academic average (calculated from the date of re-admission) falls below 3.0 may be subject to dismissal.

STUDENT CONDUCT

Students are expected to maintain acceptable standards of personal conduct. Failure to do so will be grounds for dismissal.

GRADUATION REQUIREMENTS

The minimum grade point average (GPA) required for graduating with a bachelor’s degree is a cumulative 2.0 in upper-division courses. The minimum grade point requirement for an advanced degree is 3.0 in graduate level courses. The minimum number of upper division semester hours required for graduation is 64. All undergraduate degrees granted require the approval of the university faculty. Master’s degrees have a thesis and non-thesis option. The Ph.D. or professional doctorate degree requires the submission of a satisfactory dissertation and the approval and recommendation of the Graduate Committee.

7.1.3. RETENTION OF STUDENT RECORDS

Students’ admission records are kept in the Office of Admissions. Once a student has matriculated, the Office of the Registrar will maintain academic files. All transfer credits, credits awarded by examination, for completion of research projects, for theses and dissertations, and related achievements are maintained in the Office of the Registrar.

The University of Northern California keeps permanent records of students, courses, and degrees awarded for a period of five years. Duplicate computer records are retained permanently. Both paper and computer records are kept in the Registrar’s Office.
Students may order official transcripts by contacting the Office of the Registrar. A $10 fee is charged for the first transcript. Additional transcripts requested thereafter are $5 each.

7.1.4. STUDENT RECORDS AND RELEASE OF INFORMATION

Student records are supervised by the Registrar and access is afforded by school officials for purposes of recording grades, attendance, advising, audits, and accrediting reviews, as well as determining tuition and eligibility.

7.1.5. CHANGE OF STATUS

Students are required to notify the Registrar when a change in status occurs, i.e., change in address, e-mail address, phone number, name, attendance, eligibility, or any other change that may have an impact upon completion of the student’s education.

7.2. RIGHTS AND CONDUCT

7.2.1. ACADEMIC FREEDOM

UNC is strongly committed to academic freedom and free speech, and endorses in principle the 1940 Statement of Principles of Academic Freedom set forth by the American Association of University Professors and the Association of American Colleges:

Academic freedoms are the right of every UNC faculty member. These freedoms include:

• Freedom to teach and discuss a field of competence without restrictions on instructional method.
  In the exercise of this freedom, the faculty member should be careful not to introduce controversial matters that have no relation to the subject matter of the course. The faculty member is also obligated to encourage the free pursuit of learning by students. The faculty member adheres to a proper role as intellectual guide and counselor. Every reasonable effort is made to foster honest academic conduct and to assure that evaluation of students reflects the true merit of their work. The confidential nature of the relationship between faculty member and student is respected.

• Freedom as a private citizen to speak out on public issues.
  The special position of the faculty member as a person of learning and an educational officer in the community, however, imposes the special obligation that he or she must remember that the public may judge the profession and the institution on the basis of such public utterances. The faculty member measures all rights and obligations as a citizen against rights and responsibilities to the field of specialization, to students, profession, and institution. When speaking, writing, or acting as a private person, the faculty member avoids creating the impression that he or she is speaking for UNC.

7.2.2. STUDENT RIGHTS

It is the policy of University of Northern California that each student be guaranteed the following rights and freedoms:

• The right to participate in any and all university-sponsored activities and services without regard to the student’s race, creed, color, gender, sexual orientation, nationality, or age.
• The right to obtain a list of basic rights.
• The right to be evaluated in the classroom solely on the basis of academic ability, achievement and fulfillment of the requirements of the class.
• The right to be represented in a democratic student government.
• The right to organize for the purpose of promoting common interests.
• The right to participate in the formulation and implementation of academic and non-academic policy.
• The right to petition for changes in academic or non-academic policies and procedures.
• The right to due process in any action brought or taken by the University against the student that can reasonably be expected to affect the student’s status with the University.
• The right to restrict the release of information taken from the student’s academic records as stated in Section 438 of the Family Educational Rights and Privacy Act of 1974.

7.2.3. PRINCIPLES OF ETHICAL CONDUCT
Inherent within the responsibility for educating the future leaders of our society is the obligation to adhere to the highest ethical standards and principles. UNC is committed to maintaining the highest standards of ethics and integrity in all of its academic and administrative operations.
• Members of the university community are expected to exercise and demonstrate personal and professional honesty and to respect the rights, values and contributions of others.
• Members of the university community are expected to be aware of and comply with relevant laws, regulations, contract requirements and university policies and procedures.
• Individuals with access to confidential, proprietary or private information must never use or disclose such information except where authorized or legally obligated to do so.
• All members of the university community are responsible for avoiding, where possible, real or potential conflicts of interest and commitment between personal and professional responsibilities, including relationships that have the appearance of a conflict.
• The university’s interests should be foremost in all official decision making and employees and others acting on behalf of the university shall remove themselves from decision-making roles that involve them in any personal capacity or which involve their friends or family members.
• All individuals acting on behalf of the university have a responsibility to ensure that funds and other assets received are used in an ethical manner. Assets of the university (including personnel), whether tangible or intangible, may not be used for illegal purposes or personal gain.
• Members of the university community shall strive to present all information, including financial information and research data and results, completely and accurately.

Members of the university community are expected to comply with these principles. Failure to do so may be grounds for dismissal.

7.2.4. POLICY CONCERNING PLAGIARISM
UNC requires academic honesty. All work submitted by a student must represent her or his own original words or ideas. In cases where a student chooses to use the words or ideas of another person, then the student is required to cite all relevant sources, and the extent to which such sources were used. Words or ideas that require citation include, but are not limited to, all hard copy or
electronic publications, whether copyrighted or not, and all verbal or visual communication when the content of such communication clearly originates from an identifiable source.

7.2.5. REGULATIONS REGARDING HARASSMENT AND SEXUAL HARASSMENT

UNC is committed to maintaining an environment that recognizes the inherent worth and dignity of every person. Critical to UNC’s mission is providing a nondiscriminatory environment that is conducive to learning. Therefore, all forms of harassment are antithetical to UNC’s goals and counter to UNC’s commitment to fostering a community based on tolerance, sensitivity, understanding, and mutual respect.

UNC is committed to providing all employees and students a workplace free of harassment and will not tolerate sexual harassment in any form. Prohibited harassment includes anyone (male or female) making unwelcome sexual advances, requesting sexual favors, or engaging in other written, verbal or physical conduct of a sexual nature. Some examples of the forms sexual harassment may take include sexually suggestive or derogatory comments, jokes or innuendoes about sex, crude pranks, sexual advances or propositions, leering, whistling, obscene gestures, displaying sexually explicit or pornographic material, unwelcome touching, physical assault, or disparate treatment based on gender.

Any student who believes he or she has been the subject of sexual harassment in school should immediately report the incident to an instructor or any UNC employee. The report will then be immediately forwarded to the school’s sexual harassment investigator. All reports of sexual harassment will be investigated promptly, impartially, and as confidentially as possible under the direction of the school’s sexual harassment investigator. Appropriate corrective action will be taken to remedy all violations of this policy. Under no circumstances will the reporting student be subject to retaliation.

Any person associated with UNC who is found to have harassed a fellow student or employee will be subject to severe disciplinary action including possible discharge or withdrawal. UNC will also take any additional action necessary to appropriately remedy the situation.

The individual who makes unwelcome advances, threatens, or in any way harasses another student or employee is personally liable for such actions and their consequences. UNC will not provide legal, financial or any other assistance to an individual accused of harassment if a legal complaint is filed.

7.2.6. POLICY ON STUDENT COMPLAINTS AND GRIEVANCES

This policy applies to complaints regarding fellow students, staff and faculty. It is suggested that the student pursue the following progression for the resolution of a complaint:

1. Attempt to resolve the issue with the party in question.
2. Seek the advice of the Program Coordinator and/or Department Chair.

At the point where the student has exhausted all of the previous avenues for resolution of the conflict, the Chief Academic Officer (CAO) should be apprised of the situation in writing. If unable to resolve the matter, the CAO will convene a hearing composed of the CAO, a faculty member, a student member. The parties involved in the dispute will present their cases at the hearing. The decision of the hearing will be final resolution of the grievance.
A student or any member of the public may file a complaint about this institution with the Bureau of Private Postsecondary Education by calling (888)370-7589 toll-free or by completing a complaint form, which can be obtained on the bureau’s Internet web site www.bppe.ca.gov.

7.2.7. ADA AND DISABILITY POLICY

UNC does not discriminate on the basis of disability in the educational programs or activities, which it conducts in accordance with Sections 503 and 504 of the Rehabilitation Act of 1973, as amended. It does provide reasonable ADA accommodations in accordance with U.S.C. 12101, Et. Seq. and EEOC Bulletin 915.002.

If you are an individual with a disability who may require assistance or accommodation in order to participate in or receive benefit from a UNC educational program, or if you desire more information, please contact the Office of Administration at UNC.

7.2.8. NONDISCRIMINATION POLICY

UNC does not discriminate on the basis of age, parental status, marital status, sexual preference, disability, race, color, or national origin in admissions and/or employment in its programs and activities, which it conducts in accordance with Title VI of the Civil Rights Act of 1964, as amended. In addition, UNC does not discriminate on the basis of gender in the educational programs or activities which it conducts in accordance with Title IX of the Education Amendments of 1972, as amended. Moreover, UNC is committed to maintaining a working and learning environment, which is free from sexual harassment. No person shall, on the basis of gender, sexual orientation, age, creed, marital status, disability, race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination or be subjected to sexual harassment in any programs or activities.

The President is the campus officer assigned responsibility for ensuring compliance with federal, state, and UNC regulations prohibiting discrimination on the basis of gender, disability, sexual preference, marital status, age, parental status, race, color, or national origin and for ensuring a working and learning environment which is free from sexual harassment and racial discrimination.

7.2.9. EQUAL OPPORTUNITY

All members of the UNC community will be provided equal opportunities for equal accomplishment and ability. UNC encourages diversity and appreciates the special attributes of each individual.
8. FACULTY

Doherty, Brian J., B.S.E. University of Pennsylvania 1984; M.S., Ph.D., Duke University, 1985, 1990. [Professor of Biomedical Engineering, 1994]

Felsing, Gary, B.S., M.S., University of California-Davis, CA, 1966, 1968. [Associate Professor of Biomedical Engineering, 2000]


Jutamulia, Suganda, B.S. Bandung Institute of Technology (Indonesia) 1977; M.S. University of Indonesia 1980; Ph.D. Hokkaido University (Japan), 1985. [Professor of Biomedical Engineering & Photonics, 1994]

Li, Jiangan (John), B.S. and M.S. in Electrical Engineering, University of Science and Technology of China (USTC), Hefei, China, 1985 & 1988, M.S., University of Northern California, 1998. [Lecturer in Systems Engineering, 2002]

Liu, Y. King, B.S. Bradley University 1955, M.S., University of Wisconsin-Madison, 1959, Ph.D. Wayne State University 1963. [Professor of Biomedical Engineering & President, 1993]

Lu, Tom (Taiwei), B.S., University of Science and Technology of China (USTC), Hefei, China, 1985; Ph.D., Pennsylvania State University, 1990. [Professor in Biomedical Engineering, 1994]


Ramos, Constance, A.B., Ph.D., J.D., University of California, Berkeley, CA, 1983, 1989. [Professor of Biomedical Engineering & Computer Science, 1994]


Welch, Karen, B.A., California State University, Fullerton, 1998, M.S., San Francisco State University, 2000. [Instructor in Languages, 2000]

Yu, Francis T.S., B.S., Mapua Institute of Technology, Manila, Philippines, 1956; M.S, Ph.D., University of Michigan, 1958, 1964. [Professor of Optical & Photonic Engineering, 2002]

Zhang, Jiangzhong, B.S., M.S., Nankai University, China, 1984, 1987; Ph.D. in Electrical Engineering, Pennsylvania State University, 1997. [Assistant Professor of Optical & Photonic Engineering, 2002]
Chu, Jack, Ph.D. in Macromolecular Science and Engineering, The University of Michigan, 1992. [Associate Professor of Biomedical Engineering, 2008]

Fitzgibbon, Ina, B.S. Physical Therapy 1997, MBA. Pepperdine University, CA 2011 [Associate Professor of Business Administration, 2012]
9. UNIVERSITY OF NORTHERN CALIFORNIA GOVERNANCE

BOARD OF DIRECTORS:

Emmit George, J.D., Interim Chairman of the Board

Paul Dunn, Ph.D., member

Anthony S. Dintcho, MD, DPM, member

Ina Fitzgibbon, MBA, member

Howard Leonhardt, D. Eng. (hc), member