



UNLV *Graduate Catalog*

2009-2011

Nevada System of Higher Education

The Nevada System of Higher Education, comprised of two doctoral-granting universities, a state college, four comprehensive community colleges and one environmental research institute, serves the educational and job training needs of the nation's fastest growing state. The NSHE provides educational opportunities to more than 108,000 students and is governed by the Nevada Board of Regents

Daniel Klaich
Chancellor

The Board of Regents wishes to advance student learning to the highest level, foster the expansion of knowledge through teaching and research, encourage community service, and enrich the lives of our students, our communities, our state, and the nation. In fulfillment of this purpose, we hold the following values at the center of our endeavor:

- Integrity
- Excellence
- Accountability
- Inclusiveness
- Creativity
- Innovation

Board of Regents

James Dean Leavitt, Chairman
Jason Geddes, Ph.D., Vice Chairman
Mark Alden
Robert J. Blakely
William G. Cobb
Cedric Crear
Dorothy S. Gallagher
Ron Knecht
Kevin J. Page
Dr. Raymond (Ray) Rawson
Dr. Jack Lund Schofield
Michael Wixom

Disclosures

Rights of Privacy Act of 1974

The Federal Family Education Rights and Privacy Act of 1974 affords persons who are currently, or who were formerly, in attendance at the university as registered students a right of access to their "educational records," which contain information directly related to such persons and the right to challenge the accuracy of their records. The act also restricts the persons to whom the university may disclose a student's educational records without the student's written permission. The university's policy is to comply fully with all provisions of the act, and a detailed

statement concerning the rights afforded current and former students is available, at no cost, in the office of UNLV's General Counsel. Any person who feels the university has failed to comply with the Federal Family Education Rights and Privacy Act may file a complaint with the Family Education Rights and Privacy Act Office, Department of Education, 300 Independence Avenue S.W., Washington D.C. 20201.

Annual Jeanne Clery Campus Safety and Security Report

In order to comply with provisions of "The Jeanne Clery Disclosure of Campus Security Policy and Campus Crime Statistics Act", reports from the University community and local law enforcement agencies are compiled and published annually by the Department of Public Safety. As law enforcement professionals tasked with the maintenance of a safe and secure educational environment, it is our responsibility to provide a comprehensive report regarding the campus public safety environment including the incidence of crime.

Limitations

The 2009-2011 Graduate Catalog describes current academic programs of study, course descriptions and degree requirements at the graduate level for the academic years 2009-10 and 2010-11 at the University of Nevada, Las Vegas. The content of this catalog is current as of August 2009, but is subject to modification at any time to accommodate changes in university resources or educational plans.

This catalog does not constitute a contractual commitment that the university will offer all the courses or programs described, and the university reserves the right to revise catalog provision and fees at any time in accordance with the actions of the president the Nevada System of Higher Education, or any other governing body. The university reserves the right to eliminate, cancel, reduce in size or phase out courses, academic programs and/or limit enrollments in specific programs and courses, to change fees during the student's period of study, and to require a student to withdraw from the institution for cause at any time.

Inquiries

Inquiries should be addressed to: Dean of the Graduate College, University of Nevada, Las Vegas, 4505 Maryland Parkway, Box 451017, Las Vegas, NV 89154-1017, (702) 895-3320, or call UNLV's main switchboard at (702) 895-3011. Visit the UNLV Web site at <http://www.unlv.edu>. @2009



A Message from UNLV President Neal J. Smatresk

As the new president of UNLV, I'm delighted to encourage you to consider graduate studies at the University of Nevada, Las Vegas. UNLV is a wonderful institution with exceptional programs, excellent faculty, and a supportive atmosphere where graduate education thrives.

As you explore graduate education at UNLV, you'll be pleased to learn that nearly a quarter of UNLV's students are currently enrolled in graduate/professional programs. The number of students in these programs has increased by 33 percent since 2003. These numbers should provide some indication of the significance of graduate studies at UNLV. We know that high quality graduate education is pivotal to the growth and sophistication of our institution.

In addition to supporting the educational and research missions of the university, graduate education also plays a pivotal role in preparing tomorrow's leaders in many professions. It enables our students to move into the workplace with the kind of preparation that only advanced study can provide. Alumni of our graduate programs are the professionals who lead our community in health care, education, law enforcement, social work, business, art, and engineering, just to name a few critically important fields. Their contributions are vital to the quality of life that we enjoy here in Southern Nevada.

Again, we welcome your interest in UNLV and encourage you to join us in our dedication to research and graduate education as we create a bright future for our university and community.

Dr. Neal J. Smatresk
UNLV President

Table of Contents

Degree Programs	4	School of Dental Medicine	248
Academic Calendar	5	School of Nursing	261
Web Resources	6	William F. Harrah College of Hotel Administration	253
About UNLV	7	Recreation & Sport Management	276
Program Accreditations	7	William S. Boyd School of Law	279
Division of Research & Graduate Studies	9	College of Liberal Arts	296
Admission & Registration Information	11	Anthropology	296
Academic Policies	16	English	305
Degree Progression Policies & Procedures	20	Foreign Languages	313
Tuition & Fees	24	History	317
Financial Assistance	27	Political Science	326
College of Business	30	Ethics and Policy Studies	328
Accounting	30	Psychology	334
Business Administration	33	Sociology	342
Economics	47	Women's Studies	355
Finance	51	College of Sciences	358
Management	52	Chemistry	359
Management Information Systems	54	Geoscience	366
College of Education	60	School of Life Sciences	376
Counselor Education	62	Mathematical Sciences	382
Curriculum & Instruction	67	Physics & Astronomy	392
Educational Leadership	89	Water Resources Management	398
Educational Psychology	106	Greenspun College of Urban Affairs	400
Special Education	116	Communication Studies	401
Sports Education Leadership	131	Criminal Justice	403
Howard R. Hughes College of Engineering	137	School of Environmental & Public Affairs	408
Civil & Environmental Engineering	138	Environmental Studies	408
School of Computer Science	148	Public Administration	411
Construction Management	154	Hank Greenspun School of Journalism & Media Studies	419
Electrical & Computer Engineering	157	Marriage & Family Therapy	421
School of Informatics	168	School of Social Work	426
Mechanical Engineering	171	Index	436
College of Fine Arts	183		
School of Architecture	183		
Art	189		
Film	191		
Music	193		
Theatre	207		
Division of Health Sciences	215		
School of Allied Health Sciences	215		
Health Physics & Diagnostic Sciences	215		
Kinesiology & Nutrition Sciences	219		
Physical Therapy	224		
School of Community Health Sciences	233		
Environmental and Occupational Health	238		
Health Care Administration & Policy	241		
Health Promotion	244		

Degree Programs

Accounting – M.S.
Anthropology – M.A.; Ph.D.
Architecture – M. Arch
Aerospace Engineering – M.S.
Art – M.F.A
Astronomy – M.S.; Ph.D.
Biochemistry – M.S.
Biological Sciences – M.S.
Biomedical Engineering – M. S.
Business Administration – M.B.A.; Executive M.B.A.
Business Administration/Dental Medicine – Dual M.B.A./
D.M.D.
Business Administration/Hotel Administration – Dual
M.B.A./M.S.
Business Administration/Law – Dual M.B.A./J.D.
Business Administration/Management Information
Systems – Dual M.B.A./M.S.
Chemistry – M.S.; Ph.D.
Civil & Environmental Engineering – M.S.E.; Ph.D.
Clinical Mental Health M.S.
Communication Studies – M.A.
Community Health Counseling – M.S.,
Computer Science – M.S.C.S.; Ph.D.
Construction Management – M.S.C.S.
Creative Writing – M.F.A.
Criminal Justice – M.A.
Crisis and Emergency Management – M.S.
Curriculum & Instruction – M.Ed.; M.S.; Ed.S.; Ed.D.; Ph.D.
Economics – M.A.
Education/Law – Dual Ph.D in Education/J.D.
Educational Leadership– M.Ed.; M.S.; Ed.S.; Ed.D.;
Executive Ed.D.; Ph.D.
Educational Psychology–M.S.; Ed.S.; Ph.D.
Educational Psychology & Juris Doctor Dual Ph.D./J.D.
Electrical & Computer Engineering – M.S.E.E.; Ph.D.
English – M.A.; Ph.D.
Environmental & Occupational Health – M.P.H.
Environmental Science – M.S.; Ph.D.
Ethics & Policy Studies – M.A.
Exercise Physiology – M.S.
Film, Screenwriting – M.F.A.
Foreign Languages – M.A.
Geosciences – M.S.; Ph.D.
Health Care Administration – M.H.A.
Health Physics – M.S.
Health Promotion – M.Ed.
Higher Education Leadership – Ph.D.
Higher Education Leadership – M.Ed.
History – M.A.; Ph.D.
Hospitality Administration – Executive M.H.A; Ph.D.
Hotel Administration – M.S.
Hotel Administration/M.B.A – Dual M.S./M.B.A.
Hotel Administration/M.I.S. – Dual M.S./ M.I.S.
Informatics – M.S.; Ph.D.
Journalism & Media Studies – M.A.
Kinesiology – M.S.

Learning & Technology – Ph.D.
Management Information Systems – M.S.
Management Information Systems & Business Administration
Dual M.S./M.B.A.
Management Information Systems & Hotel Administration
Dual M.S.
Marriage & Family Therapy – M.S.
Materials & Nuclear Engineering – M.S.
Mathematical Sciences – M.S.; Ph.D.
Mechanical Engineering – M.S.E., Ph.D.
Music – M.M.
Musical Arts – D.M.A.
Nursing – M.S.N.; Ph.D.
Physical Therapy – D.P.T.
Physics – M.S.; Ph.D.
Political Science – M.A.; Ph.D.
Psychology – Ph.D.
Public Administration – M.P.A.
Public Affairs – Ph.D.
Public Health – M.P.H.; Ph.D.
Radiochemistry – Ph.D.
School Counseling – M.Ed.
Science – M.A.S.
Social Work – M.S.W.
Social Work/Law – Dual M.S.W./J.D.
Sociology – M.A.; Ph.D.
Spanish, Hispanic Studies – M.A.
Special Education– M.Ed.; M.S.; Ed.S.; Ed.D.; Ph.D.
Sport & Leisure Service Management – M.S.
Sport Education Leadership– M.Ed.; M.S.; Ph.D.
Teacher Education – Ph.D.
Theatre – M.A.; M.F.A.
Transportation – M.S.T.
Water Resources Management – M.S.
Workforce Education & Development – M.Ed; M.S.

Graduate and Advanced Graduate Certificate Programs

Addiction Studies (Counselor Education)
Advanced Graduate Certificate in Accounting (Accounting)
Graduate Certificate in Accounting (Accounting)
Graduate Certificate in Management (Management)
Family Nurse Practitioner (Nursing)
Finance Graduate Certificate (Finance)
Forensic Social Work (Social Work)
Management Information Systems (Management Information)
Marriage & Family Therapy (Marriage & Family
Therapy)
Mental Health Counseling (Counselor Education)
New Venture Management Graduate Certificate (Management)
Nonprofit Management (Public Administration)
Nursing Education Post-Masters Certificate (Nursing)
Pediatric Nurse Practitioner Certificate (Nursing)
Public Management (Public Administration)
Women's Studies (Women's Studies)

Academic Calendar

Fall Semester 2009

August	24	Instruction begins.
September	7	Labor Day recess.
October	30	Nevada Day recess.
November	11	Veterans Day recess.
December	26-27	Thanksgiving Day recess.
	7-12	Study Week.
	12	Instruction ends.
	10-15	Final examinations.
	15	Semester ends.
	15	December Commencement.

Spring Semester 2010

January	11	Instruction begins.
	18	Martin Luther King holiday.
February	15	Washington's Birthday recess.
March	13	Mid-semester.
	29	Spring Break begins.
April	3	Spring Break ends.
	26	Study Week begins.
May	1	Study Week ends.
		Instruction ends.
	8	Semester ends.
	8	Commencement.

Summer Session 2010 I

May	10	Instruction begins.
	28	Instruction ends.

Summer Session 2010 II

May	31	Memorial Day Recess
June	1	Instruction begins.
	2	Instruction ends.
July	5	Independence Day recess.
	6	Instruction begins.
	11	Instruction ends.

Summer Session 2010 III

July	5	Instruction begins.
August	6	Instruction ends.
Fall 2010		
August	23	Instruction begins.
September	6	Labor Day recess.
October	29	Nevada Day recess.
November	11	Veterans Day recess.
	25-26	Thanksgiving recess.
	29	Study Week begins.
December	4	Study Week ends.

4	Instruction ends.
11	Semester ends.

Spring Semester 2011

January	17	Martin Luther King holiday.
	18	Instruction begins.
February	21	Washington's Birthday Recess.
March	14-19	Spring Break.
May	2-7	Study Week
	7	Instruction ends.
	14	Semester ends.
		Commencement. (TBA)

Summer Session 2011 I

May	16	Instruction begins.
	30	Memorial Day Recess.
June	1	Instruction ends.

Summer Session 2011 II

June	6	Instruction begins.
July	4	Independence Day recess.
	9	Instruction ends.

Summer Session 2011 III

July	11	Instruction begins.
August	13	Instruction ends.

***Dates are subject to change**

UNLV Web Resources

Graduate College:

<http://graduatecollege.unlv.edu/>

Graduate Study Timeline

<http://graduatecollege.unlv.edu/current/guidance/>

Research and Graduate Studies

<http://research.unlv.edu/>

The Graduate & Professional Student Association

<http://gpsa.unlv.edu/>

Academic Colleges & Divisions:

Business

<http://business.unlv.edu/>

Education

<http://education.unlv.edu/>

Engineering

<http://engineering.unlv.edu/>

Fine Arts

<http://finearts.unlv.edu/>

Honors

<http://honors.unlv.edu/>

Hotel

<http://hotel.unlv.edu/>

Health Sciences (Division of)

<http://healthsciences.unlv.edu/>

Liberal Arts

<http://liberalarts.unlv.edu/>

Sciences

<http://sciences.unlv.edu/>

Urban Affairs

<http://universitycollege.unlv.edu/>

Additional Resources, Departments, & Services:

Campus Life

<http://studentaffairs.unlv.edu/units/campuslife/index.html>

Campus Recreation and Wellness Center

<http://srwc.unlv.edu>

Career Services

<http://hire.unlv.edu>

Cashiering and Student Accounts

<http://cashiering.unlv.edu>

Disability Resource Center

<http://studentlife.unlv.edu/disability>

Financial Aid and Scholarships

<http://finaid.unlv.edu/>

International Students and Scholars

<http://studentlife.unlv.edu/international/>

Jean Nidetch Women's Center

<http://womenscenter.unlv.edu>

Library Services

<http://www.library.unlv.edu/>

Office of Student Conduct

<http://studentlife.unlv.edu/judicial/>

Parking Services

<http://parking.unlv.edu>

Rebel Card Services

<http://www.rebelcard.edu>

Registrar's Office

<http://register.unlv.edu/>

Research Centers & Institutes

<http://research.unlv.edu/cli&m/centers-institutes.html>

Student Computing Help Desk

<http://oit.unlv.edu/students>

Student Counseling & Psychological Services

<http://studentlife.unlv.edu/caps/>

Student Diversity Programs & Services

<http://getinvolved.unlv.edu>

Student Health Center

<http://studentlife.unlv.edu/shc/>

Student Union

<http://studentunion.unlv.edu>

UNLV Bookstore

<http://unlv.bnccollege.com>

UNLV Campus Dining

<http://www.unlvdining.org>

Veteran Services

<http://finaid.unlv.edu/veterans/>

Writing Center

<http://writingcenter.unlv.edu>

About UNLV

The University of Nevada, Las Vegas, located in the vibrant and dynamic city of Las Vegas and surrounded by the Mojave Desert, embraces the traditional values of higher education adapted for the global community of the twenty-first century. UNLV assists students in meeting the intellectual and ethical challenges of responsible citizenship and a full and productive life through opportunities to acquire the knowledge and common experiences that enhance critical thinking, leadership skills, aesthetic sensitivity, and social integrity.

The university provides traditional and professional academic programs for a diverse student body and encourages innovative and interdisciplinary approaches to teaching, learning, and scholarship. UNLV simultaneously engenders collegial relationships and a sense of community among its members. UNLV embraces the interdependence of quality instruction, scholarly pursuits, and substantive involvements in campus and community life. The university offers artistic, cultural, and technical resources and opportunities to the broadest possible community. It promotes research programs and creative activities by students and faculty that respond to the needs of an urban community in a desert environment. UNLV is committed to developing a synergy between professional and liberal studies, between undergraduate education and graduate programs, and between superior teaching and meaningful research. UNLV increasingly is a dynamic resource for, and partner with, the community that it serves.

In its 50-year history, UNLV has undergone an amazing transformation from a small branch college into a thriving urban research institution of 28,000 students and 3,300 faculty and staff.

Along the way, the urban land-grant university has become a dynamic resource for one of the country's fastest-growing and most enterprising cities. UNLV's 332-acre main campus, located on the southern tip of Nevada in a desert valley surrounded by mountains, is home to more than 220 undergraduate, master's, and doctoral degree programs, all accredited by the Northwest Commission on Colleges and Universities.

UNLV Mission Statement

The University of Nevada, Las Vegas, is a research institution committed to rigorous educational programs and the highest standards of a liberal education. We produce accomplished graduates who are well prepared to enter the work force or to continue their education in graduate and professional programs. Our faculty, students, and staff enthusiastically confront the challenges of economic and cultural diversification, urban growth, social justice, and sustainability. Our commitment to our dynamic region and State centrally influences our research and educational programs, which improves our local communities. Our

commitment to the national and international communities ensures that our research and educational programs engage both traditional and innovative areas of study and global concerns. UNLV's distinctive identity and values permeate a unique institution that brings the best of the world to our region and, in turn, produces knowledge to improve the region and world around us.

- UNLV is committed to and driven by these shared values that will guide our decision making:
- High expectations for student learning and success;
- Discovery through research, scholarship, and creative activity;
- Nurturing equity, diversity, and inclusiveness that promotes respect, support, and empowerment;
- Social, environmental, and economic sustainability;
- Strong, reciprocal, and interdependent relationships between UNLV and the region around us;
- An entrepreneurial, innovative, and unconventional spirit.

Program Accreditations

All programs at UNLV are accredited by the Northwest Commission on Colleges and Universities (NWCCU). UNLV's international programs are approved by the Council on International Educational Exchange (CIEE). For more accreditation information, visit the UNLV Program Accreditations webpage.

Accounting

The Association to Advance Collegiate Schools of Business (AACSB)

Architecture

National Architectural Accrediting Board (AAB)

Art

National Association of Schools of Art and Design (NASAD)

Athletic Training

Commission on Accreditation of Athletic Training Education (CAATE)

Business Administration

The Association to Advance Collegiate Schools of Business (AACSB)

Computer Science

Accreditation Board for Engineering and Technology (ABET)

Construction Management

American Council for Construction Education (ACCE)

Didactic Program in Dietetics

Commission on Accreditation for Dietetics Education (CADE)

Dental Medicine

Commission on Dental Accreditation (CODA)

Economics

The Association to Advance Collegiate Schools of Business (AACSB)

Education

The National Council for Accreditation of Teacher Education (NCATE)

Engineering

Accreditation Board for Engineering and Technology (ABET)

Gerontology

Association for Gerontology in Higher Education (AGHE)

Health Care Administration

Association of University Programs in Health Administration (AUPHA)

Health Education

American Association for Health Education (AAHE)

Health Physics

Applied Science Accreditation Commission of the Accreditation Board for Engineering and Technology (ASAC ABET)

Interior Architecture and Design

Council for Interior Design Accreditation (CIDA)

Landscape Architecture

Landscape Architects Accreditation Council (LAAB)

Law

American Bar Association (ABA) (member of AALS)
Association of American Law Schools

Marriage and Family Therapy

Commission on Accreditation for Marriage and Family Therapy Education (COAMFTE)

Music

National Association of Schools of Music (NASM)

Nuclear Medicine

Joint Review Committee on Educational Programs in Nuclear Medicine Technology (JRCNMT)

Nursing

National League for Nursing (NLN)

Phlebotomy Certificate

National Accrediting Agency for Clinical Laboratory Sciences (NAACLS)

Physical Education

National Association for Sport & Physical Education (NASPE)

Physical Therapy

Commission on Accreditation in Physical Therapy Education (CAPTE)

Psychology (Clinical)

American Psychological Association (APA)

Public Administration

National Association of Schools of Public Affairs and Association (NASPAA)

Radiography

Committee on Education in Radiologic Technology (JRCERT)

Recreation – Professional Golf

Management Professional Golf Association (PGA)

Social Work

Council on Social Work Education (CSWE)

Theatre

National Association of Schools of Theatre (NAST)

Division of Research & Graduate Studies



As Vice President for Research and Graduate Dean, I would like to extend a warm welcome to those interested in graduate study at UNLV. I believe you will find our graduate programs among the best in the country, attracting the best and brightest students nationally and internationally.

Offering nearly 120 graduate degree programs, including 36 doctoral and professional degrees,

UNLV provides wide-ranging and unique areas of study to more than 6,000 graduate and professional students. The UNLV Graduate College seeks to provide its students with the highest quality academic experience, including excellent opportunities for research, scholarship, and creative activity. We pride ourselves on cultivating a campus culture that promotes involvement of graduate students in these activities.

We also seek to identify new and innovative ways to meet graduate students' needs. We provide ample opportunities for financial assistance, offering a wide variety of assistantships, fellowships, and scholarships, and we maintain a customer service orientation in our efforts to meet student needs beyond the classroom and laboratory.

The Graduate College looks forward to working with your academic department to facilitate your education. We are dedicated to enhancing your experience at UNLV and will do our very best to guide you as you pursue graduate study.

Ron Smith, Ph.D.
Vice President & Graduate Dean
Division of Research and Graduate Studies

The UNLV Graduate College

The Graduate College strives to achieve the institutional mission by supporting a wide range of excellent master's and doctoral degree programs in the major areas of human knowledge—the physical sciences, the social sciences, the humanities, and the arts—as well as in professional fields that respond to local, state-wide, and

regional needs. It is clear that our institution's mission of becoming a premier metropolitan research university with academically excellent programs that focus on student needs as well as issues and problems of the local community and state of Nevada rests, in large part, with the direction, growth and quality of UNLV graduate education. This commitment is further supported by the integration of the university's research and graduate program management into the Office of Research and Graduate Studies. This structure strategically links the on-going development of UNLV's research infrastructure with graduate education and directly enhances scholarship opportunities for graduate students.

The Graduate College seeks to support and advance graduate education, including the student learning, the research, scholarly, and creative activities, and the community and institutional services associated with it. The Graduate College is ideally suited to fulfill this purpose and, in this capacity, will assist academic departments and colleges as well as coordinate efforts with student service and administrative offices to meet the needs and interests of graduate students, graduate faculty, and graduate programs; encourage programs and programmatic emphases that meet the challenges of our rapidly growing local population, state, and region as well as the challenges facing the nation and world; articulate a standard of intellectual excellence that pervades university discussions and decisions about matters that affect graduate education; provide university-wide policies and guidance which define good practice in graduate program administration; and bring faculty and students together to encourage intellectual communication, multidisciplinary and interdisciplinary graduate instruction; and cooperative research and artistic projects.

The Graduate College, in all of its policies and actions, must reinforce and encourage that the institution is an intellectual community where students, faculty, and programs with different backgrounds and interests all pursue advanced knowledge and seek improvement of the human condition for the twenty-first century. This shared purpose ultimately defines the most important reason for the existence of a Graduate College and the larger community.

Equal Opportunity

It has been and will continue to be the policy of the University of Nevada, Las Vegas, to be an equal opportunity institution. All decisions of admissions and employment are based on objective standards that will further the goals of equal opportunity.

The university is committed to assuring that all programs and activities are readily accessible to all eligible persons without regard to their race, color, religion, gender, national origin, ancestry, age, disability, Vietnam-Era and/or disabled veteran status, any protected class under relevant state and federal laws, and, in accordance with university policy, sexual orientation.

Persons having questions regarding university policies relating to nondiscrimination law are encouraged to contact

the Office of Human Resources and Diversity Initiatives, Campus Services Building, room 237 or call (702) 895-3504.

Your Graduate School Experience

The reasons for enrolling in graduate school are as varied as the people who make up the graduate student population. Your decision to seek an advanced degree means you share with other UNLV graduate students a spirit of adventure that comes with discovery—discovery of new information, new skills—and discovery of the depths of your own intellectual abilities. You will also share a capacity for hard work, because graduate study, whatever the subject matter, is difficult. But at the end of the sometimes tedious, oftentimes exhilarating work in your chosen field, you will have the satisfaction of having mastered a body of knowledge that places you in an elite group. Your achievement of a graduate degree will be a beginning, not an end. It will only be the start of your development and a forecast of your potential for future contributions to your chosen area of interest.

The university's advanced degree programs are based on close working relationships between students and faculty. Although most programs can be developed to meet the needs and interests of the individual student, the student must also satisfy all departmental and Graduate College requirements. Therefore, it is important that all students carefully read the appropriate sections of this catalog and stay in close contact with the faculty members in their degree program. Students are responsible for being aware of and observing the policies and regulations stated in the Graduate Catalog.

The Graduate Dean with the advice of the Graduate Council determines policies and procedures of the Graduate College. The Council consists of one delegate from each academic department that sponsors an advanced degree program, and it operates with standing committees. The Graduate and Professional Student Association also has representatives on the Graduate Council. The Graduate Dean and Associate Graduate Dean are ex-officio members of the Graduate Council and each standing committee.

Once enrolled as a student, you will have various responsibilities within the academic community. The conduct of all persons affiliated with the University of Nevada, Las Vegas is governed by the Rules and Disciplinary Procedures for Members of the University Community. This code outlines the responsibilities of students, faculty, staff and administration as well as the rules, sanctions and hearing procedures in effect on the campus. Printed copies of the code are available in the Registrar's Office. The UNLV Student Conduct Code is available through the UNLV Office of Student Conduct.

Services for Graduate Students

The Graduate College offers services to support graduate students in many different areas. In cooperation with various offices at the University of Nevada, Las Vegas, Graduate Student Services seeks to provide information and programs aimed at the unique needs of graduate students.

Orientation. Every semester, prior to the beginning of classes, the Graduate College conducts an orientation for new graduate students and Graduate Assistants. Each department and/or program offering a graduate degree provides additional orientation and advising for new students.

Recruitment. UNLV is committed to growing selectively, serving the region, and achieving distinction. In recognition of this commitment, the Graduate College seeks to develop, implement, coordinate, and monitor a university-wide graduate recruitment program. Primary goals of this program are to assist the individual graduate programs to identify potential graduate students and to encourage these students to apply and enroll. Also, the Graduate College participates in the UNLV McNair Scholars Program that helps to identify and prepare under represented and minority students for graduate school.

Thesis and Dissertation Support. For many programs, the thesis or dissertation represents the culmination of the graduate experience. The Graduate College provides guidance, oversight and direction to graduate students and faculty concerning the policies and procedures for final submission of the thesis or dissertation.

Professional Development Programs. The Graduate College works with other campus units to provide a formal, value-added experience for graduate students that will enhance their career development. For example, a Professional Development Program in College Teaching is currently offered in association with the University Teaching and Learning Center to individuals seeking academic careers.

Student Advising Services. The advising services provide informal and student-centered issue-resolution services, and general advising advice, to graduate students and prospective graduate students. The office offers guidance, information, and assistance when regular channels have failed to provide graduate students with the information that they need to solve problems or make informed decisions. Note: The office does not provide academic advising; students must consult with the graduate coordinator in their own graduate program, or program of interest, for academic guidance.

Graduate and Professional Student Association

The Graduate & Professional Student Association was formed in 1980 to provide additional opportunities for graduate students to interact, both socially and academically, and to provide a forum for dealing with problems specific to graduate student life. GPSA's primary

goals are to improve the quality of graduate education and to offer graduate student grants for research and other scholarly projects.

Each department on campus has a graduate student representative who communicates all pertinent information concerning the GPSA to his/her constituents. The GPSA has graduate student representation on all standing committees of the Graduate College and participates in at least one community service project each semester.

The GPSA office provides a study and social lounge, a copy service and a computer lab. The office is open year round, all day and some evenings. Meetings are held on the first Monday of every month, and all graduate students are encouraged to attend and participate. For more information contact the GPSA office, Lied Library, Room 3251 or call (702) 895-2261.

Admission & Registration Information

Admission to the Graduate College at the University of Nevada, Las Vegas is competitive; the minimum standard is evidence of the ability to matriculate in and complete an advanced graduate degree successfully. The rules and criteria established by the Board of Regents, University, Graduate College, and individual graduate programs determine admissibility.

The Graduate College processes applications and supporting materials when received for the semester indicated by the applicant. All application materials must be received by June 15 for fall and November 15 for spring admission (May 1 and October 1, respectively, for international applicants). Application deadlines vary by department, and many graduate programs have different admissions deadlines that applicants must meet to be considered for admission. Students should contact the department where they are seeking admission to get this information.

In consultation with the Graduate College, departments have the right to establish additional admission standards and criteria. It is the responsibility of the applicant to contact the appropriate department for information on additional departmental admission requirements. Please note that applicants must submit admissions materials to both the Graduate College and their graduate program of interest simultaneously in order to apply for admission. The process below describes the Graduate College requirements; please also follow the requirements, guidelines and deadlines of your degree program of interest.

Admission Requirements

Requirements for Domestic Applicants

Applicants must meet the following academic requirements:

1. Hold a baccalaureate or advanced graduate degree from a regionally accredited four-year college;
2. Have a minimum overall grade point average of 2.75 (4.00=A) for the bachelor's degree, or a minimum 3.00 GPA (4.00=A) for the last two years of study;
3. A student who has an advanced degree from an accredited college or university with a minimum overall GPA of 3.00 may, at the option of the Graduate Dean and department, be admitted to an advanced degree program with an undergraduate grade point average of at least 2.00 but less than 3.00.

Requirements and Procedures for International Applicants

International applicants are considered for the Graduate Standing classification only. Besides the admission requirements listed previously, international applicants from countries where English is not the native language, or who did not receive a degree from an institution where English is the language of instruction, must show competency in English. The Graduate College requires a minimum score of 550 (written), or 213 (computerized), or 80 (internet-based) on the Test of English as a Foreign Language (TOEFL), 85 on the Michigan Test, or a 7 band or higher on the International English Language Testing System (IELTS).

Credentials not written in English must be accompanied by an English translation certified as true by a university official, an official representative of a United States embassy or consulate, the United States Information Service, the United States Education Foundation, or an approved professional translating service. Notarized copies of originals or translations are not considered official.

International applicants must submit a completed Certificate of Finance to the Office of International Students & Scholars, must satisfy the financial eligibility requirements, and receive their Letter of Admission from the Graduate College by July 1 if admitted for fall semester and November 15 if admitted for the spring semester before an I-20 will be issued.

For information concerning matters not related directly to the degree program (housing, fees, etc.), contact the Office of International Students and Scholars. Once admitted, international students must consult with this office and their academic advisor.

Application Procedures for Domestic and International Applicants

To be considered for admission, prospective students must complete two simultaneous application processes: one in the Graduate College and the other in the department that offers your program of study. The Graduate College requires the same application and admission materials from all prospective graduate students, regardless of department of

interest. Individual academic departments may require satisfactory composite scores on standardized tests, letters of recommendation, a personal statement, portfolio, or any combination of these or other items. Because departmental requirements vary, please refer to your department of interest for specific application requirements and deadlines. To apply to the Graduate College, submit the following admission materials for consideration:

- A completed application: The application is available for you to fill-out online by selecting the “Applying to Graduate School” link on the Graduate College homepage at <http://graduatecollege.unlv.edu>.
- A nonrefundable admission application fee, payable to the Nevada System of Higher Education by check, money order, or online by credit card.

*Note: Applications and materials will not be processed until the application fee is received. Applicants to multiple UNLV graduate programs must pay the admission application evaluation fee for each application filed. Denied applicants, who later seek admission to the same or other UNLV degree program, are required to pay an additional application fee to cover processing.

- One official transcript from every postsecondary institution the applicant has attended, showing all degrees and coursework, the dates awarded, and extension and correspondence work.

*Note: Only transcripts sent directly from the institution are considered official. Failure to disclose all course work and/or degrees awarded will result in rescission of admission.

Send Graduate College admission materials to:

University of Nevada, Las Vegas
Graduate College
FDH 352 Box 451017
4505 S. Maryland Parkway,
Las Vegas, NV 89154-1017

Mailing addresses for specific graduate programs are available on department websites via the Graduate College website. Applicants must submit admission materials to your department of interest by their deadline. Because departmental requirements vary, please be sure to refer to your department of interest for specific application requirements. Many graduate programs require some or all of the following documentation:

- One official transcript from all postsecondary institutions attended, showing all degrees and the dates awarded and extension and correspondence work. Only transcripts sent directly from the institution are considered official. Some departments only require

unofficial transcripts; please check with your department of interest to confirm.

- Letters of recommendation sent by former instructors, employers, or other professionals who can evaluate the applicant’s potential to complete graduate study.
- Resume, portfolio, etc. Some departments may request additional materials (i.e., resume, portfolio, and statement of purpose, writing samples, and the like).
- Standardized test scores. In addition, some departments may require satisfactory composite scores on the Graduate Record Examination (GRE), Graduate Management Admission Test (GMAT), Miller Analogies Test (MAT), or other standardized tests. Information concerning standardized examinations required for admission to the degree program is available from the Student Development Center. Some examinations are given only four or five times a year and require that registration be completed a minimum of six weeks prior to the test date. With the exception of the Miller Analogies Test (MAT), students may take the required tests at other colleges or universities if taking them at UNLV is inconvenient for the applicant.

The Admission Process

1. A Student Admission File is created upon receipt of an admission application and fee. Applications are not processed until the Graduate College receives all required credentials. To avoid processing delays, students must submit the online admission application and fee prior to sending additional materials (i.e., transcripts, test scores, letters of recommendation, etc.). Applicants are responsible for making sure the Graduate College and department receive the appropriate credentials by the required deadlines. All application materials, including transcripts, become the property of the university and may not be released to the applicant or any individual.
2. The Graduate College evaluates the application materials and forwards them to the department for review. Upon review of the materials, the department will make a recommendation to the Dean of the Graduate College for approval. Early submission of all application materials to the Graduate College and department simultaneously, facilitates a more expeditious review process.
3. Applicants will be notified of their admission status on their Apply Yourself page (online). Those accepted to pursue a UNLV graduate degree will receive a Letter of Admission from the Graduate College. The Letter of Admission is an important document that the student should retain.
4. The admission process is completed upon enrollment in graduate-level courses for the specified term and degree program indicated on the Letter of Admission. Failure to enroll or withdraw from all course work, during the

semester of admission will void the Letter of Admission.

*Note: Occasionally a student may be admitted with deficient undergraduate preparation contingent on the deficiency being corrected by completing one or two undergraduate courses early in the graduate program. Students needing more than two undergraduate courses are advised to consult with the department for a recommendation on which courses they should take to meet the prerequisite admission requirements. These courses will not apply toward the advanced degree. Most College of Education departments require a minimum of 18 undergraduate credit hours in professional education courses. Nevada professional certification may be considered as fulfilling this requirement. To be considered for admission for a future semester, the student must reapply and submit another application processing fee.

Transfer Work

Courses used to fulfill requirements for one degree may not be used toward another degree. For UNLV Non-Degree Seeking graduate students, a maximum of 15 graduate credits taken at UNLV may be applied toward a graduate program. Graduate work with a grade of B or higher (3.00, A=4.00) may be transferable into a degree program subject to departmental and Graduate Dean approval. Grades of B- or lower, and courses graded on a satisfactory pass/fail basis, are not transferable into graduate degree programs. With the department and Graduate College approvals, no more than one-third of the minimum number of credits required for the degree (not including credits for thesis, dissertation, and professional/scholarly papers) may be transferred from an accredited graduate degree granting institution.

Second Admission or Readmission to the Graduate College

Students may apply for a second master's degree (in a different department) or a doctoral degree after completing a master's degree. In these cases, students must submit a new application for admission, the fee, and supporting credentials required by the Graduate College and the new department or program.

The Graduate College issues only two Letters of Admission without earning a degree. If a degree results from the admission, there is no limit to the number of allowable future admissions.

Change of Department

Students are admitted to pursue an advanced degree in a specific department or program. To change to another department or program, students must submit a new application for admission, the required application fee, and all necessary admission credentials to the Graduate College. Upon admission, the student must withdraw in writing from

the original department. Graduate students may not be enrolled in two degree programs simultaneously.

Revocation of Admission

It is assumed that the information provided on the application for admission is complete and accurate. Subsequent evidence to the contrary may result in the admission being revoked and the loss of any credit or degree stemming from the admission. To reapply for admission after a revocation, a new application and fee are required. Students should contact the Graduate College to determine what additional materials are needed. Materials from the previous application, such as official transcripts, may be used.

Admission Status and Classification of Students

Graduate Standing

Students accepted to pursue a program leading to an advanced degree are classified as having Graduate Standing. The Graduate Standing classification allows students to plan and matriculate in a degree program, to request formation of an advisory committee, and to be assigned or select a faculty advisor, depending on the degree program.

Graduate Provisional

Students whose previous academic records are not strong enough to merit Graduate Standing may be granted probationary admission and classified as Graduate Provisional. This classification does not apply to students with deficiencies or insufficient undergraduate credits in the chosen field of study. The Graduate College and the student's department determine placement in this classification.

A provisional student must complete nine credit hours of graduate-level course work selected by the department and listed on the Letter of Admission. The student must complete this course work within one calendar year of admission, with grades of B or higher, (B- grades are unacceptable) before taking additional course work. Failure to complete the required course work in the specified period or a grade less than B (3.00) will automatically cancel the student's admission.

When the Graduate College receives the grades covering the required course work, the student will be given Graduate Standing status. A student may only be admitted as a Graduate Provisional student once.

Conditional Admission

A Conditional Admission status may be granted when the applicant must submit additional material before finalizing admission, i.e., a final transcript of course work in progress while applying for admission. Graduate Standing or Graduate Provisional students may also be classified as Conditional Admission. The Letter of Admission will specify which material must be submitted and the date the Graduate College must receive it. Failure to meet the

condition(s) will automatically cancel the student's admission.

Non-Degree Student

The Non-Degree Student status is assigned to individuals with baccalaureate degrees who wish to take graduate courses but not pursue an advanced degree. Registration for classes as a Non-Degree Student is processed through the Graduate College. Generally, Non-Degree Students may enroll in up to 12 credit hours per semester.

Department faculty are responsible for determining the adequacy of preparation of Non-Degree Students before allowing them to take upper-division or graduate courses which are open to Non-Degree Graduate Students. The student should check with the department about graduate courses accessible to Non-Degree Students. It is the student's responsibility to provide proof of adequate preparation.

A Non-Degree Graduate Student wishing to seek a degree must apply for admission to the Graduate College and pay an application processing fee. Non-Degree Graduate Students may transfer up to fifteen UNLV credits with grades of B or higher into a degree program. Courses taken as a Non-Degree Graduate Student count toward the degree program at the discretion of the graduate coordinator, and/or department chair, and Graduate Dean.

Undergraduates Taking Graduate-Level Courses

Undergraduates with a minimum 90 semester hours of credit and 3.00 or higher grade point average may enroll in graduate courses. Students in the Honors Program must have a minimum of 45 semester hours of credit and a 3.00 or higher grade point average. The Approval for an Undergraduate to Enroll in 700-level Course Work Form must be completed and necessary signatures obtained and approved by the Graduate College prior to registration. Students may enroll in up to six hours of graduate-level courses during one semester.

Reserving Courses for Graduate Credit. Upon approval, UNLV undergraduates may take 600/700-level course work and reserve the credits earned for possible use in an advanced degree program. Course work reserved for graduate credit may not be used to satisfy baccalaureate degree requirements.

Graduate Courses for Undergraduate Credit. Upon approval, UNLV undergraduates may take 600/700-level course work for use in an undergraduate degree program. Courses used in an undergraduate program may not be applied toward an advanced degree at a later date.

Immunization Requirement

Nevada state law requires all new University of Nevada, Las Vegas graduate students to submit proof of immunization before they may register for classes. New students are

required to provide proof of immunity to remove a registration hold. The Graduate College sends immunization forms along with the admission notification. For further information, contact the Student Health Center at (702) 895-3370.

Nevada Residency

The Dean of the Graduate College determines the Nevada residency of graduate students according Board of Regents regulations and the laws of the State of Nevada. Persons, such as Nevada certified school teachers and Armed Forces personnel stationed in Nevada, are normally accorded residency status. A full statement of the regulations is available online.

Registration Policies

The university outlines specific registration procedures in the Schedule of Classes, which is made available prior to each semester by the Registrar's Office. Students must register for classes using the procedures outlined in the class schedule including enrolling by the dates and times specified for each semester or special session. Students paying fees after the date and time specified in the schedule may be charged a late fee. An administrative drop may result for nonpayment of fees. The registration or enrollment of a student ineligible to attend the university is subject to immediate cancellation. A full-time graduate student is one who is enrolled in nine or more semester credits or equivalent or six credits for graduate assistants.

Adding or Dropping Classes

Students may add or drop a course up to the close of the late registration period. After this date, and with approval, students may make changes only when the circumstance is sufficiently extraordinary to warrant an exception.

Dropping/Withdrawing From Classes

The terms drop and withdraw are used interchangeably. The academic policies and calendar dates for dropping and withdrawing are the same. Drop generally refers to dropping one or more courses during a given semester. Withdrawal generally refers to the act of dropping all courses during a given semester.

A student may drop or withdraw from full semester courses during the free drop period (first ten weeks of the fall or spring semester) without a grade. The instructor must provide a preliminary evaluation of the student's grade before the end of the free drop period. No drops or withdrawals will be permitted after the end of the free drop period as published in the current class schedule (see Grades and Examinations). Refer to the appropriate class schedule for drop dates for special modular courses, short courses, extended education and summer term courses. Students who stop attending class and fail to file an official drop request form with the Registrar will receive a grade of F.

Students who wish to withdraw from all classes must obtain a Withdrawal form from the Registrar's Office, obtain all required signatures, and return the form to the Registrar's Office. The withdrawal is official only after the Registrar's Office accepts it.

A student who has officially dropped a class and who is no longer registered for credit or audit is ineligible for further attendance in that class.

Cancellation of Registration

The university reserves the right to cancel any registration in specific courses for which the student is ineligible. The registration of any student who is ineligible to attend the university is subject to immediate cancellation. The university also reserves the right to cancel the registration of an individual whose attendance, in the opinion of the appropriate administrative officials, would not be mutually beneficial to that person and to the institution.

Cancellation of Courses and Programs

The university reserves the right to cancel any registration in which the enrollment is insufficient to warrant offering the course and/or to eliminate, cancel, phase out or reduce in size courses and/or programs for financial, curricular or programmatic reasons.

Repeat Policy

Any course may be repeated, regardless of the grade received. Credit will be allowed only once for successful completion of the course, except for courses designated in the catalog as allowable repeats. A student may repeat any UNLV course once at UNLV and not have the original grade included in the computation of the grade point average. The repeat grade must be on the same grading option as the original grade. The original grade will remain on the student's academic record with suitable notation. For courses repeated prior to February 1971, both the original grade and the repeat grade are included in the grade point average. Students are responsible for providing the Registrar's Office with written notification when a repeat course is completed. Computer-printed grade reports may not initially compensate for repeated courses. Grade point averages, credits attempted, and credits earned will be manually adjusted.

When a course is repeated more than once, only the original grade is omitted in computing the grade point average. The fact that UNLV has granted a degree to a student shall not preclude the student's right to repeat a course for the purpose of improving a grade. However, class standing will not be affected by the results. A student receiving a final grade of 'F' in a course can obtain credit by pre-registering for the course, repeating the class work, and receiving a passing grade.

A failed course cannot be challenged by examination. A failed course does not have to be repeated unless the course is a specific college or department requirement. A student may be allowed to repeat any course once and not have the

original grade computed in the graduation GPA. If a course is repeated more than once, only the original grade is omitted in computing the graduation GPA.

Unit of Credit

The unit of credit, or semester hour, is generally defined as one 50-minute lecture a week for a semester. Two or three laboratory hours per week, depending on the amount of outside preparation required, usually carries the same credit as one lecture hour.

Course Numbers

Graduate-level courses are numbered 500-799.

Undergraduate-level courses are numbered 100-499.

Symbols

Numbers separated by a hyphen indicate courses which must be taken in sequence. The first semester is prerequisite for the second, for example, 701-702. Numbers separated by a comma indicate courses which may be taken one without the other, for example (701, 702). Various areas of the same course may be taken for credit. They are indicated by letters, for example A., B., etc.

Grading System

The following symbols are used in reporting and recording student grades:

A	Superior
B	Above Average
C	Average
D	Below Average
F	Failing
AD	Audit
I	Incomplete
S	Satisfactory
X	Hold Grade

Note: Faculty members have the option of using plus (+) and minus (-) for grades of A, B, C, and D. Exception: A+ grades are not given.

I or Incomplete Grade

The following regulations apply to the 'I' or Incomplete grade:

1. The 'I' grade is used for content/lecture type courses designed to be completed within one semester and where the student has failed to complete all of the requirements. The instructor is responsible for determining if the reason for non-completion is satisfactory.
2. An 'I' is given only when a minor part of the course work remains incomplete and the major portion has been completed at a level which is clearly passing.
3. Graduate students receiving an 'I' grade in 500, 600- or 700level courses have one calendar year to complete all course requirements and remove the 'I' grade; however, the instructor may require that it be made up in less time. If course requirements are not completed within

one year, the Registrar's Office will automatically record a grade of 'F'. Students must make up an Incomplete in a 400-level or lower course in one semester.

S or F (Satisfactory or Failing) Grades

The Satisfactory (S) or Failing (F) mark is used upon completion of the thesis, dissertation, professional paper or for noncredit or satisfactory/fail courses. Grade-point values are not assigned for S. Many graduate and professional schools may not accept satisfactory/fail credits, or accept them only if accompanied by written evaluations of the work accomplished in such courses that bear upon the field of specialization. Additional evidence such as GRE or other advanced test results may also be required. UNLV does not accept graduate courses graded satisfactory/fail for use in a degree program except thesis, dissertation, or professional paper credits.

X (Hold) Grade

The X grade is restricted to 500-, 600- or 700-level research or clinical practicum courses where the course requirements may extend beyond one semester.

Grade Changes

A reported grade may be changed because of a clerical error made by the instructor or Registrar. Grade changes require the approval of the Graduate College Dean. Under present university regulations, the Registrar cannot change a grade once six months have passed following issuance of the official student grade report.

Transcripts of Credit

Official transcripts bear the University Seal, the Registrar's signature, and reflect all academic work attempted at UNLV. Upon written request, the Office of the Registrar will issue official UNLV transcripts. Requests should be made at least one week before the date the transcripts are needed. The Registrar will not issue transcripts for any student having a delinquent indebtedness to the university. In addition, transcripts of work from other institutions will not be issued. Work in progress does not appear on the transcript until the semester or registration period officially ends. Transcripts are not prepared during final examination, grade recording, and registration periods.

Academic Policies

The policies and regulations of the graduate program or department, the Graduate College, the University of Nevada, Las Vegas, and the Board of Regents are subject to review and change. The Graduate College Policy Manual

and the UNLV Student Conduct Code are available by request in the Graduate College and on our website. It is the responsibility of students to know and observe all regulations and procedures relating to their graduate program, the Graduate College, and UNLV. In no case will any regulations be waived or an exception granted based on a plea of ignorance of, or contention that the graduate program, Graduate College, or university did not inform a student of the regulations or procedures. Questions regarding graduate-level study regulations and their interpretation should be addressed to the Graduate College.

Academic Integrity

All members of the UNLV community are dedicated to learning. The university and the graduate college expect nothing less than a high level of scholarly integrity and academic honesty on the part of students, faculty, staff, and administrators.

Quality academic work requires honesty. The UNLV faculty and administration regard any attempt by a student to present as his or her own work that which he or she has not solely produced as a serious offense. Students are considered to have cheated, for example, if they copy the work of another; use unauthorized Note: or other aids during an examination; turn in a paper or an assignment written, in whole or in part, by someone else as their own. Students are guilty of plagiarism, intentional or not, if they copy material from books, magazines, or other sources without identifying and acknowledging the sources, or if they paraphrase ideas from such sources without acknowledging them. Students guilty of, or assisting others in, either cheating or plagiarism on an assignment, quiz, examination, or other scholarly endeavor may receive a grade of 'F' for the course involved, and may be suspended or removed from the program. Additionally, UNLV has established policies regarding research misconduct among students, faculty and staff. Research misconduct pertains to commission of any of the following acts: falsification of data, improper assignment of authorship, claiming another person's work as one's own, unprofessional manipulation of experiments or of research procedures, or misappropriation of research funds. (Adapted from the 1994-95 Graduate Catalog Northern Illinois University).

If a student is deemed by a faculty member to be guilty of academic dishonesty, where applicable, the student may be assigned a failing grade for the corresponding segment of the course or for the entire course. The faculty member or administrator also may initiate disciplinary review under procedures described in the Nevada System of Higher Education document Rules and Disciplinary Procedures for Members of the University Community.

Disciplinary sanction options described therein include warning, probation, suspension, and expulsion or revocation of a degree if a degree has been previously awarded. In all cases the faculty member is responsible for recording the circumstances, notifying the student in writing, and for

giving the student an opportunity to reply. Appeals go to the chair of the student's academic department, academic dean and Graduate Dean.

If a graduate student fails to maintain the standards of academic or professional integrity expected as defined in writing by their discipline or program, the student's admission status in his or her program will be terminated. If any member of the university community is deemed guilty of academic dishonesty, action may be brought under the Rules and Disciplinary Procedures for Members of the University Community. In addition, students who violate these standards will be subject to conduct sanctions, in accordance with the UNLV Student Conduct Code and Policies, in order to promote their own personal development, to protect the university community, and to maintain order and stability on campus.

Credit Requirements

Residence Credit Requirement

Resident credit means any graduate course that is satisfactorily completed at UNLV, except credits earned by special examination or correspondence courses.

Correspondence study, credit by special examination, or enrollment in another institution within the Nevada System of Higher Education does not constitute an interruption of resident credit.

A minimum of 50 percent of the total credits required to complete the master's, specialist, or doctoral degree not including transferred credits, the thesis, dissertation, or professional paper must be earned at UNLV after admission to a graduate degree program.

Graduate Credit

All courses numbered 500-799 are considered graduate level. To determine which graduate-level courses will apply to a specific degree, the student must have them approved on a degree program. Prior to having a degree program approved, there is no guarantee that a course will apply toward the degree. To be considered a graduate-level course, the instructor must be a member of the Graduate Faculty. The Graduate College requires a minimum of 50 percent of the degree program semester hours are 700-level courses excluding thesis, dissertation, or professional/scholarly paper. Individual departments may require more than the Graduate College minimum.

Graduate-level courses may not be challenged. Graduate courses which are graded on a satisfactory/fail basis, may not be used in a graduate degree program except for thesis, dissertation, or professional/scholarly paper credits.

Credit toward Degree

Courses used to fulfill requirements for one degree may not be used toward another degree. No more than three credits of a student's degree program may consist of UNLV

workshop, institute, and conference credits, and the student must have received a grade for these credits.

A course in which a grade of less than C was received will not be considered for use toward the degree.

Departments may impose a higher grade standard. Experimental, experiential (life and work experiences), correspondence, and audited courses may not be applied toward the degree. In addition, courses numbered in the 100-499 series cannot be used for graduate credit.

Credit may be used toward the graduate degree for courses taken while an undergraduate at UNLV only if the course was reserved for graduate credit. See the Admissions section for this information.

Transfer Credit Limitations: Prior to Admission and Enrollment

Not more than one-third of a student's degree program (not including the thesis, dissertation, or professional/scholarly paper) may be transferred from another university at the time admission is granted. Courses used to fulfill requirements for one degree may not be used to reduce credit hour requirements in another degree program. For UNLV Non-Degree graduate students, a maximum of 15 graduate credits taken at UNLV may be applied toward a graduate degree program.

Transfer Credit Limitations: After Admission and Enrollment

Once admitted to an advanced degree program, students must obtain prior written consent of the department and the Graduate Dean to take course work elsewhere and use it in their degree program. Such work must be graduate level, graded, and must not be experimental, correspondence, or extended in nature.

The department chair, the graduate coordinator, the academic dean responsible for approving the student's degree program, and the Graduate Dean must approve all credits taken prior to admission or transfer credit. To be considered for use:

1. The work must have been taken at an accredited institution;
2. The work must have been completed with a grade of B or higher (B- is not acceptable);
3. Official transcripts covering the work must be sent directly from the issuing institution to the Graduate College; and
4. The work must be posted to the student's permanent academic record.

Transfer credit is approved only when evidence exists that the work is certifiably graduate level and has not been used in another degree program. The age of the transfer work under consideration, or the year taken, may also be a factor. The student is responsible for providing this evidence. Courses used to fulfill requirements for a previous degree may not be used toward another degree.

After admission, credits (workshops and correspondence courses will not be considered) taken at another institution may be applied toward the degree if prior permission is obtained. Contact the Graduate College for the request form, additional information and the conditions of transfer credits.

Limitation on Credit Load

The university considers a graduate student taking nine credits per semester as full-time (six credit hours if the student is a graduate assistant). Please note that the number of credits enrolled impacts financial aid. Contact the office of Financial Aid and Scholarships for further information.

Graduate students normally may not take more than 12 credit hours (10 if a graduate assistant) during the fall and spring terms. They may take no more than six credit hours in a single five-week Summer Term and earn no more than a total of 12 credits during the Summer Term (pre, post, and regular five-week sessions combined). Overload petitions are available in the Graduate College office. Petitions must be approved by the Graduate Dean prior to registration.

Grade Point Average

A candidate for an advanced degree must have an overall grade point average of 3.00 for all graduate program approved courses. The GPA, computed by the Graduate College, includes all completed graduate course work accepted at admission and all subsequently approved course work.

Continuous Enrollment

After admission to a graduate program, students must register for a minimum of six semester hours each calendar year. Students working on a thesis or dissertation must register for three semester hours of credit each semester (excluding summer), until the document has been completed and has been given final approval. Students who have not registered for academic work within one calendar year will be separated from their program and must reapply for admission should they wish to continue. Exceptions to the above policy, as with a request for a leave of absence, are made only with the approval of the student's advisor, department chairperson or graduate coordinator, academic dean and the Graduate Dean. Any student using the services of the academic staff or university facilities must be registered for the period during which the services are rendered or the facilities are used. Students must be registered during the semester they intend to graduate and/or take final, comprehensive, preliminary, examinations, defend a thesis or dissertation.

Six-Year and Eight-Year Policy

The Six-Year and Eight-Year Policy applies to all course work, including all approved transfer degree course work. In special circumstances, the student's faculty advisory committee may recommend that the Graduate Dean extend these degree time limits. Each department may establish

shorter periods than those previously discussed contingent upon the approval of the Graduate Dean and inclusion in the Academic Policies section of this catalog.

Students violating the six-year and eight-year policy and/or the continuous enrollment policy are no longer automatically eligible to complete their program under the requirements in place at the time of admission. This decision is left to the discretion of the department. Students are considered making satisfactory progress toward the degree as long as they are completing six degree program credits per calendar year. Students not meeting this requirement will be separated from the Graduate College.

Master's Degree Students: All master's degree requirements must be completed within six years. Course work completed more than six calendar years before the term in which all degree requirements are met may not be used in the degree program.

Doctoral Degree Students: A student beginning a doctoral degree program and holding a master's degree in an appropriate field of study must complete all doctoral degree program requirements within six years. A student beginning a doctoral degree program without a master's degree must complete all requirements for the degree within eight years.

Leave of Absence

When necessary a student may request approval for a leave of absence from a degree program. During the leave of absence, the student should remain in contact with the department. However, all degree requirements must be completed within the six- and/or eight-year policy as stated previously.

Probation and Separation

Departments are to review the academic performance of graduate students at the end of each semester and/or academic year. If a department determines that a student is not making satisfactory progress toward the degree, it may request the Graduate Dean separate the student from the college or place the student on probation. The department must provide the student with the specific requirements, including deadlines, which must be completed to be removed from probation. If the Graduate Dean approves the request, the student will be placed on probation. Failure to meet the conditions of the probation will result in separation from the Graduate College.

Failure to make satisfactory progress may include: failure to complete six credits per calendar year toward the degree program; unsatisfactory grades (including Incompletes, grades below a B, or Withdrawals); failure to consult with the advisor when requested; failure to establish a graduate committee; failure to develop an official, approved degree program; failure to establish the groundwork for an acceptable thesis or dissertation; and failure of comprehensive and qualifying examinations.

Students must prove that they are making satisfactory progress. Departments may establish their own benchmarks for progress, consistent with degree program requirements and standards in the field. Satisfactory academic progress also involves maintaining the standards of academic and professional integrity expected in a particular discipline or program. Failure to maintain these standards may result in termination of the student's admission to a graduate degree program.

A UNLV graduate student who has been dismissed for academic reasons is not eligible for admission or re-entry. The student must petition the Graduate College for academic reinstatement.

Administrative Drops and Classroom Conduct

Failure to attend a course or to submit required work will result in a grade of F. The student who neglects a course is solely responsible for dropping the course or withdrawing from the university. However, an administrative drop may be initiated at the discretion of the instructor, who will record the circumstances. The approval of the academic dean offering the course is required. Deadlines for an administrative drop are the same as for a drop initiated by the student and are based on the date received at the Registrar's Office. The student will be notified by the final grade report.

Students have a responsibility to conduct themselves in class and in the libraries in ways that do not interfere with the right of other students to learn or of instructors to teach. Use of electronic devices such as pagers, cellular phones, or recording devices, or other potentially disruptive activities, is permitted only with prior explicit consent of the instructor. The instructor may rescind permission anytime during the course.

If a student does not comply with requirements or obstructs the functioning of the class, the instructor may initiate an administrative drop. The instructor must record the circumstances. The approval of the dean of the college offering the course is required. Before a decision, the dean will consult with the student and other parties as appropriate.

Serious cases of misconduct, as defined by the Rules and Disciplinary Procedures for Members of the University Community, will be referred to the appropriate administrative officer for action.

Change of Address

Any change of address should be reported immediately to the Registrar's Office and the Graduate College. Any correspondence from the university mailed to the last address provided by the student to the Registrar and Graduate College will discharge all university responsibility for notification.

Appeals and Procedures

Appeals are to request reconsideration of a course grade, alleged unfair practice, and relief or waiver from a UNLV and/or Graduate College policy or requirement. Appeals must be filed with the Graduate College Office (FDH 3 09) in a timely manner. The Graduate College must receive grade appeals within 60 calendar days from the last day of the term/semester in question. The Registrar's Office must receive notification to change a grade due to clerical error within 60 calendar days from the last day of the term/semester. Each appeal is reviewed individually and a decision will be based on the merits and documentation provided.

It is the student's responsibility to provide a clear and concisely written statement of the appeal and to provide all relevant documentation to be reviewed. Written appeals must include:

1. UNLV Graduate College Appeal Form as a cover sheet
2. Written Statement of Appeal addressed to the appropriate UNLV administrator
3. Relevant documentation and support. For example, documents may include medical records, work verification, police reports, death certificates, airline receipts, letters from professors on university letterhead, transcripts, etc. If the issue is not resolved between the student and course instructor, a written appeal should first be directed to the Graduate Coordinator of the department in question. If the problem remains unresolved to the student's satisfaction, appeals must be directed in progressive order to the Department Graduate Coordinator, Department Chair, College Dean, then subsequently to the Graduate Dean. The Graduate Dean may act to resolve the problem or request the Graduate College Committee on Faculty and Student Issues to review the problem and make its recommendation to the Graduate Dean. The Graduate Dean will inform the student of the final decision.

Advisors and departments may have varying methods of processing appeals. Your department should be contacted for specific policies and procedures. The Graduate College Graduate Faculty and Student Issues Committee is the designated College Committee to hear certain graduate student and faculty appeals and is composed of graduate faculty a graduate student representative.

Waiver of Regulations

The Graduate Dean will consider a student's written request for waiver of a regulation upon a written recommendation from the student's department and committee chair. The regulation in question must be specified and the reason for the exception clearly stated. The Graduate Dean will notify both the student and the department of the decision.

Policies and Procedures on the Protection of Research Subjects

Human Subjects: Graduate students conducting research must adhere to UNLV policies and procedures regarding the use of human subjects. All research projects in which human subjects are involved must be reviewed and approved under the authority of the UNLV Institutional Review Board (IRB), which consists of two committees - Biomedical Sciences Committee and Social and Behavioral Sciences Committee. The IRB is responsible for the development and monitoring of university policy and procedures involving the use of human subjects in research. The provision for the protection of human subjects in research applies to all studies in all locations, whether funded or unfunded, and whether conducted by faculty, students, or staff. It also applies to persons unaffiliated with UNLV, who wish to investigate subjects under the protection of the university. Students should contact the Office of Sponsored Programs to obtain appropriate forms and further information.

Animal Subjects: It is university policy that: 1) the proper care and management of laboratory animals is essential to the welfare of the animals, to the validity of research data, and to the health and safety of those caring for or using animals; and 2) the university will comply with federal and state regulations regarding animal welfare. All animal protocols involving vertebrate animals (including farm animals and wild animals) conducted at, funded through or sponsored by UNLV must be submitted for prior Institutional Animal Care and Use Committee (IACUC) review and periodic review after approval in accordance with university policies and procedures that are required by federal law.

The provision for the protection of animal subjects in research applies to all studies in all locations, whether funded or unfunded, and whether conducted by faculty, students, or staff. It also applies to all studies in all locations, whether funded or unfunded, and whether conducted by faculty, students, or staff. It also applies to persons unaffiliated with UNLV, who wish to investigate subjects under the protection of the university. Students should contact the office of Sponsored Programs to obtain appropriate forms and further information.

UNLV Student Computer Use Policy

Public computer laboratories and mainframe computers are provided as a service to students. Use is a privilege, not a right. Users should be good citizens; they must refrain from doing anything that annoys others or disrupts the educational experiences of their peers. Failure to comply with the regulations below may result in suspension under the NSHE Code, or civil or criminal action under the Nevada Revised Statutes, or federal law. It is a violation of UNLV policy to:

1. Copy any copyrighted software provided by UNLV. It is a criminal offense to copy any software protected by copyright, and UNLV will treat it as such.
2. Use licensed software in a manner inconsistent with the licensing arrangement. Information on licenses is available at the tutor stations or through NSHE Computing Services.
3. Copy, rename, alter, examine, or delete the files or programs of another person or UNLV without permission.
4. Use a computer to annoy others, including, but not limited to, sending offensive messages or knowingly causing a system to crash.
5. Create, disseminate or run a self-replicating program (virus), whether destructive in nature or not.
6. Use a computer for non-university work, such as for a private business or non-UNLV sanctioned club.
7. Tamper with switch settings or do anything that could damage terminals, computers, printers, or other equipment.
8. Collect, read, or destroy output other than your own work without the permission of the owner.
9. Use the computer account of another with or without permission unless it is designated group work.
10. Use software in the lab not owned by UNLV unless the student is the legally licensed owner.
11. Continue to use a computer account after withdrawing from the class for which it was obtained.
12. Access or attempt to access a host computer, either at UNLV or through a network, without the owner's permission, and/or through use of log-in information belonging to another person.

Student Use of Hazardous Materials

Certain courses may require students to work with potentially hazardous materials in the lab, darkroom, or workshop. Instructors will provide instructions regarding the safe handling of all materials. Questions should be directed to the specific academic department or instructor.

Degree Progression Policies & Procedures

Degree requirements are usually completed under the policies and regulations listed in the Graduate Catalog in effect at the time of admission. However, and with departmental and Graduate College approval, the Graduate Catalog in effect during the semester in which degree requirements are completed may be used. All students seeking an advanced degree must adhere to the regulations discussed in this section. With Graduate College approval, departments may have additional specific degree

requirements that students must meet to receive an advanced degree.

Forms

All students are responsible for submitting the proper forms to the Graduate College as he or she progresses through their degree program. Failure to do so may cause a delay in the student's graduation.

The Advisor

Students are assigned an advisor by their graduate program at the time of admission into the Graduate College. The advisor is typically selected by the department from among its Graduate Faculty; after which, if required by degree program, it is the responsibility of the student to personally select an advisor to serve as chair of his or her advisory committee. At any time after admission, a student may request a change of advisor and, upon departmental recommendation and Graduate College approval, the advisor will be changed.

The Advisory Committee

The advisory committee is responsible for guiding the student through the graduate program, assisting with the thesis or dissertation (if required), and administering the final examination. Not all graduate degree programs require the appointment of an advisory committee. Students should consult with their advisor to determine whether or not an advisory committee is necessary. All members of the committee should have expertise in the student's area of concentration. Generally, four Graduate Faculty members comprise an advisory committee: three from the student's department and one graduate faculty member from another department to serve as the Graduate College representative. One of the three graduate faculty members from the department serves as the student's advisor and committee chair. The Graduate College must approve the Graduate College representative suggested by the student and advisor to serve on the committee. Occasionally, it is permissible for an additional graduate faculty member(s) to be placed on the committee. This exception requires the approval of the Graduate Dean. Master's and doctoral students must submit the Appointment of Advisory Committee form to the Graduate College before establishing the degree program.

The Degree Program

Students, with their advisor and advisory committee, must prepare a proposed graduate degree program. This degree program, which outlines the courses the student will complete for the degree, should be thoughtfully prepared. The degree program of study must comply with the regulations of the graduate program or department, Graduate College, and university. The degree program requires the approvals of the student, advisor, the graduate coordinator, the appropriate academic dean, and the Graduate Dean.

For master's students, the proposed graduate degree program must be submitted to the Graduate College prior to students completing 16 credit hours of work toward the degree. If students request that 12 or more credit hours taken prior to admission be considered for use toward the degree, the program must be submitted to the Graduate College by the sixth week of the first semester of enrollment. Doctoral students must submit the proposed graduate degree program by the end of the third semester of enrollment. By recommendation of a student's department, limited changes in the degree program may be made with Graduate College approval.

Final Research/Creative Documents

The most important component of graduate education is the student's culminating experience. This generally takes the form a final scholarly research project, a professional paper, a course, an exam and sometimes a defense. The culminating experience demonstrates the student's mastery of their research, scholarship, creative abilities, and/or written communication skills in the chosen discipline. The final document is intended to benefit the student, the academic discipline or profession, and sometimes, society.

Final documents, including theses, dissertations, professional or scholarly papers, and projects must meet acceptable standards of the given profession. Theses and dissertations must also meet Graduate College standards according to *The Guide to Preparing & Submitting a Thesis or Dissertation*. The Graduate College and advisory committees expect students to give careful attention to the style and format of the final scholarly or creative documents.

Students required to complete and defend a final research or creative document must submit the Prospectus Approval Form to the Graduate College along with a brief written statement describing the content of the document. The Graduate College requires students working on a final research or creative document to register for three semester hours of credit each semester (excluding summer) until the document has been completed and has been given final approval. Students should contact the department to determine which document is required to complete their degree program.

Thesis and Dissertation

Some departments require a thesis, or offer the option of a thesis, for the master's degree. All academic doctoral programs require a dissertation. Students must submit the Prospectus Approval form to the Graduate College at the same time the degree program is submitted for master's students and to advance to candidacy for doctoral students. The thesis or dissertation should demonstrate the student's ability to select a specific problem or topic, to assemble pertinent and necessary data, to do original research, to organize ideas and data acceptably, and to prepare a written report in clear and effective English. *The Guide to Preparing & Submitting a Thesis or Dissertation* is available on the

Graduate College website. Students must follow the instructions in the guide. Matters of form with respect to capitalization, abbreviation, quotations, footNote: and bibliography should conform to the discipline's standards. Departments will advise the student on which style manual is appropriate.

The minimum number of thesis credits required for a master's degree program is six. For the doctoral degree program, the minimum number of dissertation credits required is twelve. A grade is not reported for thesis or dissertation credits. When the final copy of the thesis/dissertation are submitted electronically to the Graduate College and approved by the Graduate Dean, the title of the thesis/dissertation is posted on the student's transcript with the number of credits given. Unless approved for a leave of absence, a student must register for a minimum of three thesis/dissertation or non-thesis/dissertation credits each semester (summer excluded) until the thesis or dissertation is completed, submitted to the Graduate College, and the student graduates. However, students intending to complete, defend, submit a thesis or dissertation to the Graduate College, and/or graduate during the summer term, must be registered for a minimum of three credits. It is strongly suggested that no later than eight weeks prior to the last day of instruction in the term the student will graduate, a draft of the work should be submitted to the advisory committee. The committee will review the thesis or dissertation for any corrections and changes, which must be incorporated before the final examination (oral defense) and final typing. The completed, unbound work must be resubmitted to the committee at least one week prior to the final examination. The Graduate College must approve all theses and dissertations for final electronic submission. It is recommended that an initial format check be performed by the Graduate College by the eighth week of the semester the student intends to graduate. Upon approval, the thesis or dissertation must be submitted electronically to the Graduate College not later than two weeks prior to the end of instruction of the term the student intends to graduate. All members of the advisory committee must approve the thesis or dissertation for submission to the Graduate College. The Graduate Dean only can give permission for an extension of this deadline.

In rare circumstances a student may be permitted to complete the thesis or dissertation away from campus. After considerable progress has been made in collecting data and outlining the work, the student may petition to complete the thesis or dissertation in absentia, waiving the registration requirement. If the petition is approved, the advisor and Graduate Dean along with the student will determine the requirements for completion of the work.

Professional or Scholarly Papers or Projects

Master's students not pursuing a thesis option may be required to complete a professional/scholarly paper or project as part of the degree program. Students are

encouraged to use *The Guide to Preparing & Submitting a Thesis or Dissertation* available in the Graduate College when preparing a professional paper. Professional/scholarly papers or projects are not, however, reviewed, retained, or approved by the Graduate College. Some graduate programs require students doing a professional paper to have a graduate committee and to defend their work; other departments incorporate final papers into culminating experience courses or have other requirements. Please check with your department for detailed guidelines.

Graduate Program Examinations

There are three major examinations which students may be required to pass in order to complete a graduate program. The following descriptions are general and may be used interchangeably by departments or programs. For the application of these terms and their use by a particular department or graduate program, refer to the appropriate section of this catalog.

Qualifying Examinations

Some departments may require doctoral students to take a qualifying examination as part of the admission screening process or for diagnostic purposes shortly after admission. The examination may be written, oral, or both.

Comprehensive and Final Examinations

Most graduate degree programs require students to successfully complete one or more comprehensive or final examinations. For master's students, the comprehensive, or final, examination is generally conducted during the last semester or term of enrollment in which a student intends to graduate. For doctoral students, the comprehensive, or preliminary, examinations are generally taken after all course work, other than dissertation credits, has been completed and before advancing to candidacy. The examination is intended to test the student's knowledge of the area of specialization and may be written, oral, or both at the discretion of the department. If the examination is written, members of the advisory committee may submit questions, all must read the questions in advance, and all must read and evaluate the student's answers. If oral, all members of the advisory committee must be present and may question the student.

The comprehensive, final, or preliminary examination must be administered at least three weeks before the last day of instruction of any given semester or term. Students must be enrolled for at least one graduate-level credit during the semester or term the comprehensive or preliminary examination is taken. For comprehensive and final examination requirements, contact the department or refer to the appropriate section of this catalog. In the examination, the student must be able to demonstrate a comprehensive understanding of a broad field of study and a detailed understanding of one or more specialized fields of expertise. The advisory committee must unanimously pass the student.

If the committee votes unanimously to fail the student or the vote is not unanimous to pass, the student, in consultation with his/her advisor, may request the committee to administer a second examination. The student must wait at least three months before taking the second examination. The advisory committee must provide formal documentation to the student clearly indicating its decision.

Oral Defense

Graduate students completing a thesis or dissertation are required to demonstrate their ability to select a specific problem or topic, to assemble pertinent and necessary data, to do original research, to organize ideas and data acceptably, and to prepare a written report in clear and effective English. This demonstration takes the form of an oral defense of the finished document. For some master's and specialist students, completing a professional/scholarly paper or project an oral defense may be required. All members of the advisory committee must be present and may question the student.

The oral defense must be held at least three weeks before the last day of instruction in the term in which the student plans to complete the degree requirements. It may be conducted before that term only with the Graduate Dean's permission. Students must be enrolled during the term the oral defense is conducted.

Satisfactory performance on a final examination will consist of a presentation and defense of the student's original thesis or dissertation research. At a minimum, the defense consists of an oral presentation to university graduate faculty and a closed deliberation and vote by the advisory committee. The oral presentation will be open to UNLV Graduate Faculty, graduate students, relevant administrators, and invited guests. The invited guests must be approved by the advisory committee chair prior to the defense.

The oral presentation may be followed by general questions of clarification from attendees [other than the advisory committee members]. The advisory committee and chair may choose to include a session of more in-depth questioning open only to the advisory committee and the UNLV Graduate Faculty. An additional phase of questioning with only the advisory committee and candidate may also be included. The final phase of closed deliberation, and the vote to pass or fail the student, will only be open to the student's appointed advisory committee.

The Graduate College must be notified not less than two weeks in advance of the examination. A public announcement regarding an oral defense must be made to the appropriate department's graduate faculty a minimum of seven (7) days prior to the oral defense.

During the oral defense, the student must be able to demonstrate a comprehensive understanding of a broad field of study and a detailed understanding of a more limited field. The advisory committee must unanimously pass the student. If the committee votes unanimously to fail the student or the vote is not unanimous to pass, the student, in

consultation with his/ her advisor, may request the committee to administer a second examination. The student must wait at least three months before taking the second examination. The department may require additional course work, substantial reworking of the thesis, dissertation, or professional/scholarly paper or project or whatever is believed necessary to prepare the student for the second examination. The Graduate College will not approve third examination requests.

Advancement to Candidacy

The Graduate College designates the advancement to candidacy status for doctoral students only. Doctoral students are advanced to candidacy upon successful completion of all course work, passing the comprehensive examination, and completing the dissertation prospectus. The date of advancement is recorded on the students' official UNLV transcript.

Graduation Procedures

Application for Graduation

Students are responsible for applying for graduation by the semester deadline. Doing so triggers your graduate evaluator to review your file and make sure that everything is in order for you to graduate. The graduation application is available for downloading on the Graduate College website. The application form must be signed and returned to the Graduate College by the deadline posted on the Graduate College website. Applications for graduation will not be processed unless all required forms and documents have been submitted to the Graduate College including degree program, and if required the prospectus approval, appointment of advisory committee, and for doctoral students the advancement to candidacy form. If students do not complete the degree requirements in the term anticipated, it is expected that they will do so in the next regular term (summer excluded). A new application for graduation must be filed, and an additional diploma fee will be charged. In addition, students must be enrolled in a minimum of 3 credits during the term they apply for and expect to graduate.

Granting of Degrees

Degrees are awarded three times a year in May, December, and August. Students must be enrolled in a minimum of 3 credits during the term they intend to graduate. When students apply for graduation, the Graduate College reviews the degree program. The Graduate Dean certifies that they have met degree requirements and a recommendation is forwarded to the Board of Regents. If any requirement has not been met, the degree will not be awarded. The degree will be revoked if it is awarded in error, or if it is later discovered that the degree requirements were not met, or if fraudulent claims are later discovered.

Commencement

Students may not participate in commencement prior to completion of all degree program requirements. Commencement is held twice a year in May and December. August graduates may participate in the December commencement following the completion of degree requirements.

Tuition & Fees

Fees: All fees assessed by the university are subject to change by the Board of Regents. Every effort is made to keep fees low as possible while rendering the desired level of service. Nonresident fees are calculated to cover a major part of the direct cost of instruction.

Graduate Tuition and Fees*

*The fees listed below are applicable to Fall 2009 and Spring 2010.

Graduate Per Credit Hour Fee	\$217.25
Non-Resident Graduate Fees:	
1-6 credits	\$457.25 per credit hour
7 or more credits	\$6170.00 per semester +\$217.75 graduate per credit hour fee
Good Neighbor Graduate Fee	\$457.25 per credit hour
Other Fees	
Graduate and Professional Student Association	\$18.00 per semester
International Education	\$2.00 per semester
Rebel Recycling	\$1.00 per semester
Student Health	\$70.00 per semester
Technology	\$4.00 per credit hour
Student Life Facilities	\$173.00 per semester for 4 or more credits
International Student (international students only)	\$145.00 per semester
Integrate	\$3.00 per credit
New Graduate Student Orientation	\$35.00

Nonresident Tuition

Students who are not Nevada residents must pay a nonresident tuition fee in addition to the per credit hour fees per semester. Nonresident students taking less than seven credits should contact the Admissions Office for up-to-date fee information. Students eligible under Good Neighbor regulations pay a reduced nonresident tuition fee in addition to the per credit hour registration fee per semester.

Audit Fee

The fee for audit is the same as the fee for registering for credit. The equivalent credits of an audit course are considered in determining if the student is assessed out-of-state tuition.

Nevada Residency for Tuition Purposes

Residency Decisions

The Board of Regents establishes Nevada residency for tuition purposes regulations. For admitted degree-seeking graduate students, residency status is determined at the time of admission to a degree-seeking program and is indicated in the official Letter of Admission from the Graduate College. Non-degree-seeking graduate students will generally be classified as out-of-state until and unless Nevada residency is determined via the residency application process. If the residency status is not "Nevada," out-of-state tuition will be assessed. Residency decisions are made during the application process and will be posted on the admission acceptance letter.

Qualifying for Nevada Residency

The following categories qualify for Nevada resident status:

1. A member of the Armed Forces of the United States
2. Full-time licensed personnel employed by a public school district in Nevada
3. A teacher who is currently employed full time in Nevada
4. A professional or classified employee of the University and Community College System of Nevada
5. Company relocation (also applies to spouse and children)
6. Family relocation to the state
7. Millennium scholarship recipients
8. A student who has lived in the state for a period of 12 months

Applying for Nevada Residency

To apply for residency, download and complete the Residency Application and include photocopies of supporting documents. Mail or fax documentation to the Office of Admissions by the application deadline listed in the Academic Calendar and Registration Guide. Residency review for fall applications begins June 1; spring review begins Nov. 1.

Good Neighbor Regulations for Reduced Nonresident Tuition

Students who claim residence for at least 12 months in a qualifying Arizona or California county, or graduates from a high school or community college in a qualifying Arizona or California county may be eligible to attend the university at a reduced tuition cost. Those claiming residency for 12 months must have maintained legal bona fide residence for

at least 12 consecutive months prior to the first day of the semester in which enrollment is sought. Applications are available online or in the Graduate College. Requests for Good Neighbor status must be filed by the close of late registration for the semester in which the student has applied for admission. Any student who enrolls under this policy shall not be eligible for reclassification as a resident student unless the student has subsequently enrolled as a non-Good Neighbor nonresident for the period of one year, or did not enroll in an Nevada System of Higher Education institution for at least 12 months immediately prior to the date of application for reclassification to resident student status.

Approved Good Neighbor Counties:

Alpine
El Dorado
Inyo
Lassen
Modoc
Mono
Nevada
Placer
Plumas
San Bernardino
Sierra Counties

Special Fees and Charges

An application fee of \$60 (domestic) is charged to any person applying for admission. It is not refundable or applicable to any other fee. International applicants must pay an additional \$15 evaluation fee (\$75.00 total). Special charges may be made according to current costs for the following:

- a. Courses requiring equipment, facilities or materials not available on the campus, i.e., golf and certain field courses.
- b. Courses requiring use of high technology equipment, e.g., computer courses or health profession courses.
- c. Private instruction in music and similar arts
- d. Noncredit courses, conferences, workshops, postgraduate professional seminars and similar educational offerings.
- e. Courses requiring field trips or travel.
- f. Personal expenses incurred by students in connection with field trips.
- g. Lab and computer usage fees.
- 3. The following fees are either assessed or identified at registration.
 - a. A late registration fee of \$25 per day to a maximum of \$250 is assessed to students who do not complete registration by the date designated. Summer Term students are assessed a late registration fee of \$25 per day until the end of the late registration period for that Summer Session. In case the time designated for registration is not adequate, the Registrar may defer the assessment of this fee for one day.

- b. Returned Check Fee. Personal checks are accepted in payment of fees owed to the university, although no counter checks or checks altered in any way are accepted. A collection fee of \$25 is assessed for any check returned unpaid by a bank. The check must be made good within 10 days or it will be turned over to a collection agency, and the student will be liable for all collection costs and any other related costs. If a personal check is returned from the bank, the university reserves the right to place the student on a cash basis only and withdrawal procedures may be initiated at the option of the university. A stop payment placed on a check does not constitute withdrawal from courses. Official withdrawal must be processed as returned checks and are subject to the same fees and collection cost.
- c. A graduation fee of \$50 will be billed to the student's account after the application for graduation is filed in the Graduate College. If a student fails to meet graduation requirements after a diploma has been ordered, \$2.50 of the fee is forfeited.
- d. Late application for graduation, \$20.
- e. A fee of \$55 for Master Thesis publication and \$65 for Doctoral Dissertation publication will be billed to the student's account after the application for graduation is filed.

Student Health Fee

The Student Health program fees for Fall, Spring, and Summer semester classes are not to be confused with the voluntary Student Health Insurance plan. Program fees support various services offered by the Student Wellness Cluster.

The Student Health program facilitates on-campus educational experiences and leadership opportunities for all UNLV students; is responsible for public health protection of the UNLV community; provides access to health care and provisions or coordination of health needs for students; provides student counseling and psychological services; and includes the Jean Nidetch Women's Center.

Group Health and Accident Insurance Fee

The Student Health Insurance plan is available to students formally admitted and currently enrolled taking six or more undergraduate credits or graduate students taking three or more credit hours. This plan is not to be confused with the student health program fee that all registered students pay for fall, spring, and summer sessions.

The Student Health Insurance provides services beyond those available through the Student Health Center for eligible on and off campus medical services. You may sign up for the Student Health Insurance by picking up an enrollment packet at the Student Health Center or Bursar's Office prior to the beginning of Fall, Spring, and Summer sessions or by accessing the web.

Grants-in-Aid

Each student is expected to pay all assessed fees on registration day unless a grant-in-aid is secured prior to registration day. Students are responsible to pay their portion on time. Late fees and/or withdrawal may be initiated for a student's portion and/or reported to a credit bureau. Legal proceedings may be initiated for any default accounts receivable.

Delinquent Accounts

A student or former student having a delinquent account receivable or an overdue student loan of any amount with any division of the Nevada System of Higher Education shall not be permitted to register, receive any type of transcript of records, grades, diploma or certificate or obtain services from any division. The university reserves the right to refer any delinquent account to a collection agency and/or report to a credit bureau. Legal proceedings may be initiated for any delinquent account.

Deferred Payment Option

Deferred payment is available to students who are registered for seven credits or more and are not receiving any sort of financial aid, grant-in-aid, etc. There is a \$20.00 service charge for all deferred fee payment plans. The \$20.00 service charge plus 50 percent of the per credit fee, nonresident tuition (if applicable), and 100 percent of special fees are due by the first installment date. Second installment is due by Friday of the fourth week of instruction. Failure to pay the second half of the deferred payment on schedule will constitute withdrawal from the university. The tuition will still be owed, but the student will not receive credit for the courses. Any delinquent accounts may be reported to a credit bureau. All delinquent accounts not paid as required will be sent to a collection agency. The student is responsible for all collection costs, attorney fees, etc. All students must pay their tuition in full at registration or be on an approved deferred payment to be considered enrolled for the semester. All unapproved accounts will be disenrolled. No exceptions. The university reserves the right to deny deferred payment to any student who does not pay tuition and fees as scheduled, including late fees.

Refund of Fees

Students who withdraw from the university receive a refund of fees according to the schedule below, which is subject to change by the Board of Regents. All requests for exception to the refund policy for extraordinary circumstances must be made to Student Enrollment Services or the Fee Appeal Committee. An appeal form is available at Student Enrollment Services, Cashier's Office or the Bursar's Office website.

1. For all UNLV students, including auditors, for net credit load reductions and withdrawals from the university, the refund policy is as follows:
 - A. WITHIN THE FIRST WEEK OF INSTRUCTION.

100 percent credit of all fees.

B. AFTER THE FIRST WEEK OF THE INSTRUCTIONAL PERIOD OF A REGULAR TERM.

*50 percent credit for total withdrawals from all courses until the end of the sixth week. No credit for total withdrawals after the end of the sixth week.

* 0 percent credit for partial withdrawals.

2. For all UNLV students, including auditors, for net credit load reductions and withdrawals from the university during the Summer Term, the refund policy is as follows:
 - A. Courses dropped prior to the first day of the instructional period will receive a 100 percent credit.
 - B. Courses dropped within the first 20 percent of the course period, as defined by Student Enrollment Services, will receive a 50 percent credit.
 - C. There will be no credit for courses dropped after 20 percent of the course period has passed.
3. No credit shall be made for health and accident insurance premiums.
4. Modular courses follow different refund policies than stated above. Inquire at Student Enrollment Services for details regarding a particular modular course's refund policy.
5. Upon written approval of the Vice President for Student Life, a full refund of all registration fees and tuition shall be given upon official withdrawal at any time during the first eight weeks of the semester in the following circumstances:
 - A. Induction of the student into the U.S. Armed Forces;
 - B. Death of a parent, spouse, child or legal guardian of the student; or
 - C. Death of a student.
 - D. No refund is made if withdrawal is after eight weeks, regardless of the circumstances. All refunds are made by check.
6. In most cases, federal regulations require that refunds for students receiving financial aid must be refunded back to the financial aid program rather than the student. For information about exemptions to this policy, please contact Student Financial Services. Dropping below full time for students on financial aid may invalidate eligibility for financial aid. Students may owe UNLV for financial aid refunds.

Room and Board Refund

Students withdrawing from the residence hall will receive refunds according to the terms and conditions of the residence and dining hall contract.

Financial Assistance

The University of Nevada, Las Vegas subscribes to the following statement that has been adopted by the Council of Graduate Schools in the United States and by most of the leading graduate schools in North America:

Acceptance of an offer of a graduate scholarship, fellowship, traineeship, or graduate assistantship for the next academic year by an actual or prospective graduate student completes an agreement which both student and the graduate school expect to honor. In those instances in which the student indicates acceptance prior to April 15 and subsequently desires to change plans, the student may submit in writing a resignation of the appointment at any time through April 15 in order to accept another scholarship, fellowship, traineeship, or graduate assistantship. However, an acceptance given or left in force after April 15 commits the student not to accept another appointment without first obtaining formal release for that purpose. It is further agreed by the institutions and organizations subscribing to the above resolution that a copy of this resolution should accompany every scholarship, fellowship, traineeship, and assistantship offer sent to a first-year graduate student before April 15.

Student Financial Services

The University of Nevada, Las Vegas provides a wide variety of assistance to finance higher education expenses. Grants, scholarships, part-time employment, and educational loans are available to help students with educational costs while attending UNLV. Students are encouraged to explore all possible resources. Financial Aid Administrators are available to discuss the variety of resources available and to assist graduate students in the application process. For further information, contact Graduate Student Financial Services at (702) 895-5569 and UNLV Student Financial Services, located in the Student Services Complex, at (702) 895-3424. The Graduate Student Financial Services office is located in the Graduate College on the 3rd floor of the Flora Dungan Humanities Building.

Federal Loan Programs

Federal Perkins Loans

A Federal Perkins loan is a low-interest (5 percent) loan available to graduate students that is made through the university. Actual award amounts depend on federal and institutional funding levels. Preference is given to those applicants who are attending at least half time and have the greatest financial need. The total amount awarded is determined by financial need.

Application must be made with the FAFSA, which must be mailed to the federal processing center by February 1. Priority is given to those with the greatest need whose

federal financial aid information is received by UNLV before the priority filing date.

Federal Direct Stafford Loans

Direct Stafford loans are low interest loans to assist you in paying for your college education. The interest rate is variable and set annually, not to exceed 8.25 percent. You may call Student Financial Services or contact the Federal Aid Information number at 1-800-433-3243 for the current interest rate. Your loans may assist you in meeting your tuition and or living expenses. You do not have to start repaying them until you drop below half-time enrollment, withdraw completely from school, or graduate.

There are two types of Stafford loans:

- a. The Federal Direct Subsidized Stafford Loan is based on financial need. Interest on this loan is paid by Federal taxpayers while you are in school attending at least half-time.
- b. The Federal Unsubsidized Loan is available to students regardless of financial need. You will be charged interest from the time the loan is disbursed until it is paid in full.

Graduate Assistantships

A number of state-supported and extramurally funded graduate assistantships are available. The most important regulations governing these positions are:

1. Applications must be sent to the department which you are seeking employment no later than March 1 proceeding the fall semester in which an assistantship is sought. Applications may be submitted after this date in case of unexpected openings occurring for the fall semester. In rare cases where an assistantship is available for the spring semester, the application deadline is November 15th.
2. Application forms are available from the Graduate College Office and on our website.
3. An assistantship is normally offered for a full academic year. If a student seeks renewal of an assistantship for the next year, a new application form must be submitted.
4. Currently, a graduate assistantship carries with it a stipend paid monthly for the academic year. This stipend may vary for extramurally funded assistantships. Tuition waivers are also included with the assistantship. These waivers are approved only for work directly related to the student's degree program (courses numbered 500 and approved for graduate credit and 700-level courses). This waiver covers a significant portion of the per credit hour fee. The tuition waiver covers the full amount of out-of-state tuition. Tuition waiver amounts may vary or extramurally funded assistantships.
5. Graduate assistantships are not generally available during Summer Term. However, tuition waivers are available for Summer Term before and after a contract year has been completed. Tuition waivers are not

available for undergraduate or audited courses. The above policies may differ for extramurally funded assistantships.

6. Graduate assistants must have graduate standing status at the time they begin their assistantships.
7. International students whose graduate assistantship includes instructional duties (lecture, discussion groups, laboratory supervision, tutoring) must have received a successful grade on the Test of Spoken English (TSE) prior to assuming these instructional duties.
8. Graduate assistants must carry a minimum of six semester hours of graduate credit per semester. To carry more than twelve semester hours of credit, the department chair, academic dean, and the Graduate Dean must approve an Overload Petition.
9. Graduate assistants are expected to spend on the average 20 hours per week on departmental duties in either instruction and/or research.
10. Graduate assistants may not accept employment on or off campus without written permission from their faculty advisor, department chair, and Graduate College Dean. Graduate assistants are normally prohibited from being employed for more than 10 hours per week beyond their assistantship.
11. Graduate assistants are expected to report in the same time-frame as faculty, i.e., during academic semesters and not during break or vacation times. Graduate Assistants must report one week prior to commencement of classes both fall and spring semester. Exceptions to this statement may be negotiated at the time of employment; however, both parties must agree to the arrangement and approval must be obtained from the Chairperson, Academic Dean and Graduate Dean.
12. New graduate assistants are expected, as part of their contract obligation, to attend the Graduate Assistant Teacher Training and General Orientation Sessions that are offered at the beginning of each fall semester.
13. Graduate assistantships will be terminated if the student does not satisfactorily perform assigned duties. Assistantships will also be terminated if a student does not make satisfactory progress toward the degree. Unsatisfactory progress includes, but is not limited to: filing a degree program late; receiving a grade of less than B; failing to remove an Incomplete grade after one calendar year; and failing comprehensive or qualifying examinations as required by the degree program.
14. Offers of assistantships, whether state-supported or extramurally funded, are valid only if they come from the Graduate College Dean.

Graduate Scholarships and Fellowships

Updates on fellowship and scholarship information are available on the Graduate College website.

For New Students: McNair Post-Baccalaureate Scholarships

McNair Post-Baccalaureate Scholarships, administered by the Graduate College, are awarded in open competition to first-year graduate students who participated in a McNair Scholars program at UNLV or at another institution as an undergraduate.

To be considered, applicants must:

1. Have an undergraduate GPA of 3.0 and graduate standing status at the time the scholarship begins.
2. Enroll in a minimum of nine credit hours for two consecutive semesters.

For Current Students: The following fellowships and scholarships are only available to graduate students already admitted to the Graduate College.

President's Graduate Fellowships

The President's Graduate Fellowships are provided through funding from the UNLV Foundation as directed by UNLV's president for the research support of doctoral students. Up to three awards are given annually, each offering a fellowship package including a stipend, tuition (up to 12 credits), fees, and health benefit totaling \$24,000.

Nominees must:

- Be doctoral students working primarily on the dissertation.
- Have a minimum graduate GPA of 3.5.
- Hold full-time student status (at least nine graduate credits) in each semester of the fellowship year.

Nominations must be submitted through department chairs. (Only one letter of nomination may be submitted from each department.)

Barrick Graduate Fellowships

Barrick Graduate Fellowships were established by an endowment from philanthropist Marjorie Barrick. They are given to outstanding doctoral students who have demonstrated excellent scholarship during their graduate study at UNLV. Two awards are given, each offering a \$14,000 fellowship with full fees paid (up to 12 credits), including all out-of-state tuition, if applicable.

Applicants must:

- Be a doctoral-level student.
- Have completed at least 24 credits of doctoral study (at the time of application).
- Have a minimum graduate GPA of 3.5.
- Enroll as a full-time graduate student (at least nine graduate credits) in each semester of the fellowship year in order to devote maximum effort to doctoral study. Criteria for selection will also include demonstrated excellence in research.

Scholarships

Alumni Association Scholarships are awarded to outstanding master's students who received their undergraduate degrees from UNLV. Three awards are given, each offering a \$1,000 scholarship for the academic year.

Applicants must:

- Be a master's-level or specialist student.
- Have completed at least 12 credits of graduate study at UNLV (by the end of the current spring semester).
- Have minimum UNLV undergraduate and graduate GPAs of 3.5.
- Enroll in six or more graduate credits in each semester of the scholarship year.
- Hold an undergraduate degree from UNLV.

James F. Adams/GPSA Scholarships. The UNLV Graduate & Professional Student Association established these scholarships in honor of Dr. James F. Adams, former dean of the Graduate College (1980-85), to recognize academic achievement of master's-level students. Six awards are given, each offering a \$1,000 scholarship.

Applicants must:

- Be a master's-level or specialist student.
- Have completed at least 12 credits of graduate study at UNLV (by the end of the current spring semester).
- Have a minimum graduate GPA of 3.5.
- Enroll in six or more credits in each semester of the scholarship year.

Summer Session Scholarships are designed to enable summer study for doctoral students, however excellent master's and specialist's students may be considered. Ten awards are given, each offering a \$2,000 scholarship during the summer.

Applicants must:

- Have completed at least 12 credits of graduate study at UNLV (at the time of application).
- Have a minimum graduate GPA of 3.0.
- Enroll in six credits in any one or combination of summer sessions.

Criteria for selection will include summer plans for conducting dissertation or thesis research.

Employment

On-Campus Employment. Several campus departments and offices employ students in a variety of positions. These jobs can be viewed on the Student Financial Services website. On-campus employment listings are available to graduate students enrolled in at least five credits at UNLV. Financial need is not a criterion for on-campus employment.

Job Location and Development. Employment opportunities are offered to UNLV students by community businesses and

individuals. These jobs can be viewed on the Student Financial Services website. In addition to job listings, the JLD Program sponsors biannual Job Fairs where employers from businesses, government agencies, and hospitals, to name a few, come to campus to discuss part-time employment opportunities.

Federal Work Study. The Federal Work Study Program is a federally funded financial aid program awarded as part of the financial aid package. This program enables students to earn a portion of their college expenses through employment with a UNLV department or office or off campus with contracted nonprofit agencies.

Community service is a major goal of this program. If available, students may choose jobs related to their academic majors and career objectives. Work hours may also be arranged according to class schedules.

To qualify for a Federal Work Study job, applicants must meet the eligibility requirements of the federal financial aid programs. One requirement, financial need, is determined by Student Financial Services and based on income and asset information entered on the Free Application for Federal Student Aid (FAFSA) application.

Funds are limited. Therefore, applicants must mail the completed FAFSA application to the federal processing center by February 1. Questions concerning the eligibility requirements or application process may be directed to Student Financial Services, second floor, Student Services Complex.

College of Sciences

The natural and mathematical sciences represent the dual cutting edges of our technological future. UNLV's College of Sciences is dedicated to making that future real, both in the creation of new knowledge through research and in the application of that knowledge in the classroom, the community and the world. These are the guiding principles that bring students, faculty and staff together. Whether in a small discussion session, in a research laboratory or in the field, UNLV College of Sciences graduate students are in an environment in which learning is the common goal. Many students choose a graduate institution based on the reputation of an individual faculty scholar or laboratory group. This is often an excellent approach to finding the right match between a new student and a mentor. However, even those who come to UNLV Sciences without a particular graduate project in mind can count on identifying potential major professors who are receptive to a wide array of interests and backgrounds. The College of Sciences, through its active programs of research and teaching, has been able to assemble a remarkable foundation of state-of-the-art instrumentation and facilities, providing an ever-growing set of opportunities for students who desire the best from their graduate experiences.

Wanda J. Taylor, Interim Dean

(1991), Professor; B.S., University of Minnesota; M.S., Syracuse University; Ph.D., University of Utah.

Science M.A.S.

The Master of Arts in Science (M.A.S.) is a nonthesis degree designed to allow students to increase their knowledge base in two different fields of science. Traditional and nontraditional students interested in pursuing or advancing science-related careers will discover a host of new opportunities after completing the program. Secondary science teachers who enroll in the program will be better prepared to face classroom challenges with a broad science background.

Program Director

Bhatnagar, Satish C.

(1974). Professor; Ph.D., University of Indiana, Bloomington.

This program includes the current graduate faculty, course work and facilities from the departments of Biological Sciences, Chemistry, Geoscience, Mathematical Sciences, and Physics. Any graduate courses offered by these departments can be considered for inclusion in this degree program. In addition, graduate courses from Environmental Studies can be used to satisfy the second field.

Admission Requirements

1. A bachelor's degree in any of the sciences, mathematical sciences or secondary education with at least nine upper-division science/math courses.
2. A minimum grade point average (GPA) of 2.75 for all undergraduate work.
3. Submission of official transcripts of all undergraduate work documenting the above record.
4. A completed admission application submitted to the Graduate College.
5. Three letters of recommendation prepared by persons familiar with the applicant's academic or professional record.
6. A letter of intent.

Degree Requirements

1. Completion of a total of 30 credits of regular course work of which 50% must be at 700 level. Students accepted into the Master of Arts in Science (MAS) program will be required to take at least twelve credits in one major area of one department and at least six credits each in two minor fields of science, mathematics and/or statistics from two different departments in the College.
2. At most six 700 credits outside the College but related with the major/minor may be earned after two semesters with a prior approval of the faculty advisor.
3. No grade below B- can be included in the degree program.
4. Choose either Option A, or Option B

Option A: Course Work. In addition to 30 credits completed in requirements 1 and 2, six credits must be finished at 700 level to make a total of at least 36.

Option B: Project/Paper. It covers for a maximum of six credits in a major area to make a total of at least 33 credits. It requires a project in a major area under the direction of the student's advisor or another member of the student's supervisory Committee. A written proposal must be submitted to the student's committee before the project can be initiated. This proposal should normally be submitted at the end of the second semester of study. Credit for the project will require a research paper (minimum length 30 pages).

By way of example, the project could involve working with a UNLV science researcher to learn a new technique or to contribute to a field study, or library research on an aspect of science that is new, or the design of a computer program that incorporates recent developments in graphics and software.

Upon completion of the program, the candidate will be required to pass a comprehensive oral exam administered by the supervisory committee. At the time of the oral exam, the student will present the final research paper. The committee will question the student on the project as well as on a broad base of knowledge

of major area. The committee will report the result of this exam to the Deans of the Graduate College and College of Sciences.

- Also, not more than six credits can be earned through independent studies. Graduate credits (minimum acceptable grade of B (3.00) may be transferred into the program from another accredited institution. However, at least two-thirds of the minimum number of credits required or the graduate degree must be taken at UNLV (not including credits for project/paper).

A student will be placed on academic probation if a minimum 3.00 grade point average is not maintained in all work taken in the degree program.

Chemistry

Chair

Lindle, Dennis W.
(1991), Professor; B.S., Indiana University; Ph.D., University of California, Berkeley.

Graduate Coordinator

Hatchett, David W.
(1999), Associate Professor; B.S., California State University, Stanislaus; Ph.D., University of Utah.

Graduate Faculty

Abel-Santos, Ernesto
(2006), Associate Professor; B.S., Autonomous University of Santo Domingo, Dominican Republic; Ph.D., Washington University School of Medicine, St. Louis.

Bae, Chulsung
(2004), Assistant Professor; B.S., Inha University, Korea; M.S., University of Massachusetts, Lowell; Ph.D., University of Southern California.

Bhowmik, Pradip
(1998), Associate Professor; M.S., University of Dhaka, Bangladesh; M.S., University of Massachusetts at Dartmouth; Ph.D., University of Massachusetts at Amherst.

Czerwinski, Kenneth R.
(2003), Associate Professor; B.A., Knox College; Ph.D., University of California, Berkeley.

Gary, Ronald K.
(1999), Associate Professor; B.S., University of California, Irvine; Ph.D., Cornell University.

Heske, Clemens
(2004), Associate Professor; Diploma, TH Darmstadt, Germany; Ph.D., University of Wurzburg, Germany.

Hodge, Vernon F.
(1982), Professor; B.A., M.S., San Diego State University; Ph.D., University of California, San Diego.

Lee, Dong-Chan
(2005), Assistant Professor; B.S., M.S., Kyungpook National University, Korea; Ph.D., University of Massachusetts, Lowell.

Lindle, Dennis W.
(1991), Professor; B.S., Indiana University; Ph.D., University of California, Berkeley.

Naduvalath, Balakrishnan
(2002), Associate Professor; M.S., University of Calicut, India; Ph.D., Indian Institute of Technology, Kanpur.

UnivOrgill, MaryKay
(2003), Assistant Professor; B.S. Brigham Young University; M.S., Ph.D., Purdue University.

Robins, Kathleen A.
(1991), Associate Professor; B.S., University of Illinois, Champaign-Urbana; M.A., Ph.D., University of California, Santa Barbara.

Spangelo, Bryan L.
(1994), Professor; B.S., Keene State College; Ph.D., George Washington University Medical Center.

Steinberg, Spencer
(1989) Professor; B.A., Ph.D., University of California, San Diego.

Tirri, Lawrence J.
(1977), Assistant Professor; B.S., Fairleigh Dickinson University; Ph.D., Fordham University.

Professors Emeriti

Alsup, William M.
(1964-1991), Emeritus Associate Professor; B.S., M.E., Ph.D., University of Wyoming.

Billingham, Edward J., Jr.
(1965-1988), Emeritus Professor; B.S., Lebanon Valley College; Ph.D., Pennsylvania State University.

Earl, Boyd
(1976), Professor; B.S., University of Idaho; M.S., Ph.D., University of California, Berkeley.

Emerson, David W.
(1981-1998), Emeritus Professor; B.A., Dartmouth College; M.S., Ph.D., University of Michigan.

Grenda, Stanley C.
(1967), Associate Professor; B.S., DePaul University; M.S., University of Arizona; Ph.D., Lehigh University.

Titus, Richard L.
(1967-1997), Emeritus Professor; B.A., DePaul University; Ph.D., Michigan State University.

The Chemistry Department offers the Ph.D. in Chemistry or Radiochemistry and the M.S. in Chemistry or Biochemistry. Students may supplement their programs with appropriate courses from other science departments, with the approval of their graduate committee. Research may include projects conducted in the Chemistry Department, the Harry Reid Center, the Desert Research Institute, or the Environmental Protection Agency.

For additional information contact: David Hatchett (Graduate Coordinator) at (702) 895-3509. Web address: can be accessed through the UNLV home page at www.unlv.edu.

Chemistry and Biochemistry M.S.

Admission Requirements

Admission to the program requires an undergraduate degree in chemistry, chemical engineering, biology, biochemistry or a related discipline, with a cumulative GPA of 2.75, or of 3.00 for the last two years of undergraduate work. An application must be submitted to the Graduate College, with official transcripts of all college-level work. Two letters of recommendation from individuals able to assess the applicant's potential as a graduate student should be sent directly to the department along with an additional set of transcripts. The GRE General Aptitude Test results must be received by the department prior to regular admission.

Individuals with apparent deficiencies in their undergraduate background may be required to enroll in selected courses in addition to those listed in the following section to satisfy M.S. degree requirements.

Degree Requirements

1. Required Courses
A minimum of 30 graduate credits is required, of which 10-13 must be in:
CHEM 795 - Independent Study
CHEM 798 - Thesis
CHEM 791 - Graduate Seminar
CHEM 770 - Protein Chemistry
CHEM 771 - Metabolism and Energetics
CHEM 772 - Nucleic Acid Chemistry
CHEM 773 - Physical Biochemistry
CHEM 672 - Biochemistry Laboratory
BIOL 701 - Ethics in Scientific Research
2. Specializations
Research and course work specializations are available in analytical chemistry, biochemistry, organic chemistry, and physical chemistry. The individual student's program of course work must be selected in consultation with and approved by the student's committee, and may include courses from selected disciplines other than chemistry, such as biology, physics, civil and environmental engineering, or water resources management.
3. Research Advisor
Students are expected to select a research advisor by the end of their first semester.
4. Departmental Seminar
Each student is required to present a departmental seminar on the student's research prior to graduation. This requirement is in addition to the two credits in

CHEM 791. Students are expected to attend weekly departmental seminars.

5. Student's Examination Committee
Each student is required to meet at least once per semester with the student's examination committee. At the meeting in the semester prior to the expected term of graduation, the student will be asked to make a detailed presentation on research progress. The committee will then make recommendations to be addressed by the student during the remainder of the student's research program, in writing the thesis, and in the final examination. The committee may request another meeting prior to the final exam if deemed necessary.

Notes: It is expected that each student be a teaching assistant for a minimum of two courses prior to graduation. It is also expected that each student publish at least one research-based manuscript in a peer-reviewed journal. Chemistry Ph.D.

Admission Requirements

For preferential consideration, please submit materials for Fall semester admission by February 1, and for Spring semester, by October 1.

1. The applicant is required to submit a completed Graduate College application, application fee and official transcripts to the Graduate College with copies submitted to the department.
2. Admission to the Ph.D. degree program in Chemistry requires a B.S. degree or a M.S. degree in Biochemistry, Chemistry, Biology, or a related discipline.
3. A minimum grade point average (GPA) of 3.00, on a 4.0 scale, for all undergraduate or graduate work is required for admission to the program.
4. In addition, the Graduate College application and official transcripts, the Department of Chemistry requires a statement of interest from the applicant. A letter of application should state interests and goals for graduate study. This is a 1-2 page essay describing the applicant's reasons for considering graduate study, goals after completion of the graduate degree, and the applicant's specific areas of interest.
5. The Department of Chemistry requires three letters of recommendation from persons familiar with the academic record of the applicant. Each letter should detail the potential of the applicant for advanced graduate work in Chemistry or Biochemistry.
6. The Department of Chemistry requires scores for GRE, General Record Exam, for admission.
7. The Department of Chemistry requires all international students whose first language is not English or who have not received baccalaureate or master's degrees from an institution in which the language of instruction

is English must pass the TOEFL (Test of English as a Foreign Language) examination. Satisfactory scores for the TOEFL exam are listed in the admissions section of this catalogue.

Degree Requirements

Doctoral students in Chemistry are required to complete a minimum of 60 credit hours beyond the baccalaureate. All 60 credits hours must be completed from courses at the 700-level. For students entering the Ph.D. program with an approved M.S. degree in Chemistry or a closely related discipline, at least 30 credit hours must be completed in the Ph.D. program at UNLV comprised of courses at the 700-level.

The doctoral degree requires course work, a proposal defense, a comprehensive oral and written examination, and a written dissertation. All students are required to complete and publicly defend a dissertation describing their research. It is suggested and expected that each student publish at least one research-based manuscript in a peer-reviewed journal prior to graduation.

Students will be advised on which courses to take by the faculty within each discipline of study. It is suggested that students take between 18 – 21 credit hours of 700 level courses with additional credit hours comprised of a combination of:

- CHEM 795 - Independent Study (1-3 units)
- CHEM 799 - Dissertation (a minimum of 12 credits)
- CHEM 796 - Dissertation Prospectus (minimum, 1 credit)
- CHEM 797 - Directed Research (minimum, 1 credit)
- CHEM 791 - Graduate Seminar (5 credits, 3 presentations minimum)

The faculty in the division of study will determine if course work from the M.S. degree are comparable to existing 700 level courses offered in the Department of Chemistry. Students will be notified by the department in writing within the first semester of enrollment which courses from their M.S. degree will be accepted toward the requirements for the Ph.D. degree.

Satisfactory progress toward meeting the degree requirements is required of all candidates. Satisfactory progress is defined as, at a minimum:

1. All students are required to maintain a minimum a 3.00 grade point average in all graduate-level courses. Two grades of B- are permitted in the degree program as long as the GPA remains at or above 3.00. One grade of C+ or lower will result in academic probation even if the overall GPA is above 3.0. Two grades of C+ or lower will result in automatic suspension or separation from the program.
2. A dissertation advisor must be chosen by the end of the first semester, and the Doctoral Advisory Committee must be appointed prior to the end of the second semester. An approved graduate degree program must be filed prior to the beginning of the third semester of enrollment. All students must meet these deadlines;

failure to do so will result in academic probation. Failure of a student on academic probation to meet these requirements within the next semester could result in separation from the program.

The Doctoral Advisory Committee must consist of the faculty advisor (chair), chemistry graduate faculty in the discipline of study, one additional chemistry graduate faculty member, and one graduate-college representative from outside the department. Failure to identify an advisor and form this committee will result in the student being placed on academic probation. The use of committee members external to UNLV is allowed with approval from the examination committee. External members without graduate faculty status at UNLV will be non-voting members of the Ph.D. examination committee.

3. All students are required to schedule an interview with the advisor either before or during the first semester of study. If the student does not select an advisor, the Graduate Coordinator will assign a temporary advisor. The purpose of the initial interview is to develop a plan of course work for the first year.
4. All students are required to schedule a diagnostic interview with the Doctoral Advisory Committee before the end of the 2nd semester. The purpose of the interview is to develop a list of recommended courses and design the student's degree program, which must be submitted prior to completing 16 credits of course work toward the degree.
5. All students must prepare a dissertation proposal for a Proposal Defense Examination. The student will register for CHEM 796 Dissertation Prospectus. This examination must be completed prior to the end of the fourth semester. To remain in good standing students are required to develop and defend a dissertation prospectus no later than the fourth semester of enrollment. If a student does not defend a dissertation prospectus they will be placed on academic probation. The Proposal Defense Examination focuses on the dissertation proposal and the student's ability to perform the research. It includes a formal oral presentation of the student's dissertation proposal, research to date, and questions by the dissertation advisory committee on the dissertation topic. The Proposal Defense Examination is to be taken prior to the Comprehensive Examination.
6. Advancement to Candidacy. Students will advance to candidacy if the Comprehensive Examination is passed and the enrolled coursework is successfully completed based on the evaluation of the students Doctoral Advisory Committee. The comprehensive exam will consist of written and oral components as defined by the Ph.D. Examination Committee. Satisfactory performance on the Comprehensive Examination requires that Ph.D. students have a basic knowledge of the discipline of study. It also requires the student to follow the guidelines established for each discipline

(i.e., Biochemistry, Physical Chemistry, Analytical Chemistry, Inorganic Chemistry and Organic Chemistry). The student's Doctoral Advisory Committee or the faculty from the discipline of study will determine the format and content of both the written and oral exams.

7. The Ph.D. Examination Committee will determine if the student passes the Comprehensive Examination. If a student fails any part of the Comprehensive Examination, the Ph.D Examination Committee will determine if the student is allowed to retake the portion of the comprehensive exam that is not passed.

Students who fail to pass any part of the Comprehensive Examination or Proposal Defense on the first attempt must successfully complete a second attempt (as specified by the Ph.D. Examination Committee) within the next six months to remain in the program.

Failure to advance to candidacy by the end of the sixth semester of enrollment will result in the student being placed on academic probation. Failure to advance to candidacy by the end of the seventh semester will result in the student being separated from the program.

Students who enter the program with a baccalaureate degree and who fail the second examination may be allowed to continue as a Master of Science student with the consent of the Doctoral Advisory Committee.

Students who entered the program with a master's degree who fail the examination a second time will be separated from the program.

A student who has successfully passed both the Proposal Defense and Comprehensive Examinations will advance to candidacy for the Ph.D. degree.

After advancement, subsequent years of study will be required for the graduate student to complete their degree. The duration of this period will depend on the success of the research project as defined by the Doctoral Advisory Committee.

Completed coursework will only be counted towards the graduation requirements of this program for six years, if the student completed a master's degree or eight years if the student completed a baccalaureate degree. It is recommended that students publish at least one research-based manuscript in a peer-reviewed journal prior to graduation.

Satisfactory performance on the final examination will consist of the presentation and defense of the dissertation research. The defense will consist of an oral presentation open to the public, a short period of questions from the public, a closed session of questions from the Doctoral Advisory Committee, and a closed deliberation and vote by just the Doctoral Advisory Committee members. Any graduate faculty member may attend the closed session of questions of the defense.

Sample Program of Study

CHEM 790 - Directed Readings
CHEM 791 - Graduate Seminar
CHEM 792 - Research Seminar
CHEM 793 - Special Topics
CHEM 795 - Independent Study
CHEM 796 - Dissertation Prospectus
CHEM 797 - Directed Research
CHEM 799 - Dissertation

Radiochemistry Ph.D.

The Radiochemistry Ph.D. Program is a student-driven research intensive program stressing fundamental aspects of radiochemistry science. It was established by the Departments of Health Physics and Chemistry and includes participants from the Harry Reid Center, Nuclear Science and Technology Group. The program is administered by the UNLV Graduate College. The Ph.D. program requires 60 credits of research and courses beyond the baccalaureate degree. Credit is required for four courses in nuclear chemistry, radiochemistry, detectors, and laboratory. The remaining courses are based on the area of interest of the student and include laboratory research. Students are obliged to maintain a B average and show progress in their research.

To advance to candidacy, students are required to pass an oral exam on their research and an outside topic related to radiochemistry. The curriculum and research provides a comprehensive and interdisciplinary examination of topics and experiences necessary to produce graduates who are ready to secure employment and participate in radiochemistry research. An example class schedule for incoming students with a baccalaureate appears below. Representative program for B.A. student entering UNLV radiochemistry program:

Fall semester – Year 1 - Total Credits: 8

- RDCH 701 - Nuclear Chemistry
- RDCH 702 - Radiochemistry
- RDCH 750 - Radiochemistry Laboratory Research

Spring semester – Year 1 - Total Credits: 9

- HPS 604 Radiation Measurement and Detection (credits: 3)
- HPS 714 Radiation Detection and Radiochemistry Laboratory (credits: 3)
- HPS 750 - Radiation Risk Assessment

Fall semester – Year 2 - Total Credits: 10

- RDCH 710 - Actinide Chemistry
- HPS 670 - Environmental Health Physics
- ME 656 - Radioactive Waste Management
- CHEM 791 - Graduate Seminar

Spring semester – Year 2 - Total Credits: 7

- CHEM 655 - Instrumental Analysis
- ME 655 - Fundamentals of Nuclear Engineering

- HPS 791 - Graduate Seminar

Fall semester – Year 3 - Total Credits: 7

- RDCH 799 Doctoral Dissertation
- GEOL 708 - Radiogenic Isotope Geochemistry
- HPS 791 - Graduate Seminar

Spring semester – Year 3 - Total Credits: 6

- CHEM 799 - Dissertation
- CHEM 791 - Graduate Seminar

Fall semester – Year 4 - Total Credits: 7

- CHEM 799 - Dissertation
- CHEM 795 - Independent Study
- CHEM 791 - Graduate Seminar

Spring semester – Year 4 - Total Credits: 6

- CHEM 799 - Dissertation

Course Descriptions

Chemistry

CHEM 602 - Scientific Software for the Microcomputer

CHEM 621 - Physical Chemistry

CHEM 622 - Physical Chemistry II

CHEM 628 - Quantum Chemistry

Note: Graduate credit may be obtained for courses designated 600 or above. A full description of this course may be found in the Undergraduate Catalog under the corresponding 400 number. Notes: Credit at the 600 level normally requires additional work.

CHEM 631 - Advanced Inorganic Chemistry

Credits 3

Atomic and nuclear properties. Structure, symmetry, and bonding for molecular and solid-state compounds. Solution behavior, solubility, acid-based properties. Chemistry of the elements and periodic trends. **Prerequisites:** CHEM 422 or equivalent.

CHEM 655 - Instrumental Analysis

CHEM 672 - Biochemistry Laboratory

CHEM 678 – Endocrinology

Note: Graduate credit may be obtained for courses designated 600 or above. A full description of this course may be found in the Undergraduate Catalog under the corresponding 400 number. Notes: Credit at the 600 level normally requires additional work.

CHEM 710 - Environmental Aquatic Chemistry

Credits 3

Study of the chemistry of natural waters, emphasizing chemical speciation and the interaction of aqueous media with soil and air. Considerable attention given to the use and limitations of thermodynamic equilibrium models of chemical speciation. **Prerequisites:** Graduate standing or consent of instructor.

CHEM 715 - Environmental Organic Chemistry

Credits 3

Organic chemistry of natural waters, soils and the atmosphere, emphasizing chemical reactions, sorption, bio-concentration and fate and transport. Use and limitation of thermodynamic and kinetic models and the extrapolation of laboratory data to environmental conditions. **Prerequisites:** Graduate standing in chemistry or consent of instructor.

CHEM 725 - Advanced Organic Chemistry

Credits 3

Advanced study of structures and reactions of organic compounds. Reactive intermediates, reaction mechanism, stereochemistry, and synthesis examined. **Prerequisites:** CHEM 242 and 421.

CHEM 726 - Organic Synthesis

Credits 3

Study of the synthesis of complex organic molecules. Stereochemistry, use of organometallic reagents and chiral auxiliaries stressed, with considerable emphasis on current literature. **Prerequisites:** CHEM 242, 421

CHEM 728 - Organic Synthesis Laboratory

Credits 2

Some reasonably challenging syntheses undertaken to include reactions requiring rigid exclusion of air and moisture. Products characterized by modern spectroscopic methods.

Notes: Eight hours laboratory per week. **Prerequisites:** CHEM 242, 421, 447 or consent of instructor.

CHEM 735 - Advanced Physical Chemistry

Credits 3

Statistical and quantum mechanics and their use in calculating thermodynamic properties. **Prerequisites:** CHEM 421 and 428

CHEM 745 - Instrumental Analysis-Inorganic

Credits 3

Theory of modern analytical instrumentation as it pertains to inorganic analysis. Notes: May include atomic emission and absorption, x-ray, radioactivity and mass spectroscopic methods.

CHEM 746 - Instrumental Analysis-Organic

Credits 3

Theory of modern analytical instrumentation as it pertains to organic analysis. May include gas chromatography-mass spectrometry, supercritical fluid chromatography, nuclear magnetic resonance, Fourier transform infrared methods and fluorescence techniques.

CHEM 749 - Polymer Chemistry

Credits 3

Polymer structure; classification of polymerization reactions, step-growth and chain-growth polymerization reactions; condensation, radical, cationic, and anionic polymerization reactions; physical properties and characterization of polymers. **Prerequisites:** Consent of instructor.

CHEM 750 - Quality Assurance and Statistics

Credits 3

Purpose, theory, and applications of quality assurance/quality control. Experimental design including development of sampling protocols. Statistics relating to the evaluation of data quality covered. Notes: Not a theoretical statistics course. **Prerequisites:** STA 161 and CHEM 455.

CHEM 752 - Chromatography

Credits 3

Theory and applications of chromatography as the basis of analytical separations for inorganic and organic analyses. Separating power, selectivity, efficiency, and limitations of the various methods discussed. **Prerequisites:** CHEM 241, 422, and 455.

CHEM 755 - Sample Preparation and Analysis

Credits 3

Collection, preparation, and analysis of gaseous, soil, and water samples using approved standard methods. Techniques used may include gas chromatography, gas chromatography-mass spectroscopy, high performance liquid chromatography- atomic absorption spectroscopy, and inductively coupled plasma atomic emission spectroscopy. Notes: One hour lecture and six hours laboratory. Consult instructor(s) prior to enrollment. **Prerequisites:** Graduate standing in chemistry.

CHEM 760 - Environmental Radiochemistry/Radiation Safety

Credits 3

Practical applications of radiochemistry to topics of current and future concern, such as the temporary and permanent storage of radioactive wastes, nuclear utilities, nuclear medicine and isotope geology. Includes advanced radiochemical techniques and radiation safety training. **Prerequisites:** CHEM 421 and 422 or equivalent, or consent of instructor.

CHEM 765 - Inorganic Chemistry

Credits 3

Physical approach to inorganic compounds, mainly of the transition elements including bonding, stereochemistry, and electronic properties with use of symmetry and elementary group theory. **Prerequisites:** CHEM 422

CHEM 770 - Protein Chemistry

Credits 3

Protein structure and function. Enzymology (kinetics, regulation). Survey of techniques used in protein purification and analysis. **Prerequisites:** CHEM 475 or equivalent.

CHEM 771 - Metabolism and Energetics

Credits 3

Biochemical pathways of carbohydrate, lipid, nucleic acid and amino acid metabolism and the mechanism of mitochondrial ATP synthesis. **Prerequisites:** CHEM 475

CHEM 772 - Nucleic Acid Chemistry

Credits 3

Chemistry and function of nucleic acids (DNA, RNA) and their analogs. **Prerequisites:** CHEM 475 or equivalent.

CHEM 773 - Physical Biochemistry

Credits 3

Theory and practice of physical chemistry as applied to the structure, properties, and interactions of biochemical macromolecules. Includes thermodynamics, various types of spectroscopy, electrophoresis, ligand binding, and hydrodynamic methods (covering the theoretical aspects of diffusion, sedimentation, and viscosity). **Prerequisites:** CHEM 475

CHEM 775 - Bioanalytical Environmental Toxicology

Credits 3

Principles of toxicology. Study of the interaction of toxicants with biochemical pathways. Emphasis on toxic chemicals of environmental interest. **Prerequisites:** CHEM 475

CHEM 783 - Spectral Interpretation

Credits 3

Spectroscopic data obtained from the techniques of nuclear magnetic resonance (NMR), mass spectrometry (MS), infrared (IR) and ultraviolet-visible (UV-VIS) spectrophotometry used to establish structural features of organic molecules. Emphasizes strategies, interpretation, modern techniques, and problem solving. **Prerequisites:** Consent of instructor.

CHEM 784 - Spectral Interpretation Laboratory

Credits 1

Identification and characterization of an organic compound using infrared, ultraviolet, mass, and NMR spectrometers. Proton, carbon-13, and two-dimensional NMR spectra used to fully determine the structure. Corequisite CHEM 783

CHEM 790 - Directed Readings

Credits 1

Directed readings in the primary literature supportive of the dissertation prospectus. Notes: May be repeated, but only

three credits are applied to the academic program.

Prerequisites: Enrollment in the Chemistry or Radiochemistry doctoral program.

CHEM 791 - Graduate Seminar

Credits 1

Attendance and participation in seminar presentations. Includes student presentations. For master's students, enrollment is required. Two presentations are required. Notes: May be repeated for a maximum of five credits. Grading S/F **Prerequisites:** Graduate standing in Chemistry or Radiochemistry.

CHEM 792 - Research Seminar

Credits 3

Public defense of a graduate research project in the Ph.D. Program. **Prerequisites:** Graduate standing in Chemistry or Radiochemistry.

CHEM 793 - Special Topics

Credits 3

Study of a topic of interest from any field of chemistry (for example, analytical chemistry, biochemistry, etc.), at an advanced level. Topic varies each semester. Topic chosen will be published in the class schedule. Notes: May be repeated for credit if classes are in different topics. **Prerequisites:** Graduate standing in chemistry.

CHEM 795 - Independent Study

Credits 1 – 3

Individual directed study of a topic not covered in other courses. Notes: May be repeated once for credit. May be repeated to a maximum of six credits. **Prerequisites:** Graduate standing in chemistry and consent of instructor.

CHEM 796 - Dissertation Prospectus

Credits 1

Development of a prospectus and its defense before the Ph.D. examination committee. **Prerequisites:** Enrollment in the Chemistry or Radiochemistry doctoral program.

CHEM 797 - Directed Research

Credits 1 – 6

Supervised research in the doctoral program. May be repeated for a maximum of twelve credits. **Prerequisites:** Enrollment in the Chemistry or Radiochemistry doctoral program.

CHEM 798 - Thesis

Credits 3 – 6

Notes: May be repeated, but only nine credits applied to the student's program. Grading S/F grading only. **Prerequisites:** CHEM 745 or CHEM 746 and consent of instructor.

CHEM 799 - Dissertation

Credits 3 – 6

Research, analysis, and writing toward completion of dissertation and subsequent defense.

Notes: May be repeated but a minimum of eighteen credits and a maximum of twenty four credits will be applied toward fulfillment of degree requirements.

Grading S/F grading only. **Prerequisites:** Graduate standing in Chemistry or Radiochemistry and consent of instructor.

Radiochemistry

RDCH 701 - Nuclear Chemistry

Credits 3

Introduces nuclear properties in radiation and radiochemistry. Concepts of the nuclei, radioactive decay, and nuclear reactions examined. Use of quantum mechanics in development of nuclear models and equations. Physics involved in interaction of radiation with matter.

Prerequisites: General physics, graduate standing in Radiochemistry program.

RDCH 702 - Radiochemistry

Credits 3

Introduces chemical properties in radiation and radiochemistry. Use of stability constants and relationship between speciation, kinetics and thermodynamics. Influence of radiolysis on chemistry of radioisotopes. Radioisotope production and use. Radiochemical separations.

Prerequisites: Inorganic chemistry, physical chemistry, graduate standing in Radiochemistry program.

RDCH 710 - Actinide Chemistry

Credits 3

Basis for unique chemistry of actinide elements described and related to oxidation-reduction, complexation,orbital interaction, and spectroscopy. Using nuclear properties in understanding actinide chemistry covered. Presentations on exploiting chemical behavior of actinides in separation, nuclear fuel cycle, environmental behavior, and materials.

Prerequisites: RDCH 702, graduate standing in Radiochemistry program.

RDCH 750 - Radiochemistry Laboratory Research

Credits 3

Experimental laboratory research conducted by the student under supervision. The student supplies research topic and provides suitable literature and background information. Research plan developed in conjunction with instructor. The student obtains experience in performing radiochemical laboratory research. **Prerequisites:** Undergraduate chemistry laboratory experience, graduate standing in the Radiochemistry program.

Geoscience

Chair

Wells, Michael L.
(1993), Professor; B.S., University of California at Santa Cruz; M.S., Ph.D., Cornell University.

Graduate Coordinator

Yu, Zhongbo
(1999), Professor; B.S., Hohai University; M.S., University of Southern Mississippi; Ph.D., Ohio State University.

Graduate Faculty

Buck, Brenda
(1998), Associate Professor; B.S., University of Notre Dame; M.S., Ph.D., New Mexico State University.

Cline, Jean S.
(1998), Professor; B.S., Wisconsin State University; M.S., University of Arizona; Ph.D., Virginia Polytechnic Institute and State University.

Crow, H. Clay
(1993), Instrumental Analyst; B.S., California State University; M.S., UNLV; Ph.D. New Mexico Institute of Mining and Technology.

Hanson, Andrew
(2000), Associate Professor; B.S., Montana State University; M.S., San Diego State University; Ph.D., Stanford University.

Elisabeth Hausrath
(2009), Assistant Professor; B.S., Brown University; Ph.D., Pennsylvania State University.

Jiang, Ganqing
(2004), Assistant Professor; B.A., Xiangtan Mining College; M.Sc., China University of Geosciences; Ph.D., Columbia University

Kreamer, David K.
(1990), Professor; B.S., M.S., Ph.D., University of Arizona.

Lachniet, Matthew
(2003), Associate Professor; B.A., Antioch College; M.S., Michigan State University, Ph.D., Syracuse University.

Metcalf, Rodney V.
(1991), Associate Professor; B.S., M.S., University of Kentucky; Ph.D., University of New Mexico.

Mulcahy, Sean
(2008), Assistant Research Professor; B.S., Virginia Polytechnic Institute; Ph.D., University of California, Davis.

Nicholl, Michael
(2004), Professor; B.S., Eastern Michigan University; M.S., Ph.D., University of Nevada, Reno.

Nowicki, Scott
(2008), Assistant Professor in Residence; B.S., Augustana College; M.S., Ph.D., Arizona State University; .

Rowland, Stephen M.
(1978), Professor; A.B., University of California, Berkeley; Ph.D., University of California, Santa Cruz.

Simon, Adam
(2005), Assistant Professor; B.S., University of Maryland, College Park; M.S., State University of New York, Stony Brook; Ph.D., University of Maryland, College Park.

Smith, Eugene I.
(1980), Professor; B.S., Wayne State University; M.S., Ph.D., University of New Mexico.

Spell, Terry
(1996), Associate Professor; B.S., West Georgia College; M.S., New Mexico Institute of Mining and Technology; Ph.D., State University of New York, Albany.

Taylor, Wanda J.
(1991), Professor and Interim Dean; B.S., University of Minnesota; M.S., Syracuse University; Ph.D., University of Utah.

Professors Emeriti

Bachhuber, Frederick W.
(1974-2002), Emeritus Professor; B.S., M.S., University of Wisconsin; Ph.D., University of New Mexico.

Weide, David L.,
(1973-2004), Emeritus Professor; A.B., Ph.D., University of California, Los Angeles, M.A., California State University, Los Angeles.

The Department of Geoscience is an active and enthusiastic department consisting of eighteen full-time faculty, approximately sixty graduate students and 80 undergraduate majors. The department offers a program of courses, seminars and research opportunities leading to Master of Science and Doctor of Philosophy degrees in Geoscience. The interests of the faculty and students cover a wide range of topics. Graduate students can choose one of four Geoscience emphases: Geology, Geophysics, Hydrogeology, and Soil Science. Active research by faculty and students is ongoing throughout the western United States, as well as in Antarctica, Canada, Chile, China, Costa Rica, Indonesia, France, Guatemala, Mexico, New Zealand, Panama, Poland, Russia, South Africa, Spain, and Switzerland.

The department encourages interdisciplinary research. Opportunities for geological and interdisciplinary research may be pursued with organizations near, or on, campus that cooperate with the department including: the Harry Reid Center (HRC) for Environmental Studies; the Division of Hydrologic Sciences of the Desert Research Institute (DRI), a division of the University and Community College System of Nevada; the Environmental Monitoring and Support Laboratory of the Environmental Protection Agency (EPA); the Department of Energy; and other university departments and schools such as life sciences, chemistry, physics, and engineering.

Students are encouraged to read the general graduate college rules and regulations elsewhere in this catalog and to read the Department of Geoscience Graduate Student Guidelines, which are available on the department's web site at: <http://geoscience.unlv.edu/graduateprogram.htm>. An understanding of these documents is essential for satisfactory progress toward the degree.

Admission Requirements for M.S. and Ph.D. Degrees in Geoscience

Admission for any of the four emphases may be in the spring or fall semester. For preferential consideration, please submit materials for fall admission by February 1, and for spring semester, by October 1.

Admission and degree requirements for the Department of Geoscience are listed below. These requirements apply to all of the emphases. Note that each emphasis has requirements in addition to those listed below. Please check the section describing the emphasis of interest to you.

General Admission Requirements Common to All Geoscience Emphases

1. A B.S. degree (specific degree requirements are listed under each emphasis description). A master's degree is recommended, but not required, for admission to the Ph.D. program.
2. A minimum overall grade point average of 3.00 (on a 4.00 scale).
3. Satisfactory scores on the general Graduate Record Examination (GRE).
4. Three letters of recommendation from individuals competent to comment on the applicant's promise as a graduate student.
5. A letter of application stating interests and goals for graduate study. This is a 1-2 page essay describing the applicant's reasons for considering graduate study, goals after completion of the graduate degree, and the applicant's specific areas of interest.
6. Submission of official copies of academic transcripts.
7. Submission of an application and fees to the Graduate College.
8. All international students whose first language is not English or who have not received baccalaureate or master's degrees from an institution in which the language of instruction is English must pass the TOEFL (Test of English as a Foreign Language) examination. Satisfactory scores for the TOEFL exam are listed in the Admissions section of this catalogue.

Geosciences M.S.

Degree Requirements

A minimum of 30 credit hours beyond the undergraduate degree is required for the M.S. degree in Geoscience.

Six credits of:

GEOL 797 - Thesis

and 24 credits of course work will be counted toward the degree program, although more course and thesis credits may be taken. Of the 24 required course credits, at least 12 credits must be in 700-level courses and include:

GEOL 701 - Research Methods in Geoscience and
GEOL 795 - Poster Presentation and Time Management.
GEOL 701 and **795** must be taken during the first year of enrollment.

Credits taken at other institutions will be considered for transfer, however, at least 16 of the 24 course credits required for the degree must be taken at UNLV.

Students must confer with their appointed advisor prior to enrollment in their first semester. An approved degree program and thesis prospectus must be filed with the Graduate College, and a thesis committee must be appointed by the end of the second semester after admission to the college. This responsibility rests with the student. Students will be dropped from the program and separated from the Graduate College if they fail to fulfill this requirement.

Satisfactory progress toward meeting the degree requirements is required of all students. Satisfactory progress includes maintaining at least a 3.00 grade point average in all graduate-level courses. Specific grade requirements are slightly different for M.S. students than they are for Ph.D. students: consult the Geoscience Graduate Student Guidelines at <http://geoscience.unlv.edu/graduatestudentguidelines.htm> for full details.

Geoscience Emphasis M.S. and PhD

Emphasis in Geology

The emphasis in Geology includes the fields of economic geology, environmental geology, geochemistry, geochronology, geomorphology, igneous petrology, paleontology, metamorphic petrology, Quaternary geology, pedology, sedimentology, stratigraphy, structural geology, surficial processes, tectonics, and volcanology. Students must satisfy all of the general degree and admission requirements in addition to those listed below.

Admission requirement in addition to those listed above for the Master of Science and Ph.D. degrees:

1. A bachelor's degree in geology or equivalent. A Master of Science degree in geology or equivalent is recommended for the Ph.D. applicants, but not required.
2. In order to be admitted without contingencies the student must have completed an introductory geology class and six of the following eight classes (or their equivalents): mineralogy, geochemistry, geomorphology, structural geology, igneous and metamorphic petrology, paleontology, field geology, and sedimentology/stratigraphy.

Emphasis in Geophysics

Admission requirements in addition to those listed above for the Master of Science and Ph.D. degrees:

1. A bachelor's degree in geology, engineering, physics or mathematics. A Master of Science degree is recommended for Ph.D. applicants, but not required.
2. To be admitted to the program with a Geophysics emphasis, it is recommended that the student have completed the following courses for unconditional admission to the program.

Mathematics: Three semesters of calculus

Physics: Two semesters of introductory (calculus level) physics

Geology: Physical geology, historical geology, mineralogy, structural geology, sedimentology/stratigraphy, and igneous and metamorphic petrology.

Degree requirements in addition to those listed above for the Master of Science and Ph.D. degrees.

Required Graduate Courses

In addition, each student must take at least three courses from the list below. The remaining credits can be obtained from the list below or other Geoscience graduate-level courses that are appropriate for the course of study.

GEOL 645 - Geophysical Methods
CEE 636 - Engineering Geophysics
ECG 780 - Digital Signal Processing
GEOL 793 - Independent Study and Research

Elective Graduate Courses

GEOL 630 - Geographic Information Systems (GIS):
GEOL 643 - Plate Tectonics
GEOL 644 - Tectonics of Orogenic Belts
GEOL 646 - Geologic Applications in Remote Sensing
GEOL 678 - Hydrogeochemistry
GEOL 688 - Microtechniques in Geoscience
GEOL 716 - Geostatistics
GEOL 744 - Tectonics and Structures
GEOL 745 - Advanced Structural Geology
GEOL 746 - Strain and Microstructural Analysis
GEOL 747 - Geological Evolution of Western North America
GEOL 770 - Sedimentary Basins
GEOL 772 - Reflection Seismic Data Interpretation
GEOL 773 - Seminar in Geophysics
BIOL 618 - Microbial Ecology
CEE 634 - Rock Mechanics
CEE 636 - Engineering Geophysics
CEE 676 - Earthquake Engineering
CEE 737 - Soil Dynamics and Earthquake Engineering
CEE 775 - Seismic Response of Structures

Emphasis in Soil Science

Admission requirements in addition to those listed above for the Master of Science and Ph.D. degrees:

1. A B.S. degree in a Natural Science (or similar field and course work) or B.A. degree in Natural Science (or similar field and course work) with approval of the graduate coordinator. A Master of Science degree is recommended for Ph.D. applicants, but not required.
2. To be admitted to the program with a Soil Science emphasis, it is recommended that the student have completed two of the following courses for unconditional admission to the program: Mineralogy, Geomorphology, Sedimentology/Stratigraphy, or Geochemistry.

Degree requirements in addition to those listed above for the Master of Science and Ph.D. degrees.

Required Graduate Courses

GEOL 610 - Soil Classification and Resource Management
GEOL 786 - Soils Applications: Paleoclimate, Neotectonics,

Elective Credit

Remaining credits can be obtained from the list below or other graduate-level courses that are appropriate for the course of study and approved by the student's committee.

GEOL 646 - Geologic Applications in Remote Sensing
GEOL 716 - Geostatistics
GEOL 735 - Seminar in Environmental Geology
GEOL 744 - Tectonics and Structures
GEOL 760 - Advanced Spatial Modeling with GIS
GEOL 770 - Sedimentary Basins
GEOL 776 - Paleosols Records of Past Landscapes
GEOL 688 - Microtechniques in Geoscience

Emphasis in Hydrogeology

Admission requirements in addition to those listed above for the Master of Science and Ph.D. degrees:

1. B.S. or master's degree in geology or a related discipline (e.g., civil engineering). A Master of Science degree is recommended for Ph.D. applicants, but not required.
2. To be admitted to the program with a hydrogeology emphasis, it is required that the student have completed four of the following courses (or their equivalents) for unconditional admission to the program:
 - GEOL 474 Hydrogeology
 - GEOL 330 Geochemistry
 - GEOL 333 Geomorphology
 - GEOL 341 Structural Geology
 - GEOL 348 Field Geology
 - GEOL 462 Stratigraphy and Sedimentology

Degree requirements in addition to those listed above for the Master of Science and Ph.D. degrees.

Elective Graduate Courses

Course credits can be obtained from the list below or other graduate level courses that are appropriate for the course of study and approved by the student's committee.

GEOL 630 - Geographic Information Systems (GIS):
GEOL 646 - Geologic Applications in Remote Sensing
GEOL 674 - Hydrogeology
GEOL 678 - Hydrogeochemistry
GEOL 709 - Field Methods in Hydrogeology
GEOL 711 - Principles of Hydrology and Hydraulics
GEOL 712 - Watershed Hydrology
GEOL 715 - Advanced Hydrogeology
GEOL 716 - Geostatistics
GEOL 719 - Vadose Zone Hydrology
GEOL 740 - Arid Zone Soils
GEOL 744 - Tectonics and Structures
GEOL 760 - Advanced Spatial Modeling with GIS
GEOL 765 - Seminar in Stratigraphy
GEOL 785 - Seminar in Sedimentology
GEOL 792 - Seminar in Hydroscience

Geosciences Ph.D.

Degree Requirements

The doctoral degree requires course work, a proposal defense, an oral qualifying examination, and a written dissertation, which may consist of three or more publishable papers. A minimum of 60 credits past the baccalaureate or bachelor's degree is required. Students entering the Ph.D. program with an M.S. degree in geology or a related field will be awarded 24 credits toward the Ph.D. Credits taken at another institution will be considered for transfer; however, at least two-thirds of the minimum number of credits required for the degree, not including dissertation credits, must be taken at UNLV.

Course selection is based on the student's research objectives. The student, the advisor and the doctoral advising committee will design the degree program. All Ph.D. students must take at least 12 credits of:

GEOL 799 - Dissertation. The 60 credits required of those students entering the program with a B.S. must include at least 24 course credits at the 700 level. The 36 credits required of those students entering the program with an M.S. degree must include at least 12 course credits at the 700 level. In both cases the 700-level courses must include:

GEOL 701 - Research Methods in Geoscience; remaining courses may be at the 600 or 700 level. Although more course work and dissertation credits may be taken, only 12 credits of GEOL 799, and 48 course credits for those entering the program with a B.S. or 24 course credits for those entering the program with an M.S. will be counted toward the degree program.

Doctoral students are encouraged to take courses from outside of geoscience; however, a minimum of 15 credits

must be geoscience (GEOL) courses. A maximum of three credits of Independent Study:

GEOL 793 - Independent Study and Research are permitted, except in special circumstances in which case permission from the doctoral advising committee, the department Graduate Coordinator and the department chair is required.

A dissertation advisor must be chosen by the end of the first semester, and the doctoral advising committee must be appointed prior to the end of the second semester. An approved graduate degree program must be filed prior to the beginning of the third semester of enrollment. Students may request a maximum of 15 graduate credits taken at UNLV prior to admission be included in the graduate degree program, providing those credits were not used to fulfill undergraduate requirements and a grade of B (3.00) or higher was achieved.

A typical Ph.D. student will spend four years completing the required course work and research, and the department and advisor will strive to provide four academic years of support. During this time, the student must be a teaching assistant or instructor for at least one semester. Satisfactory progress toward meeting the degree requirements is required of all candidates. Satisfactory progress is defined as, at a minimum:

1. Maintenance of at least a 3.00 grade point average in all graduate-level courses. Two grades of B- are permitted in the degree program as long as the GPA remains at or above 3.00. One grade of C+ or lower results in academic probation even if the overall GPA is above 3.0. Two grades of C+ or lower will result in automatic suspension from the program.
2. Selecting a dissertation advisor and committee. The advisor must be selected before the end of the first semester and the committee before the end of the second semester.
3. Scheduling of an interview with the advisor either during or before the first semester. If an advisor is not selected, a temporary advisor will be assigned by the graduate coordinator. The purpose of the interview is to develop a plan of course work for the first year.
4. Scheduling of a diagnostic interview with the Advisory Committee before the end of the 2nd semester. The purpose of the interview is to develop a list of recommended courses and design the student's degree program, which must be submitted prior to completing 16 credits of course work toward the degree.
5. Preparation of a dissertation proposal and satisfactory performance on a Proposal Defense Examination. This examination must be completed prior to the end of the third semester. The Proposal Defense Examination focuses on the dissertation proposal and the student's ability to perform the research. It includes a formal oral presentation of the student's dissertation proposal, research to date, and questions by the dissertation advisory committee on the dissertation topic. The

Proposal Defense Examination is to be taken prior to the Comprehensive Examination.

6. Satisfactory performance on the Comprehensive Examination. Ph.D. students must have a basic knowledge of Physical Geology in addition to a comprehensive knowledge of three fields of geosciences (see Department of Geoscience Graduate Student Guidelines for recommended fields for each Ph.D. Emphasis). The format and content of the exam will be determined by the student's doctoral advisory committee with approval of the department graduate coordinator. The Comprehensive Examination will be taken either the semester after all course work is completed or before the end of the fifth semester, whichever comes first. The examination will be oral. In exceptional circumstances, as determined by the student's dissertation committee and the graduate coordinator, the examination will consist of both oral and written components. Students who fail to pass the Comprehensive Examination or Proposal Defense on the first attempt must successfully complete a second examination (as specified by the doctoral advisory committee) within the next six months to remain in the program. Students who entered the program with a baccalaureate degree and who fail the second examination may be allowed to continue as a Master of Science student with the consent of the doctoral advising committee. Students who entered the program with a master's degree who fail the examination a second time will be separated from the program. A student who has successfully passed both the Proposal Defense and Comprehensive Examinations will be admitted to candidacy for the Ph.D. degree.
7. Satisfactory performance on a final examination will consist of the presentation and defense of the dissertation research. The defense will consist of an oral presentation open to the public, a short period of questions from the public, a closed session of questions from the doctoral advising committee, and a closed deliberation and vote by just the advisory committee members. Any graduate faculty member may attend the closed session of questions of the defense.

Geoscience Emphasis M.S. and PhD

Emphasis in Geology

The emphasis in Geology includes the fields of economic geology, environmental geology, geochemistry, geochronology, geomorphology, igneous petrology, paleontology, metamorphic petrology, Quaternary geology, pedology, sedimentology, stratigraphy, structural geology, surficial processes, tectonics, and volcanology. Students must satisfy all of the general degree and admission requirements in addition to those listed below.

Admission requirement in addition to those listed above for the Master of Science and Ph.D. degrees:

1. A bachelor's degree in geology or equivalent. A Master of Science degree in geology or equivalent is recommended for the Ph.D. applicants, but not required.
2. In order to be admitted without contingencies the student must have completed an introductory geology class and six of the following eight classes (or their equivalents): mineralogy, geochemistry, geomorphology, structural geology, igneous and metamorphic petrology, paleontology, field geology, and sedimentology/stratigraphy.

Emphasis in Geophysics

Admission requirements in addition to those listed above for the Master of Science and Ph.D. degrees:

1. A bachelor's degree in geology, engineering, physics or mathematics. A Master of Science degree is recommended for Ph.D. applicants, but not required.
2. To be admitted to the program with a Geophysics emphasis, it is recommended that the student have completed the following courses for unconditional admission to the program.

Mathematics: Three semesters of calculus

Physics: Two semesters of introductory (calculus level) physics

Geology: Physical geology, historical geology, mineralogy, structural geology, sedimentology/stratigraphy, and igneous and metamorphic petrology.

Degree requirements in addition to those listed above for the Master of Science and Ph.D. degrees.

Required Graduate Courses

In addition, each student must take at least three courses from the list below. The remaining credits can be obtained from the list below or other Geoscience graduate-level courses that are appropriate for the course of study.

GEOL 645 - Geophysical Methods

CEE 636 - Engineering Geophysics

ECG 780 - Digital Signal Processing

GEOL 793 - Independent Study and Research

Elective Graduate Courses

GEOL 630 - Geographic Information Systems (GIS):

GEOL 643 - Plate Tectonics

GEOL 644 - Tectonics of Orogenic Belts

GEOL 646 - Geologic Applications in Remote Sensing

GEOL 678 - Hydrogeochemistry

GEOL 688 - Microtechniques in Geoscience

GEOL 716 - Geostatistics

GEOL 744 - Tectonics and Structures

GEOL 745 - Advanced Structural Geology

GEOL 746 - Strain and Microstructural Analysis

GEOL 747 - Geological Evolution of Western North America
 GEOL 770 - Sedimentary Basins
 GEOL 772 - Reflection Seismic Data Interpretation
 GEOL 773 - Seminar in Geophysics
 BIOL 618 - Microbial Ecology
 CEE 634 - Rock Mechanics
 CEE 636 - Engineering Geophysics
 CEE 676 - Earthquake Engineering
 CEE 737 - Soil Dynamics and Earthquake Engineering
 CEE 775 - Seismic Response of Structures

Emphasis in Soil Science

Admission requirements in addition to those listed above for the Master of Science and Ph.D. degrees:

1. A B.S. degree in a Natural Science (or similar field and course work) or B.A. degree in Natural Science (or similar field and course work) with approval of the graduate coordinator. A Master of Science degree is recommended for Ph.D. applicants, but not required.
2. To be admitted to the program with a Soil Science emphasis, it is recommended that the student have completed two of the following courses for unconditional admission to the program: Mineralogy, Geomorphology, Sedimentology/Stratigraphy, or Geochemistry.

Degree requirements in addition to those listed above for the Master of Science and Ph.D. degrees.

Required Graduate Courses

GEOL 610 - Soil Classification and Resource Management
 GEOL 786 - Soils Applications: Paleoclimate, Neotectonics,

Elective Graduate Courses

Remaining credits can be obtained from the list below or other graduate-level courses that are appropriate for the course of study and approved by the student's committee.

GEOL 630 - Geographic Information Systems (GIS):
 GEOL 646 - Geologic Applications in Remote Sensing
 GEOL 712 - Watershed Hydrology
 GEOL 716 - Geostatistics
 GEOL 719 - Vadose Zone Hydrology
 GEOL 735 - Seminar in Environmental Geology
 GEOL 740 - Arid Zone Soils
 GEOL 744 - Tectonics and Structures
 BIOL 745 - Arid Zone Soils
 GEOL 760 - Advanced Spatial Modeling with GIS
 GEOL 770 - Sedimentary Basins
 GEOL 776 - Paleosols Records of Past Landscapes
 GEOL 688 - Microtechniques in Geoscience
 BIOL 618 - Microbial Ecology

Emphasis in Hydrogeology

Admission requirements in addition to those listed above for the Master of Science and Ph.D. degrees:

1. B.S. or master's degree in geology or a related discipline (e.g., civil engineering). A Master of Science degree is recommended for Ph.D. applicants, but not required.
2. To be admitted to the program with a hydrogeology emphasis, it is required that the student have completed four of the following courses (or their equivalents) for unconditional admission to the program:

GEOL 474 Hydrogeology
 GEOL 330 Geochemistry
 GEOL 333 Geomorphology
 GEOL 341 Structural Geology
 GEOL 348 Field Geology
 GEOL 462 Stratigraphy and Sedimentology

Degree requirements in addition to those listed above for the Master of Science and Ph.D. degrees.

Elective Graduate Courses

Course credits can be obtained from the list below or other graduate level courses that are appropriate for the course of study and approved by the student's committee.

GEOL 630 - Geographic Information Systems (GIS):
 Theory and Applications
 GEOL 646 - Geologic Applications in Remote Sensing
 GEOL 674 - Hydrogeology
 GEOL 678 - Hydrogeochemistry
 GEOL 709 - Field Methods in Hydrogeology
 GEOL 711 - Principles of Hydrology and Hydraulics
 GEOL 712 - Watershed Hydrology
 GEOL 715 - Advanced Hydrogeology
 GEOL 716 - Geostatistics
 GEOL 719 - Vadose Zone Hydrology
 GEOL 740 - Arid Zone Soils
 GEOL 744 - Tectonics and Structures
 GEOL 760 - Advanced Spatial Modeling with GIS
 GEOL 765 - Seminar in Stratigraphy
 GEOL 785 - Seminar in Sedimentology
 GEOL 792 - Seminar in Hydroscience

Course Descriptions

GEOG 621 - Climatology

Credits 3

Physical characteristics of the atmosphere. World climatic classification. Local atmospheric field study. **Prerequisites:** GEOG 103 or consent of instructor.

GEOL 610 - Soil Classification and Resource Management
 GEOL 620 - Introduction to X-ray Diffraction and X-ray Spectrometry Methods
 GEOL 629 - Geochemical Thermodynamics and Kinetics
 GEOL 630 - Geographic Information Systems (GIS):
 Theory and Applications

GEOL 633 - Glacial and Periglacial Geology
GEOL 634 - Quaternary Geology
GEOL 636 - Quaternary Paleocology
GEOL 637 - Paleoclimatology
GEOL 640 - Volcanology
GEOL 643 - Plate Tectonics
GEOL 644 - Tectonics of Orogenic Belts
GEOL 645 - Geophysical Methods
GEOL 645L - Geophysical Methods Lab
GEOL 646 - Geologic Applications in Remote Sensing
GEOL 646L - Geologic Applications in Remote Sensing Lab
GEOL 649 - Geochronology
GEOL 671 - Petroleum Geology
GEOL 674 - Hydrogeology
GEOL 677 - Geology of Metallic Ore Deposits
GEOL 678 - Hydrogeochemistry
GEOL 685 - Engineering Geology
GEOL 688 - Microtechniques in Geoscience

Note: Graduate credit may be obtained for courses designated 600 or above. A full description of this course may be found in the Undergraduate Catalog under the corresponding 400 number. Notes: Credit at the 600-level normally requires additional work.

GEOL 701 - Research Methods in Geoscience

Credits 3

Discussion of the processes of scientific research and research design as applied to modern geoscience. Includes scientific approaches to field and laboratory research, research and professional ethics, writing, and public presentation. Model thesis prospectus and grant proposals prepared. Notes: Required weekend field trips familiarize students with the local geology. **Prerequisites:** Graduate standing or consent of instructor.

GEOL 707 - Stable Isotope Geochemistry

Credits 3

Investigates stable isotopes in the hydrologic and geologic cycles, and their use as tracers in paleoclimatology, hydrogeology, and oceanography. Theory and research applications of stable isotopes in geologic, biologic, water, and atmospheric samples, including carbon, oxygen, hydrogen, nitrogen, strontium, and sulfur isotopes.

Prerequisites: Geochemistry.

GEOL 708 - Radiogenic Isotope Geochemistry

Credits 3

Principles of radiogenic isotope geochemistry as a monitor of geochemical processes in the mantle, lithosphere and hydrosphere; applications to petrology, tectonics, economic geology, marine geology and paleoclimatology.

Prerequisites: GEOL 330, GEOL 426, MATH 181 or equivalent, or consent of instructor.

GEOL 709 - Field Methods in Hydrogeology

Credits 3

A survey of techniques used to investigate field problems in hydrogeology. Data collection, analysis, and professional presentation of results are emphasized. Topics may include: water balance measures, water table mapping, estimation of hydraulic parameters, and ground-water monitoring. Additional topics suggested by students may also be explored.

GEOL 710 - Igneous Petrology

Credits 4

Origin of igneous rocks, relation of magma types to tectonic settings, physical properties of magmas, application of trace elements and isotopes to petrogenesis, modeling of crystal fractionation and partial melting, phase diagrams. Notes: Six hours laboratory. **Prerequisites:** GEOL 325 or equivalent or consent of instructor.

GEOL 711 - Principles of Hydrology and Hydraulics

Credits 3

Consideration of modern concepts of hydrology and hydraulics. Includes coverage of statistical methods of analysis, unsteady flow, channel design, modeling and simulation, urban hydrology, and design of hydraulic structures. **Prerequisites:** Consent of instructor.

GEOL 712 - Watershed Hydrology

Credits 3

Concepts and processes controlling water movement and distribution within the watershed; analysis techniques for understanding watershed dynamics; numerical simulation of various watershed-scale hydrologic processes.

Prerequisites: Consent of instructor.

GEOL 713 - Flow and Transport in Unsaturated Fractured Media

Credits 3

Explores the current state of understanding regarding fluid flow and contaminant transport in unsaturated fractured geologic media (e.g., rock, soil) through review of recent literature. Competing conceptual models are contrasted in light of existing capabilities for numerical simulation at the scale of pertinent applied problems.

GEOL 715 - Advanced Hydrogeology

Credits 4

Advanced concepts used in ground water investigations, including flow system analysis, resource evaluation, exploration, development, and monitoring. **Prerequisites:** GEOL 674

GEOL 716 - Geostatistics

Credits 3

Analysis of the spatial and temporal variations in geologic, hydrologic and geochemical data, including derived

distributions, time series analysis, correlation and spectral analysis, interpolation techniques, cluster analysis and sensitivity and uncertainty techniques. **Prerequisites:** STA 491 or 691 (or equivalent) or consent of instructor.

GEOL 719 - Vadose Zone Hydrology

Credits 3

Basic physical properties of soils and water and the physical principles governing the soil-water system. Modeling the transport of moisture and chemicals in unsaturated soil with applications to practical field problems.

Prerequisites: GEOL 674

GEOL 720 - Advanced Geochemistry

Credits 4

Contemporary geochemistry applied to igneous, metamorphic, and sedimentary rocks, economic mineral deposits, and problems of the origin of the Earth and other terrestrial planets. Notes: Six hours laboratory.

Prerequisites: Graduate standing or consent of instructor.

GEOL 725 - Seminar in Petrology

Credits 3

Analysis of current problems, concepts, and research in petrology and closely related fields. **Prerequisites:** Graduate standing or consent of instructor.

GEOL 727 - Metamorphic Petrology

Credits 4

Application of field studies, petrography, mineralogy, phase equilibria, and isotopic methods to the study of metamorphic rocks and crustal evolution; explores relationships among metamorphism, tectonics and thermal evolution of the crust. Notes: Three hours lecture, three hours laboratory. **Prerequisites:** GEOL 429/629 or equivalent and graduate standing, or consent of instructor.

GEOL 730 - Seminar in Quaternary Studies

Credits 3

Evaluation of current methodology focused on solving problems of Quaternary chronology, geomorphic processes, and environmental reconstruction. Emphasis on pluvial and post-pluvial environments of the western United States, the evolution of landforms and the development of stratigraphic units and surficial geology originating during the past three million years. **Prerequisites:** Graduate standing or consent of instructor.

GEOL 735 - Seminar in Environmental Geology

Credits 3

Application of basic geologic concepts to environmental problems: emphasis on geologic hazards, waste disposal, urban planning, resource policy issues, and environmental programs. **Prerequisites:** GEOL 672 or equivalent or consent of instructor.

GEOL 740 - Arid Zone Soils

Credits 3

The role soils have in the soil-plant-atmospheric continuum of arid regions, influence of arid zone soils on all aspects of plant growth and development, influence of soil forming factors on the development of arid soils. Same as (BIO 745) **Prerequisites:** Consent of instructor.

GEOL 742 - Seminar in Volcanology

Credits 3

Analysis of current problems, concepts, and research in volcanology and closely related fields. **Prerequisites:** Graduate standing or consent of instructor.

GEOL 743 - Seminar in Planetary Geology

Credits 3

Analysis of current problems, concepts, and research in planetary geology with emphasis on newly available data.

Prerequisites: Graduate standing or consent of instructor.

GEOL 744 - Tectonics and Structures

Credits 3

Analysis of upper crustal deformation with emphasis on faulting, neotectonics and seismic interpretation; includes a group research project with field and literature data collection, analysis and results suitable for presentation at a professional conference. **Prerequisites:** Prerequisites Consent of instructor.

GEOL 745 - Advanced Structural Geology

Credits 3

Analysis of deformation of the Earth's crust with emphasis on deformation mechanisms operative in rocks at different crustal levels; the geometry, kinematics, and dynamics of common geological structural associations, and mechanism and styles of deformation in orogenic belts. Notes: Three hours lecture per week. **Prerequisites:** GEOL 341 and GEOL 349.

GEOL 746 - Strain and Microstructural Analysis

Credits 4

Examination of the principles and techniques of finite and incremental strain analysis and their application to naturally deformed rocks. Investigation of plastic deformation processes and deformation mechanisms, and recognition and interpretation of microstructures developed during deformation. Notes: Three hours lecture, three hours laboratory. **Prerequisites:** GEOL 341 or consent of instructor.

GEOL 747 - Geological Evolution of Western North America

Credits 3

Study of the geological evolution of western North America. Emphasis on the stratigraphic, structural, and tectonic development of the continent within the framework of plate

tectonics. Notes: Three hours lecture per week.

Prerequisites: GEOL 223, GEOL 341, GEOL 462.

GEOL 749 - Advanced Geochronology and Thermochronology

Credits 3

Detailed discussion of isotopic dating of rocks with application to geologic problems. Diffusion theory and reconstruction of thermal histories of rocks. Includes surface exposure dating using cosmogenic isotopes, study of uranium series disequilibrium, luminescence, electron spin resonance, and ¹⁴C dating. **Prerequisites:** GEOL 426

GEOL 750 - Seminar in Paleobiology

Credits 3

Fossil record as a tool for understanding evolutionary processes, early history of life, eruptive radiation, mass extinction, macroevolution, and origin of higher taxation

Prerequisites: Graduate standing in geology or biology or consent of instructor.

GEOL 755 - Seminar in Paleontology

Credits 3

Special topics of current interest in paleontology, with emphasis on Great Basin fossil faunas. **Prerequisites:** Graduate standing in geology or biology or consent of instructor.

GEOL 760 - Advanced Spatial Modeling with GIS

Credits 4

Advanced study in computer-based techniques for storage, retrieval, analysis, and representation of spatially referenced data. Emphasis on development of spatially distributed models in the geosciences using Geographic Information System (GIS) technology. Students required to develop system models in their chosen thesis area. Notes:

Three hours lecture and three hours lab. **Prerequisites:** GEOL 430 or GEOL 630.

GEOL 762 - Geological Applications of Computers

Credits 3

Use of computer algorithms to solve geological problems, geostatistics, modeling of geological processes.

Prerequisites: Graduate standing and CS 116 and 169.

GEOL 765 - Seminar in Stratigraphy

Credits 3

Special topics in stratigraphy with emphasis on southern Nevada and adjacent regions. **Prerequisites:** Graduate standing or consent of instructor.

GEOL 766 - Earth Systems Change

Credits 3

Investigate long-term and short-term global climate changes, ocean redox evolution, and their impacts on biospheric innovations. Explore interactions between Earth's

sub spheres (lithosphere, hydrosphere, atmosphere, and biosphere) during times of extreme environmental changes in Earth history and testing methods and techniques for such interactions. **Prerequisites:** Graduate standing or consent of instructor.

GEOL 770 - Sedimentary Basins

Credits 3

Analysis of current ideas concerning the plate tectonic setting and evolution of sedimentary basins. Emphasis on characteristic styles of basin sedimentation and resulting stratigraphic framework, provenance of basin fill, chronologic relationship of tectonic events and sedimentation, and methods of basin analysis.

Prerequisites: Graduate standing or consent of instructor.

GEOL 772 - Reflection Seismic Data Interpretation

Credits 4

Fundamentals of geologic interpretation using seismic reflection data. Introduction to seismic data acquisition and processing. Interpretation techniques include well log to seismicities, contour maps and time-to depth conversion.

Interpretation of data from different structural settings, seismic stratigraphy, and 3-D seismic interpretation. Notes: Three hour lecture and three hour lab. **Prerequisites:** Graduate standing or consent of instructor.

GEOL 772L - Reflection Seismic Data Interpretation Laboratory

Credits 0

Lab course designed to supplement the lecture course. Interpretations of several structural regimes, structure contour maps, correlation using well logs, creation of synthetics, and the interpretation of a 3-D seismic data set.

Prerequisites: Graduate standing or consent of instructor.

GEOL 773 - Seminar in Geophysics

Credits 1 – 3

Specialized topics in geophysics with an emphasis on current analysis techniques and problems. **Prerequisites:** Graduate standing or consent of instructor.

GEOL 775 - Seminar in Economic Geology

Credits 3

Analysis of current problems, concepts and research in economic geology and closely related fields. **Prerequisites:** GEOL 677 or equivalent or consent of instructor.

GEOL 776 - Paleosols Records of Past Landscapes

Credits 3

Recognition and analysis of soil horizons preserved in the rock record. Use of paleosols for reconstructing paleoclimates, tectonics, depositional environments, and other aspects of geologic history. **Prerequisites:** Graduate standing and GEOL 462 (or equivalent) or consent of instructor.

GEOL 777 - Instrumental Techniques in Geology

Credits 3

Use of modern instrumentation to acquire geological and geochemical data. Includes, but not limited to, the practical application of x-ray diffraction and fluorescence and atomic absorption spectrophotometry. Notes: Six hours laboratory.

Prerequisites: Graduate standing or consent of instructor.

GEOL 779 - Theory of Ore Deposition

Credits 3

Study of physical and chemical processes which contribute to metal solubility, transport, and precipitation. Includes fundamental geochemical and thermodynamic concepts as they apply to ore and gangue mineral stability under various geologic conditions. **Prerequisites:** GEOL 426 and GEOL 477.

GEOL 780 - Terrigenous Depositional Systems

Credits 3

Examination of modern nonmarine and marine depositional environments dominated by terrigenous sediments, processes that operate in these settings, and responses of sediment to processes. Establish criteria for recognizing these environments and processes in ancient terrigenous sequences. **Prerequisites:** Graduate standing and GEOL 462 or consent of instructor.

GEOL 781 - Carbonate Depositional Systems

Credits 3

Examination of modern non-marine and marine depositional environments dominated by carbonate sediments, organisms that produce sediments, processes that operate in these settings, and responses of sediment to the processes. Establish criteria for recognizing these environments and processes in ancient carbonate sequences. **Prerequisites:** Graduate standing and GEOL 462 or consent of instructor.

GEOL 782 - Sandstone Petrology

Credits 4

Description, classification, and interpretation of terrigenous sedimentary rocks. Emphasis on petrographic methods applied to sandstones and interpretation of provenance of sedimentary sequences. **Prerequisites:** GEOL 780 (corequisite) or consent of instructor.

GEOL 783 - Carbonate Petrology

Credits 4

Study of the physical and chemical factors important in the genesis and diagenesis of carbonate sediments and rocks. Various analytical techniques covered, with emphasis on thin section petrography for deciphering rock components and diagenesis. **Prerequisites:** GEOL 781 (corequisite) or consent of instructor.

GEOL 785 - Seminar in Sedimentology

Credits 1 – 4

Analysis of current problems, concepts, and research in sedimentary geology and related fields. Emphasis may be upon the genesis and diagenesis of specific sedimentary sequences or upon particular depositional or diagenetic environments. **Prerequisites:** Graduate standing and either GEOL 780 or GEOL 781, or consent of instructor.

GEOL 786 - Soils Applications: Paleoclimate, Neotectonics, Archeology

Credits 3

Special topics of current interest in soil science with emphasis on the use of soils for applications in geomorphology, paleoclimate, neotectonics, and/or archeology. **Prerequisites:** Graduate standing in geology, biology, anthropology, or consent of instructor.

GEOL 787 - Thesis Research

Credits 1 – 6

Supervised research prior to approval of master's program prospectus. Notes: May be repeated to a maximum of six credits, but only one credit can be applied to the student's program. Grading S/F grading only. **Prerequisites:** Enrollment in the M.S. Program.

GEOL 789 - Dissertation Research

Credits 1 – 6

Supervised research prior to advancement to candidacy in the doctoral program. Notes: May be repeated, but only two credits can be applied to the student's program. Grading S/F grading only. **Prerequisites:** Enrollment in the doctoral program.

GEOL 792 - Seminar in Hydrosience

Credits 1 – 3

Specialized topics in hydrosience.

GEOL 793 - Independent Study and Research

Credits 1 – 3

Independent study and research projects in some field of geology. Proposed project for study must be submitted in writing to the graduate program coordinator and the department chair for approval and credit evaluation at least two weeks prior to registration. Notes: May be repeated for credit, but only three credits are permitted per instructor unless special permission is received. **Prerequisites:** Consent of instructor.

GEOL 794 - Directed Readings

Credits 1 – 3

Supervised readings on special topics in consultation with a geoscience graduate faculty member. Notes: May be repeated to a maximum of six credits. Requires consent of student's academic adviser. Grading S/F grading only. **Prerequisites:** Admission to Geoscience Ph.D. program; Consent of instructor.

GEOL 795 - Poster Presentation and Time Management

Credits 1

Presentation of geological information in poster format and time management skills. Poster presentation includes layout and design, focus, data versus interpretation, computer graphics, verbal presentation and referencing. Time management issues include scheduling, planning, organization, and productivity. Notes: Should be taken during first or second semester of graduate program.

Prerequisites: Graduate standing in Geoscience.

GEOL 796 - Advanced Topics in Geoscience

Credits 1 – 3

Variety of advanced studies of current and/or topical interest in specialized areas of geoscience. Notes: May be repeated to a maximum of six credits. **Prerequisites:** Varies, depending upon the specific topic.

GEOL 797 - Thesis

Credits 1 – 6

Notes: May be repeated, but only six credits applied to the student's program. Grading S/F grading only. **Prerequisites:** Graduate standing and consent of instructor.

GEOL 799 - Dissertation

Credits 3 – 6

Research analysis and writing toward completion of dissertation and subsequent defense. Notes: Twelve credits are required for the degree, may be repeated, but only twelve credits will be applied to the student's degree program. May be repeated but only a maximum of 12 credits may be used in student's degree program. Grading S/F grade

Prerequisites: Successful completion of qualifying examination and approval by department.

School of Life Sciences

Director

Bazylinski, Dennis A.

(2006), Professor; Ph.D., University of New Hampshire, Durham.

Graduate Coordinator

Andres, Andrew J.

(2002), Associate Professor; Ph.D., Indiana University, Bloomington.

Graduate Faculty

de Belle, J. Steven

(1997), Associate Professor; Ph.D., York University, Toronto, Canada.

Devitt, Dale A.

(2005), Professor; Ph.D., University of California, Riverside.

Elekonich, Michelle M.

(2003), Associate Professor; Ph.D., University of Washington, Seattle.

Gibbs, Allen G.

(2005), Associate Professor; University of California, San Diego.

Hedlund, Brian P.

(2003), Associate Professor; Ph.D., University of Washington, Seattle.

Lee, David V.

(2007), Assistant Professor; Ph.D., University of Utah.

Meacham, Susan L.

(1998), Associate Professor; Virginia Polytechnic and State University, Blacksburg.

Reiber, Carl L.

(1993), Professor; Ph.D., University of Massachusetts, Amherst.

Riddle, Brett R.

(1990), Professor; Ph.D., University of New Mexico, Albuquerque.

Robleto, Eduardo A.

(2002), Associate Professor; Ph.D., University of Wisconsin, Madison.

Rodríguez-Robles, Javier A.

(2002), Associate Professor; University of California, Berkeley.

Schulte, Paul J.

(1990), Associate Professor; Ph.D., University of Washington, Seattle.

Shen, Jeffery Q.

(2000), Associate Professor; Ph.D., Washington University, St. Louis.

Smith, Stanley D.

(1985), Professor; Ph.D., Arizona State University, Tempe.

Stark, Lloyd R.

(1999), Associate Professor; Ph.D., Pennsylvania State University, University Park.

Starkweather, Peter L.

(1978), Professor; Dartmouth College, Hanover, New Hampshire.

Thompson, Daniel B.

(1990), Associate Professor; Ph.D., University of Arizona, Tucson.

van Breukelen, Frank

(2002), Associate Professor; Ph.D., University of Colorado, Boulder.

Walker, Lawrence R.

(1992), Professor; Ph.D., University of Alaska, Fairbanks.

Wing, Helen J.

(2005), Assistant Professor; Ph.D., University of Birmingham, Edgbaston, United Kingdom.

Professors Emeriti

Babero, Bert B.

(1965-1987), Emeritus Professor; Ph.D., University of Illinois.

Deacon, James E.

(1960-2002), Emeritus Distinguished Professor; Ph.D., University of Kansas, Lawrence.

Murvosh, Chad M.

(1964-1992), Emeritus Professor; Ph.D., Ohio State University, Columbus.

Niles, Wesley E.

(1968-2002), Emeritus Professor; Ph.D., University of Arizona, Tucson.

Yousef, Mohamed K.

(1968-1994), Emeritus Distinguished Professor; Ph.D., University of Missouri.

The School of Life Sciences (SoLS) offers programs of studies leading to the Master of Science and Doctor of Philosophy degrees. Each degree requires a research thesis (M.S.) or dissertation (Ph.D.). Research leading to the M.S. and Ph.D. degrees may be conducted in one or more of the following fields: cellular and molecular biology; genetics; microbiology; physiology; population, community, and ecosystem ecology; evolutionary biology; systematics; and biogeography. The School has well-equipped laboratories to support faculty and graduate student research. These facilities are enhanced through access to a number of specialized scientific resources, including the Nevada Genomics Center and SoLS DNA Sequencing Facility (which house state-of-the-art equipment that includes an RTPCR machine, an Amersham Typhoon imager, a microarray printer, hybridization capacity and scanner, and a DNA capillary sequencer); the Nevada Center for Biological Imaging (which houses a Zeiss LSM-510 confocal laser scanning microscopy system mounted on either upright or inverted Zeiss microscope bodies); the Ecophysiological Research facility (which includes a greenhouse designed to support experiments at elevated levels of carbon dioxide); an AAALAC-accredited animal care facility; and regional natural history collections, including those of the Wesley E. Niles Herbarium and the Marjorie Barrick Museum. Investigators from the Nevada System of Higher Education's Desert Research Institute also contribute to our graduate program. Numerous funding opportunities are available through state-funded graduate assistant programs via statewide initiatives or in association with individual faculty research programs. Prospective students should make contact with one or more faculty members to familiarize themselves with their current research interests, opportunities for conducting research projects, and funding availability. A list of faculty research interests and admission materials are available on-line at the School's web site.

Admission Requirements to the M.S. and Ph.D. Programs in the School of Life Sciences

1. A baccalaureate (B.S., B.A.) degree in biological sciences or its equivalent.
 2. A minimum grade point average (GPA) of 3.00 (on a 4.00 scale) for all undergraduate work.
 3. Satisfactory scores on the General Graduate Record Examination (GRE). Successful applicants to the program generally have scores among the upper 50th percentile of examinees taking the GRE.
 4. Letters of recommendation (two letters for the M.S. Program; three letters for the Ph.D. Program) from individuals familiar with the applicant's academic record and potential for advanced study in the biological sciences.
 5. A written statement that includes:
 - a. summary of research interests
 - b. reason(s) for wishing to earn an advanced degree
 - c. motivation for attending UNLV
 - d. possible faculty mentors
 6. Submission of official transcripts of all colleges and universities attended.
 7. Submission of a completed application form and payment of fees required by the Graduate College.
 8. All international students whose first language is not English or who have not received baccalaureate or Master's degrees from an institution in which the language of instruction is English must take the TOEFL (Test of English as a Foreign Language) examination.
- For details regarding application deadlines and the application review process, see the School of Life Sciences' Graduate Student Handbook, which is available at <http://sols.unlv.edu/gradhandbook.html>.

Biological Sciences M.S.

Degree Requirements

Specific degree requirements, including those listed below, are described in detail in the School of Life Sciences' on-line Graduate Student Handbook <http://sols.unlv.edu/gradhandbook.html>.

1. Master's students are required to complete a minimum of 30 credit hours beyond their undergraduate degree. At least 18 of these hours must be completed at the 700-level. All students must take:
BIOL 701 - Ethics in Scientific Research, preferably during their first year in residence. All students must also take at least six (6) credits of:
BIOL 796 A-D - Graduate Seminar and at least six (6) credits of:
BIOL 797 - Thesis during their residency in the Program.
2. In addition to the aforementioned general requirements, students must complete the specific course work required by the Section (e.g., Ecology and Evolutionary Biology, Cell and Molecular Biology, Microbiology, and Integrative Physiology) to which they belong. See SoLS's Graduate Student Handbook

<http://sols.unlv.edu/gradhandbook.html> for specific requirements.

3. Students may request a maximum of 15 graduate credits taken at UNLV prior to admission into SoLS's Graduate Program to be counted towards the 30 credit hour minimum graduation requirement, provided that those credits were not used to fulfill undergraduate requirements and that a minimum grade of "B" (3.00) was earned in each course.
4. At least 50 percent of the total credits required to complete the Master's degree must be earned at UNLV after admission into the Graduate Program.
5. Students should register for at least nine (9) credits each semester if they are receiving financial support from SoLS; otherwise they must register for at least six (6) credits each semester. Students working on their thesis must register for at least three (3) credits each semester (excluding summer) until the Master's Thesis is completed and given final approval.
6. Students must confer with their Thesis Advisor prior to enrollment in their first semester. The Advisor will assist with designing an initial graduate degree program (i.e., an outline of the courses that the student will complete for the degree), engage in discussions about possible research directions, and introduce the student to the personnel and resources of the School of Life Sciences.
7. Students must form an Advisory Committee before the end of their first semester in the Graduate Program. This Committee will be composed by the Thesis Advisor (who will serve as the Committee Chair), two members of SoLS's Graduate Faculty, and a Graduate Faculty Representative from UNLV (but outside of SoLS).
8. Students must meet with their Advisory Committee at least once every year (i.e., from January to October), and a written report of this meeting must be submitted to SoLS's Graduate Operations Committee by November 1.
9. The Advisory Committee will review the student's past academic background and, taking into consideration the student's research interests, determine his/her definitive graduate degree program.
10. Students must comply with the deadlines indicated in SoLS's Graduate Student Handbook <http://sols.unlv.edu/gradhandbook.html> for submitting required paperwork to the Graduate College.
11. A student will be placed on academic probation if a minimum 3.00 grade point average is not maintained in all work taken as part of the graduate degree program. A grade of "C" or less in two graduate-level classes will cause a student to be placed on academic probation.
12. The M.S. candidate will present a seminar on his/her thesis work that is open to all interested parties, including the general public. This public seminar will be widely advertised at least seven (7) days before it

takes place, and will be followed by an oral defense of the thesis research before the Advisory Committee and any other Graduate Faculty member who wishes to attend.

13. Students are expected to complete all the requirements for the Master's degree in 2-3 years.

Master's students may be withdrawn from the Program and separated from the Graduate College if they fail to fulfill any of the requirements for the degree within the specified timeline. See SoLS's Graduate Student Handbook <http://sols.unlv.edu/gradhandbook.html> for specific requirements.

Biological Sciences Ph.D.

Degree Requirements

Specific degree requirements, including those listed below, are described in detail in the School of Life Sciences' on-line Graduate Student Handbook <http://sols.unlv.edu/current.html>.

1. Doctoral students are required to complete a minimum of 60 credit hours beyond their undergraduate degree, unless they are entering the program with a master's degree from another institution (see below). At least 36 of these hours (18 for a student with an awarded M.S. degree) must be completed at the 700-level. All students are expected to take:
BIOL 701 - Ethics in Scientific Research, preferably during their first year in residence. All students must also take at least six (6) credits of:
BIOL 796 A-D - Graduate Seminar and at least six (6) credits of:
BIOL 799 - Dissertation during their residency in the Program. BIOL 799 may be repeated for credit as needed, but only 18 credits may be counted towards the 60 credit hour minimum graduation requirement.
2. In addition to the aforementioned general requirements, students must complete the specific course work required by the Section (e.g., Ecology and Evolutionary Biology, Cell and Molecular Biology, Microbiology, and Integrative Physiology) to which they belong. See SoLS's Graduate Student Handbook <http://sols.unlv.edu/current.html> for specific requirements.
3. Students may request a maximum of 15 graduate credits taken at UNLV prior to admission into SoLS's Graduate Program to be counted towards the 30 credit hour minimum graduation requirement, provided that those credits were not used to fulfill undergraduate requirements and that a minimum grade of "B" (3.00) was earned in each course.
4. Students entering the Doctoral Program with an M.S. degree from another institution must complete at least 30 credit hours at UNLV. The reduction from the 60-

credit minimum will only occur if course work completed for the M.S. degree is relevant to the student's doctoral degree, and as such the completed work must be unanimously approved by the student's research advisory committee for the reduction to be granted. No Thesis or Dissertation units can be applied toward the reduction of the 60-credit minimum.

5. Students should register for at least nine (9) credits each semester if they are receiving financial support from the School; otherwise they must register for at least six (6) credits each semester. Students working on their dissertation must register for at least three (3) credits each semester (excluding summer) until the Dissertation is completed and given final approval.
6. Students must confer with their Dissertation Advisor prior to enrollment in their first semester. The Advisor will assist with designing an initial graduate degree program (i.e., an outline of the courses that the student will complete for the degree), engage in discussions about possible research directions, and introduce the student to the personnel and resources of the School of Life Sciences.
7. The student must form an Advisory Committee before the end of his/her first semester in the Graduate Program. This Committee will be composed by the Dissertation Advisor (who will serve as the Committee Chair), two members of SoLS's Graduate Faculty, and a Graduate Faculty Representative from UNLV (outside of SoLS). Students are encouraged to include a fifth Committee member who is an expert on the student's field of research. This fifth Committee member can have an academic affiliation outside of UNLV.
8. Students must meet with their Advisory Committee at least once every year (i.e., from January to October), and a written report of this meeting must be submitted to SoLS's Graduate Operations Committee by November 1.
9. The Advisory Committee will review the student's past academic background and, taking into consideration the student's research interests, determine his/her definitive graduate degree program.
10. Students must comply with the deadlines indicated in SoLS's Graduate Student Handbook <http://sols.unlv.edu/current.html> for submitting required paperwork to the Graduate College.
11. Students must take the comprehensive examination before the end of their fifth semester of residency in the Graduate Program. The exam must be held at least three (3) weeks before the last day of instruction of any given term. The exam will include both a written and an oral component, and will assess whether the student has reached the appropriate level of knowledge and analytical skills necessary for his/her field of study. The examination is developed or administered by the Doctoral Advisory Committee or an ad hoc Committee composed of Graduate Faculty within the Section to which the student belongs. See SoLS's Graduate

Student Handbook <http://sols.unlv.edu/current.html> for information on the possible outcomes of the exam. Students who fail to pass the exam within the specified timeline will be withdrawn from the Program and separated from the Graduate College.

12. Doctoral students are advanced to candidacy after passing their comprehensive examination and successfully completing a minimum of 36 credits required by the Section to which they belong. Specific curricular requirements for each SoLS Section are described in detail in SoLS's Graduate Student Handbook <http://sols.unlv.edu/current.html>.
13. Each doctoral student should teach for a minimum of two semesters in the undergraduate curriculum of the School of Life Sciences. During that time the student will receive a Graduate Teaching Assistantship.
14. A student will be placed on academic probation if a minimum 3.00 grade point average is not maintained in all work taken as part of the graduate degree program. A grade of "C" or less in two graduate-level classes will cause a student to be placed on academic probation.
15. The Ph.D. candidate will present a seminar on his/her dissertation work that is open to all interested parties, including the general public. This public seminar will be widely advertised at least seven (7) days before it takes place, and will be followed by an oral defense of the dissertation research before the Advisory Committee and any other Graduate Faculty member who wishes to attend.
16. Students are expected to complete all the requirements for the Ph.D. degree in 5-6 years.

Doctoral students may be withdrawn from the Program and separated from the Graduate College if they fail to fulfill any of the requirements for their degree within the specified timeline. See SoLS's Graduate Student Handbook <http://sols.unlv.edu/current.html> for specific requirements.

Course Descriptions

BIOL 604 - Principles of Neurobiology
BIOL 607 - Molecular Biology
BIOL 609 - Virology
BIOL 611 - Molecular Evolution
BIOL 618 - Microbial Ecology
BIOL 622 - Taxonomy of Vascular Plants
BIOL 625 - Genomics
BIOL 626 - Plant Anatomy
BIOL 631 - Ichthyology
BIOL 632 - Herpetology
BIOL 633 - Ornithology
BIOL 634 - Mammalogy
BIOL 641 - Field Ecology
BIOL 642 - Principles of Plant Physiology
BIOL 644 - Principles of Plant Ecology
BIOL 645 - Cell Physiology

BIOL 647 - Comparative Animal Physiology
BIOL 648 - Endocrinology
BIOL 653 - Immunology
BIOL 660 - Microbial Physiology
BIOL 664 - Bacterial Pathogenesis
BIOL 665 - Vertebrate Embryology
BIOL 668 - Histology
BIOL 670 - Topics in Applied Microbiology
BIOL 671 - Aquatic Ecology
BIOL 672 - Limnology
BIOL 680 - Introduction to Biological Modeling
BIOL 685 - Microbial Genetics
BIOL 687 - Principles of Systematics
BIOL 689 - Developmental Genetics
BIOL 690 - Biogeography

Note: Graduate credit may be obtained for courses designated 600 or above. A full description of this course may be found in the Undergraduate Catalog under the corresponding 400 number. Notes: Credit at the 600 level normally requires additional work.

BIOL 701 - Ethics in Scientific Research

Credits 1

Examination of ethical problems in scientific research, including the falsification and manipulation of data, public access and peer review, and decisions concerning research problems and support. **Prerequisites:** Graduate standing.

BIOL 703 - Biochemical Genetics

Credits 3

Detailed study of the structure of nucleic acids and the molecular genetic mechanisms of replication, transcription, and induction and repression of genetic information. Biochemical genetics of gene transfer. **Prerequisites:** BIO 300 and CHEM 471.

BIOL 705 - Secondary Education: Teaching Evolution and the Nature of Science

Credits 1 – 3

Focus on Science and Creationism and hands-on activities and inquiry-based computer simulations that can be used in classrooms to illustrate evolutionary principles. Workshop taught using scientific methods so educators are well-versed in methods of evolutionary study and principles. Notes: Follow up sessions explore implementations of lessons from workshop.

BIOL 711 - Advanced Eukaryotic Genetics

Credits 3

Focuses on the biology and genetics of common model organisms: *C. elegans*, *Drosophila*, *Arabidopsis*, Zebrafish, and mouse, and their relationship to the biology of human health and agriculture. The goal is help students understand current research topics in functional genetics and genome manipulation. **Prerequisites:** Consent of instructor.

BIOL 714 - Population Genetics

Credits 3

Examines the interactions of evolutionary processes, such as natural selection, genetic drift, gene flow, and mutation, and effects of these interactions on population differentiation, speciation, and extinction. Theoretical and empirical approaches to the study of DNA substitutions and quantitative genetic change addressed. **Prerequisites:** MATH 181 and BIO 310 or consent of instructor.

BIOL 722 - Advanced Taxonomy of Vascular Plants

Credits 3

Identification, classification, and evolutionary relationships of the subfamilies and tribes of the composite, legume, and grass families. Notes: Three hours laboratory.

Prerequisites: BIO 422

BIOL 730A-D - Special Lectures in Life Sciences

Credits 3

Reserved for formal didactic classes with varying special current topics in different disciplines of life sciences. Lettering system reflects focus on topics specific for each Section within Life Sciences (A = Ecology and Evolution, B = Organismal Physiology, C = Cell and Molecular Biology, D = Microbiology). Notes: May be repeated to a maximum of nine credits. **Prerequisites:** Consent of instructor.

BIOL 742 - Topics in Advanced Plant Physiology

Credits 2

Advanced treatment of current topics in plant physiology. Topics for consideration selected from one of the three following major subject areas: (a) Water relations, ion balance, and mineral nutrition; (b) Photosynthesis, intermediary metabolism, and plant growth; and (c) Stress physiology. Instructor and students decide which area covered during a given semester. Notes: May be repeated to a maximum of six credits. **Prerequisites:** BIO 442

BIOL 743 - Ecological Plant Physiology

Credits 3

Examination of the physiological responses and adaptations of terrestrial plants to their environment. Primary topics covered include microclimate analysis, water relations, gas exchange, nutrient relations, and adaptations to stress. Adaptations of plants from contrasting physical environments emphasized. **Prerequisites:** BIO 340 and BIO 442.

BIOL 745 - Arid Zone Soils

Credits 3

Role soils have in the soil-plant-atmospheric continuum of arid regions, influence of arid zone soils on all aspects of plant growth and development, influence of soil forming factors on the development of arid soils. Same as (GEOL 740) **Prerequisites:** Consent of instructor.

BIOL 748 - Environmental Physiology

Credits 3

Examination of physiological responses, including adaptation and acclimatization to extreme physical environments. Consideration of desert, tropical, arctic, mountain, and aquatic environments and their physiology, ecological, and phylogenetic implications.

BIOL 763 - Vertebrate Reproductive Biology

Credits 3

Study of vertebrate reproduction at the systematic, organismal and population levels. Individual or group projects. **Prerequisites:** BIOL 350, 448 or 465, and consent of instructor.

BIOL 781 - Population and Evolutionary Ecology

Credits 3

Advanced topics in population growth, population interaction and evolution in ecological systems. Includes reading and class discussion of both theoretical and empirical material with emphasis on individual student analysis and integration. Notes: Three hours of lecture and discussion. **Prerequisites:** BIO 340 or equivalent and consent of instructor.

BIOL 783 - Community and Ecosystem Ecology

Credits 3

Readings and evaluation of the highest levels of organization in ecology through: a) exploration of the fundamental concepts of community distributions, structure, organization, and change; and b) analysis of ecosystem-level processes of primary and secondary production and nutrient cycling. Prerequisites BIO 340 or equivalent and consent of instructor.

BIOL 784 - Conservation Biology

Credits 3

Science of scarcity and diversity viewed from the perspective of understanding the causes and consequences of extinction as well as the conditions necessary for maintenance of biotic diversity. Review regional and worldwide developments in this emerging subdiscipline. **Prerequisites:** BIO 340 or consent of instructor.

BIOL 786 - Bioenergetics

Credits 3

Review of primary and secondary productivity and associated topics dealing with ecosystem energetics. Notes: Four hours laboratory. **Prerequisites:** Consent of instructor.

BIOL 787 - Research Laboratory Rotation

Credits 1 – 3

Provides an opportunity for newly admitted graduate students to experience the research of Biological Sciences graduate faculty through one-on-one interactions. Gives graduate students the information they need to make

informal choices about the lab(s) where they carry out their thesis and dissertation research. Notes: May be repeated to a maximum of three credits. Grading S/F grading only.

Prerequisites: Admission as a regular graduate student in the M.S. or Ph.D. Program.

BIOL 789 - Independent Graduate Study in Life Sciences

Credits 1 – 3

Students use this class to receive research credit related to their thesis or dissertation project prior to registering for BIOL 797 or BIOL 799. Notes: May be repeated to a maximum of nine credits. **Prerequisites:** Consent of instructor.

BIOL 790A-D - Research Colloquium in Life Sciences

Credits 1 – 3

Students use this class to present their individual research results to a section-wide audience. Lettering system reflects focus on topics specific for each Section within Life Sciences (A = Ecology and Evolution, B = Organismal Physiology, C = Cell and Molecular Biology, D = Microbiology). Notes: May be repeated to a maximum of nine credits. **Prerequisites:** Consent of instructor.

BIOL 791 - Research Laboratory Discussions in Life Sciences

Credits 1-2

Students present their research and discuss the work of colleagues during formal laboratory meetings with their mentor's research group. Notes: May be repeated to a maximum of ten credits. **Prerequisites:** Consent of instructor.

BIOL 792 - Advanced Topics in Cell and Molecular Biology

Credits 1 – 3

Includes papers, oral presentations and discussion of current literature in these fields. Notes: Topics announced with each offering. May be repeated to a maximum of twelve credits. **Prerequisites:** Graduate standing and consent of instructor.

BIOL 793A-D - Advanced Topics in Life Sciences

Credits 1 – 2

A seminar-style class where presentations are organized around a common theme. Students present and discuss the related primary literature. Lettering system reflects focus on topics specific for each Section within Life Sciences (A = Ecology and Evolution, B = Organismal Physiology, C = Cell and Molecular Biology, D = Microbiology). Notes: May be repeated to a maximum of six credits. **Prerequisites:** Consent of instructor.

BIOL 794 - Techniques in Molecular Biology

Credits 3

Introduction to the theory and laboratory methods used in molecular biology research. Topics include the isolation and purification of nucleic acids, restriction digests, cloning. Southern blotting, PCR, DNA sequencing, and electrophoresis. Notes: Three to nine laboratory hours per week. **Prerequisites:** Consent of instructor.

BIOL 795 - Teaching Strategies for University Science Courses

Credits 2

Designed for graduate students in the sciences and will prepare you for University-level science teaching, whether pursuing a research-based or teaching-based faculty position. We explore different learning theories, current research about learning science and applying them to teaching and the development of a personal teaching philosophy.

BIOL 796 A-D - Graduate Seminar

Credits 1 – 2

Instructs students on how to prepare and present seminars on topics of current interest in life sciences. Lettering system reflects focus on topics specific for each Section within Life Sciences (A = Ecology and Evolution, B = Organismal Physiology, C = Cell and Molecular Biology, D = Microbiology). Notes: May be repeated to a maximum of ten credits. **Prerequisites:** Graduate standing in biology.

BIOL 797 - Thesis

Credits 3 – 6

Notes: May be repeated but only six credits applied to the student's program. Enrollment by consent of instructor only. Grading S/F grading only.

BIOL 799 - Dissertation

Credits 3 – 6

Research analysis and writing toward completion of dissertation and subsequent defense.

Notes: May be repeated but a maximum of only 18 credits may be applied to the degree program. Grading S/F grading only. **Prerequisites:** Graduate standing in the Biology Ph.D. program and consent of instructor.

Mathematical Sciences

Chair

DuBose, Derrick A.

(1987), Associate Professor; B.A., California State University, Long Beach; M.A., Ph.D., University of California, Los Angeles.

Graduate Coordinator

Burke, Douglas

(1994), Associate Professor; B.S., University of Wisconsin, Madison; M.A., University of California, Berkeley; Ph.D., University of California, Los Angeles.

Graduate Faculty

Amei, Amei

(2007), Assistant Professor; B.S., Inner Mongolia University; M.S., University of Science and Technology of China; Ph.D., Washington University.

Ananda, Malwane M.A.

(1990), Professor; B.S., University of Sri Jayewardenepura; M.S., Ph.D., Purdue University.

Bachman, Gennady

(1991), Professor; B.A., Temple University; Ph.D., University of Illinois.

Baragar, Arthur

(1997), Associate Professor; B.S., University of Alberta; Ph.D., Brown University.

Bellomo, Carryn

(2003), Associate Professor; B.S., M.S., Ph.D., Old Dominion University.

Bhatnagar, Satish C.

(1974) Professor; B.A. (honor), M.A., Panjab University, India; M.A., Ph.D. Indiana University.

Catlin, Sandra

(1997), Associate Professor; B.A., University of California, Berkeley; M.S., Ph.D., University of Washington.

Cho, Hokwon

(1999), Associate Professor; B.A., Korea University; M.A., Ph.D., University of California, Santa Barbara.

Costa, David

(1993), Professor; B.S., Federal University of Pernambuco, Recife, Brazil; Ph.D., Brown University.

Dalpatadu, Rohan

(1985), Associate Professor; B.S., University of Ceylon; M.S., Ph.D., Southern Illinois University at Carbondale.

Ding, Zhonghai

(1995), Professor; B.S., Nanjing Institute of Technology; M.S., Institute of Systems Science; Ph.D., Texas A&M University.

Ghosh, Kaushik

(2007), Assistant Professor; B. Stat., Indian Statistical Institute; M.Stat., Indian Statistical Institute; Ph.D., University of California Santa Barbara.

Ho, Chih-Hsiang

(1986), Professor; B.S., National Central University; M.S., New Mexico Highlands University; M.S., Ph.D., University of Minnesota.

Li, Jichun

(2000), Associate Professor; B.S., M.S., Nanjing University, China; Ph.D., Florida State University.

Li, Xin
(1992), Associate Professor; B.S., M.S., Jilin University, Changchun; Ph.D., Texas A&M University.

Marcozzi, Michael
(1997), Associate Professor; B.S., M.S., Ph.D., University of Delaware.

Muleshkov, Angel
(1989), Associate Professor; M.S., Ph.D., University of Washington.

Neda, Monika
(2007), Assistant Professor; B.S., University of Novi Sad; Ph.D., University of Pittsburgh.

Phanord, Dieudonne D.
(2002), Professor; B.S., Gordon College; M.S., Ph.D., University of Illinois, Chicago.

Salehi, Ebrahim
(1985), Associate Professor; B.S., University of Tehran; M.S., Institute of Mathematics, Tehran; M.S., Ph.D., University of Washington.

Robinette, Michelle
(1996), Associate Professor; B.S., M.A., Ph.D., Western Michigan University.

Shiue, Peter
(1985), Professor; B.S., National Taiwan Normal University; M.S., Ph.D., Southern Illinois University.

Sun, Pengtao
(2007), Assistant Professor; B.S., M.S., Shandong University; Ph.D. Institute of Mathematics, Academia Sinica.

Tehrani, Hossein
(1997), Associate Professor; B.S., Sharif University of Technology; M.S., Ph.D., Courant Institute of Mathematical Sciences.

Westveld, Anton H.
(2007), Assistant Professor; B.A., M.A., University of Michigan; Ph.D., University of Washington.

Yang, Hongtao
(2007), Assistant Professor; B.S., M.S., Jilin University; Ph.D., University of Alberta.

Professors Emeriti

Aizely, Paul
(1968-2008), Professor; B.A., Harvard University; M.S., University of Arizona; Ph.D., Arizona State University.

Bowman, Harold
(1972-1999), Emeritus Associate Professor; B.E.E., City College of New York; M.A., Oklahoma University; Ph.D., Arizona State University.

Graham, Malcolm
(1956-1985), Emeritus Professor; B.S., New Jersey State College; M.S., University of Massachusetts; Ed.D., Columbia University.

Miel, George, J.
(1977-1985 & 1991-2006), Emeritus Professor; B.S., M.S., University of Illinois; Ph.D., University of Wyoming.

Nietling, Lloyd
(1967-1992), Emeritus Associate Professor; B.A., St. Mary of the Plains College; B.S., Aquinas College; M.A., University of Michigan; Ph.D., Ohio State University.

The Department of Mathematical Sciences offers both the Master of Science and Doctor of Philosophy degrees. The M.S. program has areas of concentration in Pure Mathematics, Applied Mathematics, Applied Statistics, Statistics, and Teaching Mathematics. The Ph.D. program has areas of concentration in Applied Mathematics, Computational Mathematics, Pure Mathematics, and Statistics. Specific disciplines include approximation theory, applied complex analysis, bioinformatics, biostatistics, calculus of variations, combinatorics, control theory, finite fields, graph theory, mathematical education, mathematical modeling, number theory, numerical analysis, partial differential equations, scientific computing, set theory, statistics. Excellent computing facilities are available for classroom studies and research. The Department of Mathematical Sciences, through an active faculty, offers graduate students both an unusual amount of personal attention and a lively research atmosphere. The degree programs are designed to provide students with a strong theoretical background in graduate-level mathematics. Our graduates have been successful in finding employment in industry, government and education.

Mathematical Sciences M.S.

Admission Requirements

Admission to the M.S. Program in Mathematical Sciences requires that an applicant has a bachelor's degree with a minimum GPA of 2.75 for all undergraduate work or a minimum GPA of 3.00 for the last two years of undergraduate work, and completed at least 18 credits of upper-division mathematics or statistics courses beyond calculus. If applicable, international applicants must submit an official TOEFL score (minimum score of 79 for the IBT, 213 for the computer test, or 550 for the paper test). To apply for admission to the M.S. Program, applicants must submit application materials to both the Graduate College and the Department of Mathematical Sciences.

Firstly, applicants must submit to the Graduate College the following materials:

1. a completed application form;
2. the official transcripts from all colleges and universities the student has attended;
3. the official TOEFL score if applicable.

Secondly, applicants must submit to the Department the following materials:

1. copies of all official transcripts sent to the Graduate College;
2. at least two letters of recommendation from persons familiar with the applicant's academic record and potential for advanced study in mathematical sciences;

3. a completed application form for Graduate Assistantship, if interested;
4. a statement of purpose describing the aim in applying for graduate study, the particular area of specialization within the mathematical sciences (if known), and any additional information that may aid the selection committee in evaluating preparation and aptitude for graduate study.

Details of the admission procedure for the M.S. Program can be found on the Department's web site.

Degree Requirements

A minimum of 30 credits of graduate work is required for the M.S. in Mathematical Sciences, including at least 27 hours of course work. At least 18 of the 27 credits must be at the 700 level. The following specific requirements must be met:

Pure Mathematics Concentration

1. Core Requirement: Six credits of analysis drawn from the list below plus three credits of algebra at the 700 level.
 - MAT 707 - Real Analysis I
 - MAT 708 - Real Analysis II
 - MAT 709 - Complex Function Theory I
 - MAT 710 - Complex Function Theory II
 - MAT 771 - Applied Analysis I
 - MAT 772 - Applied Analysis II
2. Six credits of MAT course work at the 700 level in a field of special interest to the student, excluding those credits used to meet the core requirement.
3. Six credits for thesis or additional six credits of MAT course work at the 700 level.
4. Final Examination: This will be either an examination to defend the thesis or a written comprehensive examination based on requirements 1 and 2.

Applied Mathematics Concentration

1. Core Requirement: Six credits of analysis drawn from:
 - MAT 707 - Real Analysis I
 - MAT 708 - Real Analysis II
 - MAT 709 - Complex Function Theory I
 - MAT 710 - Complex Function Theory II
 - MAT 771 - Applied Analysis I
 - MAT 772 - Applied Analysis II

and three credits of numerical analysis drawn from:

- MAT 663 - Advanced Matrix Theory and Applications
 - MAT 765 - Advanced Numerical Analysis
 - MAT 767 - Topics in Numerical Analysis
2. Six credits of MAT course work at the 700 level in applied and computational mathematics, excluding those credits used to meet the core requirement.

3. Six credits of thesis or additional six credits of MAT course work at the 700 level.
4. Final Examination: This will be either an examination to defend the thesis or a written comprehensive examination based on requirements 1 and 2.

Statistics Concentration

1. Mathematics Requirement: Six credits consisting of the following courses:
 - MAT 657 - Introduction to Real Analysis I
 - MAT 663 - Advanced Matrix Theory and Applications
 This above requirement may be waived for students who have taken MAT 457 and MAT 463 with a grade of B or above.
2. Core Requirement: Twelve credits of the following
 - STA 761 - Regression Analysis I
 - STA 762 - Regression Analysis II
 - STA 767 - Mathematical Statistics I
 - STA 768 - Mathematical Statistics II
3. Six credits of STA course work at the 700 level in a field of special interest to the student, excluding those credits used to meet the core requirement.
4. Six credits for thesis or additional six credits of STA courses at the 700 level in the appropriate area of specialization.
5. Final Examination: This will be either an examination to defend the thesis or a written comprehensive examination based on requirement 2.

Teaching Mathematics Concentration

1. Mathematics Requirement: A total of eighteen credits including nine credits from:
 - MAT 711 - Survey of Mathematical Problems I
 - MAT 712 - Survey of Mathematical Problems II
 - MAT 714 - History of Mathematics

three credits in algebra selected from:

- MAT 653 - Abstract Algebra I
- MAT 654 - Abstract Algebra II
- MAT 703 - Abstract Algebra III
- MAT 704 - Abstract Algebra IV
- MAT 655 - Elementary Theory of Numbers I
- MAT 669 - Combinatorics I
- MAT 670 - Combinatorics II

three credits in analysis selected from:

- MAT 657 - Introduction to Real Analysis I
- MAT 658 - Introduction to Real Analysis II
- MAT 707 - Real Analysis I
- MAT 708 - Real Analysis II
- MAT 659 - Elementary Complex Analysis
- MAT 709 - Complex Function Theory I
- MAT 710 - Complex Function Theory II
- MAT 687 - Introduction to Partial Differential Equations

and three credits in foundations selected from:

- MAT 651 - Foundations of Mathematics I
 - MAT 652 - Foundations of Mathematics II
 - MAT 701 - Foundations of Mathematics III
 - MAT 702 - Foundations of Mathematics IV
 - MAT 680 - College Geometry
 - MAT 683 - General Topology I
 - MAT 684 - General Topology II
2. Education Requirement: Six credits in education from:
 - CIS 622 - Instructional Middle School Mathematics Education
 - CIS 624 - Instruction Secondary Mathematics Education
 - CIG 620 - Principles of Learning Mathematics
 3. Three credits for professional paper or additional six credits of MAT or STA course work at the 700 level.
 4. Final Examination: This will be either an examination to defend the professional paper or a written comprehensive examination designed and administered by the Student Advisory Committee.

Note: MAT 711 and 712 do not count as graduate credits toward a M.S. in Mathematical Sciences with concentration in pure mathematics, applied mathematics, or statistics.

A student will be placed on academic probation if a minimum of 3.00 GPA is not maintained in all work taken in the degree program. A grade of C or less in one graduate-level course will cause a student to be placed on academic probation and will elicit a critical review of the student's program by the Graduate Studies Committee.

The Graduate College requires a minimum of 50 percent of the total credits required to complete the graduate degree, exclusive of transferred credits and/or the thesis/dissertation, must be earned at UNLV after admission to a graduate degree program.

Mathematical Sciences Ph.D.

Admission Requirements

In addition to the requirements of the Graduate College, applicants must satisfy the admission requirements of the Department of Mathematical Sciences summarized as follows. Applicants seeking direct admission to the doctoral program without a previously earned master's degree must have a minimum GPA of 3.00 for all undergraduate work or a minimum GPA of 3.25 for the last two years of undergraduate mathematics work. Applicants with a master's degree must have a minimum GPA 3.00 for all graduate work and at least 15 credits of graduate course work in Mathematical Sciences with a grade of B or better. Applicants must submit the official score of the GRE General Test with a minimum score of 700 in the quantitative part. If applicable, international applicants must submit an official TOEFL score (minimum score of 79 for the IBT, 213 for the computer test, or 550 for the paper test).

To apply for admission to the Ph.D. Program, applicants must submit application material to both the Graduate College and the Department of Mathematical Sciences.

Firstly, applicants must submit to the Graduate College the following materials:

1. a completed application form;
2. the official transcripts from all colleges and universities the student has attended;
3. the official GRE General Test score;
4. the official TOEFL score if applicable;

Secondly, applicants must submit to the Department the following materials:

1. copies of all official transcripts sent to the Graduate College;
2. at least three letters of recommendation from persons familiar with the applicant's academic record and potential for advanced study in mathematical sciences;
3. a completed application for Graduate Assistantship, if interested;
4. a statement of purpose describing the aim in applying for graduate study, the particular area of specialization within the mathematical sciences (if known), and any additional information that may aid the selection committee in evaluating preparation and aptitude for graduate study.

Details of the admission procedure for the Ph.D. Program can be found on the Department's web site.

Degree Requirements

1. Credit requirement. The doctoral students entering the program with a Bachelor's degree are required to complete a minimum of 60 credits of course work, at least 36 of which must be at the 700-level. The doctoral students entering the program with an M.S. degree are required to complete at least 30 credits of course work, at least 18 of which must be at the 700-level. Each doctoral student must complete a dissertation embodying the results of original research which is acceptable to the student's advisory committee. A student must enroll in a minimum of 18 credits of Dissertation. A maximum of 24 credits of Dissertation can be counted toward the Ph.D. degree.
2. Qualifying Examination. The purpose of the Qualifying Examination is to measure the student's knowledge of basic graduate course work in selected areas and to make sure that the student is prepared to proceed to more advanced studies. A doctoral student normally takes the Qualifying Examination within the second year after entering the program, based on the core courses in the student's concentration. Doctoral students must pass the Qualifying Examination within three years. For each concentration, the Qualifying Examination consists of two parts, which are based on:

Applied Mathematics

Part I: MAT 707-708 or MAT 709-710

Part II: MAT 771-772

Computational Mathematics

Part I: MAT 707-708 or MAT 709-710

Part II: MAT 765-766

Pure Mathematics

Part I: MAT 707-708 or MAT 709-710

Part II: MAT 703-704

Statistics

Part I: STA 767-768

Part II: STA 761-762

A student who fails the Qualifying Examination on the first attempt must complete a second examination within the next twelve months. A student who entered the program with a Bachelor's degree and who fails the second examination may be allowed to complete a M.S. degree with the consent of the Graduate Studies Committee. Such a student will not be permitted to seek readmission to the Doctoral Program in Mathematical Sciences at UNLV. A student who fails the Qualifying Examination a second time and who entered the Doctoral Program with an M.S. degree in Mathematical Sciences will be separated from the program.

3. Subject Area Breadth Requirements. With the goal of encouraging students to be exposed to a broad spectrum of mathematics during their graduate studies, doctoral students are required to take at least two one-year sequence courses with a grade of B or better, in addition to the core courses tested by the Ph.D. Qualifying Examination. Students are required to choose two one-year course sequences based on the following list:

Applied Mathematics

MAT 703-704, MAT 723-724, MAT 729-730, MAT 733-734, MAT 765-766, STA 767-768.

Computational Mathematics

MAT 703-704, MAT 723-724, MAT 729-730, MAT 733-734, MAT 771-772, STA 767-768.

Pure Mathematics

MAT 701-702, MAT 717-718, MAT 723-724, MAT 733-734, MAT 771-772, STA 767-768.

Statistics

STA 713 & 715, STA 750-751, STA 755-756, STA 753 & 765, STA 763-764, MAT 707 & STA 731.

4. Comprehensive Examination. The purpose of the Comprehensive Examination is to measure a doctoral student's knowledge of the advanced level graduate work that will be required as the student begins to do

original research in his or her area of concentration. After passing the Qualifying Examination, a student will engage in the approved course work specified by the Doctoral Advisory Committee and submit to the latter a dissertation proposal.

Usually one year after passing the Qualifying Examination, a student will complete the Comprehensive Examination, designed and administered by the Doctoral Advisory Committee, based on the student's course work with focus on his/her ability to perform research on the dissertation proposal. A student who fails the Comprehensive Examination on the first attempt must complete a second examination within the next semester. A student who fails the examination a second time will be separated from the Doctoral Program. A student who has successfully passed the Comprehensive Examination will be admitted to Candidacy for the Ph.D. degree and thereby be allowed to proceed with the approved dissertation proposal.

5. Dissertation. A doctoral candidate is expected to complete a dissertation embodying the results of significant original research, which is performed independently by the student, and is acceptable to the student's advisory committee.
6. Additional Requirements. Skills in foreign languages, computer programming and/or interdisciplinary areas, dependent on the concentration of a student's program, will be determined by the Doctoral Advisory Committee and the Graduate Studies Committee in consultation with the Department Chair.
7. Dissertation Defense. After submitting to the Doctoral Advisory Committee a dissertation draft that was approved by his/her Dissertation Advisor, a candidate will defend orally the dissertation before the Doctoral Advisory Committee and any other graduate faculty members who wish to attend. The Doctoral Advisory Committee will recommend to the Graduate Coordinator/Department Chair whether the dissertation and defense are both satisfactory.

Specific degree requirements, including those listed above, are described in detail in the Graduate Student Handbook for the Ph.D. Program, available on the department's web site. The listing of graduate courses is constantly under review. Graduate students will automatically receive new listings. Since some courses are taught on an "on demand" basis, course prerequisites for each of the four concentrations are considered guidelines with courses roughly equivalent accepted as prerequisites, subject to approval of the Graduate Studies Committee and the student's Doctoral Advisory Committee.

A student will be placed on academic probation if a minimum of 3.00 GPA is not maintained in all work taken in the degree program. A grade of C or less in one graduate-

level course will cause a student to be placed on academic probation and will elicit a critical review of the student's program by the Graduate Studies Committee.

The Graduate College requires a minimum of 50 percent of the total credits required to complete the doctoral degree, exclusive of transferred credits and/or the dissertation, must be earned at UNLV after admission to a graduate degree program.

Course Descriptions

Mathematics

MAT 651 - Foundations of Mathematics I
MAT 652 - Foundations of Mathematics II
MAT 653 - Abstract Algebra I
MAT 654 - Abstract Algebra II
MAT 655 - Elementary Theory of Numbers I
MAT 656 - Elementary Theory of Numbers II
MAT 657 - Introduction to Real Analysis I
MAT 658 - Introduction to Real Analysis II
MAT 659 - Elementary Complex Analysis
MAT 661 - Probability Theory
MAT 662 - Stochastic Processes
MAT 663 - Advanced Matrix Theory and Applications
MAT 665 - Numerical Analysis I
MAT 666 - Numerical Analysis II
MAT 668 - Applied Finite Element Analysis
MAT 669 - Combinatorics I
MAT 670 - Combinatorics II
MAT 680 - College Geometry
MAT 683 - General Topology I
MAT 684 - General Topology II
MAT 687 - Introduction to Partial Differential Equations
MAT 689 - Advanced Mathematical Topics
MAT 690 - Independent Study

Note: The 600-level courses listed above, when taught by a member of the graduate faculty, may be applied to a graduate program. For listings and a course description of this 600-level course, please consult the current Undergraduate Catalog under the corresponding 400 number. Notes: The 600-level MAT and STA courses that are normally available for graduate credit are those numbered 650 or higher; the exceptions are MAT 680, which may be counted for graduate credit in an education degree program, and STA 691, STA 693, and STA 695, which may be counted for graduate credit in a biological sciences program.

MAT 701 - Foundations of Mathematics III

Selection from the following topics: model theory, recursive function theory, set theory, mathematics of metamathematics. **Prerequisites:** MAT 652

MAT 702 - Foundations of Mathematics IV

Credits 3
Selection from the following topics: model theory, recursive function theory, set theory, mathematics of metamathematics. **Prerequisites:** MAT 652

MAT 703 - Abstract Algebra III

Credits 3
Detailed study of the following algebraic structures: groups, rings and ideals, fields, modules, and Galois theory. **Prerequisites:** A year of undergraduate abstract algebra or consent of instructor.

MAT 704 - Abstract Algebra IV

Credits 3
Detailed study of the following algebraic structures: groups, rings and ideals, fields, modules, and Galois theory. **Prerequisites:** A year of undergraduate abstract algebra or consent of instructor.

MAT 707 - Real Analysis I

Credits 3
Theory of measure, integration and differentiation: Banach spaces; Hilbert spaces; spaces of continuous functions. **Prerequisites:** MAT 658

MAT 708 - Real Analysis II

Credits 3
Theory of measure, integration and differentiation: Banach spaces; Hilbert spaces; spaces of continuous functions. **Prerequisites:** MAT 658

MAT 709 - Complex Function Theory I

Credits 3
Analytic functions, conformal mappings, Cauchy's theorem, power series, Laurent series, the Riemann mapping theorem, harmonic functions, subharmonic functions, canonical mappings of multiply connected regions, analytic continuation. **Prerequisites:** MAT 657 or MAT 659 or equivalent.

MAT 710 - Complex Function Theory II

Credits 3
Analytic functions, conformal mappings, Cauchy's theorem, power series, Laurent series, the Riemann mapping theorem, harmonic functions, subharmonic functions, canonical mappings of multiply connected regions, analytic continuation. **Prerequisites:** MAT 657 or MAT 659 or equivalent.

MAT 711 - Survey of Mathematical Problems I

Credits 3
Selected topics from logical reasoning, probability, combinatorics, graph theory, codes, number theory, constructibility, game theory, limits, functions, set theory and foundations, and plane geometry. Problem solving and techniques of proof emphasized throughout. Connections

made between the mathematics of this course and secondary education mathematics. **Prerequisites:** Graduate standing and consent of instructor.

MAT 712 - Survey of Mathematical Problems II

Credits 3

Continuation of topics listed for MAT 711 with emphasis on problem solving and techniques of proof. Again, connections made between the mathematical content of this course and mathematical content for secondary education.

Prerequisites: MAT 711 or consent of instructor.

MAT 714 - History of Mathematics

Credits 3

Historical development of mathematics from primitive origins to the present time. Lives of many mathematicians and their contributions to the development of mathematics.

Prerequisites: Graduate standing and consent of instructor.

MAT 716 - Integrative Mathematical Topics

Credits 3

Survey of mathematical topics in an integrative manner. The topics may cover theory and applications in long stretches including probability and statistics; combinatorics, number theory and algebra; geometry and topology; ODE and PDE; computation and numerical analysis; Real and complex analysis. **Prerequisites:** At least nine credits at 600-level as required in Requirement #1.

MAT 717 - Analytical Solution Methods for Partial Differential Equations, I

Credits 3

Covers the basic theory and methods for solving linear partial differential equations. Emphasis on introducing various techniques to obtain analytical solutions of linear partial differential equations. Techniques include: Method of separation of variables; Fourier transform method; Laplace transform method; Green's function method, etc.

Prerequisites: MAT 487/687, or MAT 458/658, or consent of instructor.

MAT 718 - Analytical Solution Methods for Partial Differential Equations, II

Credits 3

Covers the basic theory and methods for solving nonlinear partial differential equations. Emphasis on introducing various techniques to obtain analytical solutions.

Techniques include: Generalized method of characteristics, method of shock wave solution, method of travelling wave solution, perturbation method, method of similarity solution, etc. **Prerequisites:** MAT 487/687, or MAT 717, or consent of instructor.

MAT 723 - Advanced Ordinary Differential Equations I

Credits 3

Functional analysis; Frechet calculus; existence and uniqueness theorems for initial and boundary value problems; qualitative properties of solutions, particularly of linear equations. **Prerequisites:** MAT 671-672 or MAT 673-674

MAT 724 - Advanced Ordinary Differential Equations II

Credits 3

Topics to be selected from the following: Sturm-Liouville theory, stability theory, perturbation theory, numerical methods, the theory of invariant imbedding and functional differential equations. **Prerequisites:** MAT 723

MAT 725 - Mathematics for Operations Research I

Credits 3

Theory of stochastic processes, theory of queues, Markov processes, non-Markov processes, Markov chains, applications. **Prerequisites:** MAT 661

MAT 726 - Mathematics for Operations Research II

Credits 3

Linear and non-linear programming, dynamic programming, Lagrange multiplier and duality theorems, control theory and optimal control, applications of programming.

Prerequisites: MAT 671 and 673

MAT 729 - Partial Differential Equations I

Credits 3

Linear and nonlinear first order PDEs. Heat, wave and Laplace equations. Classical representation formulas in one and more dimensions. Properties of solutions: maximum principles, energy methods, uniqueness and regularity considerations. **Prerequisites:** MAT 687 or MAT 717

MAT 730 - Partial Differential Equations II

Credits 3

Develops a functional analytical framework which will give students a deeper understanding of the subject matter.

Topics include Sobolev and Holder spaces, embedding inequalities, weak solutions, regularity and maximum principles. **Prerequisites:** MAT 708 and MAT 729, or consent of instructor.

MAT 731 - Mathematical Modeling

Credits 3

Process and techniques of mathematical modeling with an emphasis on differential equations based models, though other models may also be considered. Applications selected from physical, biological and social sciences. Modeling projects based on student interests. Symbolic computation software. **Prerequisites:** MAT 687 or MAT 717 or consent of instructor.

MAT 733 - Topology

Credits 3

Selected topics from algebraic and point-set topology with emphasis on algebraic topology. **Prerequisites:** MAT 684 or consent of instructor.

MAT 734 - Topology

Credits 3

Selected topics from algebraic and point-set topology with emphasis on algebraic topology. **Prerequisites:** MAT 684 or consent of instructor.

MAT 740 - Mathematical Wave Propagation Theory and Application I

Credits 3

Review of linear wave equations, techniques of linear and non-linear modeling of natural occurrences and their role in understanding mathematical inversion, mathematical foundation of dyadic wave propagation, introduction to asymptotic analysis and boundary layer theory, application to problems for waves propagating in the atmosphere, ocean and space. **Prerequisites:** MAT 717 or MAT 729 or consent of instructor.

MAT 741 - Mathematical Wave Propagation Theory and Application II

Credits 3

The generalized tensor wave nature of matter, advanced mathematical methods of non-linear and quantum optics. Earth quake dynamics, elastic waves and cracks propagation with applications from earth system and space science. **Prerequisites:** MAT 718 and MAT 740 or consent of instructor.

MAT 751 - Topics in Foundations of Mathematics

Credits 3

Notes: May be repeated for credit with the consent of the mathematics department. Except under special circumstances, total credits limited to six credits.

Prerequisites: MAT 701-702**MAT 753 - Homological Algebra**

Credits 3

Modules, categories and factors, tensors, Hom, Tor, Ext, the dimensions of rings and modules, derived factors, cohomology of groups and algebras. **Prerequisites:** MAT 703-704 or consent of instructor.

MAT 754 - Homological Algebra

Credits 3

Modules, categories and factors, tensors, Hom, Tor, Ext, the dimensions of rings and modules, derived factors, cohomology of groups and algebras. **Prerequisites:** MAT 703-704 or consent of instructor.

MAT 755 - Topics in Algebra

Credits 3

Notes: May be repeated for credit with the consent of the mathematics department. Except under special circumstances, total credits limited to six. **Prerequisites:** MAT 703-704 or consent of instructor.

MAT 756 - Arithmetic on Elliptic Curves

Credits 3

The group structure of elliptic curves over the reals, complex numbers, the rationals, number fields, and finite fields; Bezout's theorem and its applications; projective geometry; genus; Mordell's theorem; points of finite order; and heights. Additional topics may include complex multiplication; modular forms; and factoring using elliptic curves. **Prerequisites:** MAT 653 and 654, or equivalent.

MAT 757 - Topics in Analysis

Credits 3

Notes: May be repeated for credit with the consent of the mathematics department. Except under special circumstances, total credits limited to six. **Prerequisites:** MAT 707-708 or consent of instructor.

MAT 760 - Mathematical Scattering Theory and Applications I

Credits 3

Scalar, vector, and tensor scattering with diverse techniques applied to earth system and space science. General Reciprocity Relations Corresponding to Different Directions of Incidence, Dyadic Scattering Theory, Two-Space Scattering Formalism of Victor Twersky, and Applications to Earth and Space Related Problems. **Prerequisites:** MAT 717 or MAT 729 or consent of instructor.

MAT 761 - Mathematical Scattering Theory and Applications II

Credits 3

Advanced statistical mechanics and spatial statistics in relation to Twersky scattering with applications from earth system and space science. Calculation of bulk propagation parameters using both configurational and ensemble average in addition to spatial average. Application of Twersky multiple two-Space Scattering formalism to space and earth related problems. **Prerequisites:** MAT 760 or consent of instructor.

MAT 765 - Advanced Numerical Analysis

Credits 3

Numerical solution of ordinary and partial differential equations; advanced programming techniques; experiments with the computer. Notes: Topics selected by instructor. Three hours lecture, two hours laboratory. **Prerequisites:** MAT 666

MAT 766 - Advanced Numerical Analysis

Credits 3

Numerical solution of ordinary and partial differential equations; advanced programming techniques; experiments with the computer. Notes: Topics selected by instructor. Three hours lecture, two hours laboratory. **Prerequisites:** MAT 666

MAT 767 - Topics in Numerical Analysis

Credits 3

Topics selected by the instructor. Notes: May be repeated for credit with the consent of the mathematics department. Except under special circumstances, total credits limited to six. **Prerequisites:** MAT 765-766

MAT 771 - Applied Analysis I

Credits 3

Functional analysis in Banach spaces and Hilbert spaces, with emphasis on computational applications. Theoretical topics to be selected from: linear functionals and operators, fixed point theorems, iterative methods, elementary spectral theory. Applications to be selected from: finite element methods, finite difference methods, approximation and interpolation, optimization algorithms. **Prerequisites:** Graduate standing and consent of instructor.

MAT 772 - Applied Analysis II

Credits 3

Functional analysis in Banach spaces and Hilbert spaces, with emphasis on computational applications. Theoretical topics to be selected from: linear functionals and operators, fixed point theorems, iterative methods, elementary spectral theory. Applications to be selected from: finite element methods, finite difference methods, approximation and interpolation, optimization algorithms. **Prerequisites:** Graduate standing and consent of instructor.

MAT 775 - Calculus of Variations

Credits 3

Variation of functionals, Euler-Lagrange equation, general variations, broken extremals, Weierstrass-Erdmann conditions, canonical forms, Noether's theorem, Hamilton-Jacobi equations, Legendre's condition, conjugate points, fields, E-function, sufficient conditions for extrema, Pontryagin's principle, introduction to linear and non-linear optimal control theory. **Prerequisites:** MATH 428 or 658 or consent of instructor.

MAT 777 - Application of High-Performance Computing Methods in Science and Engineering

Credits 3

Application of high performance computing systems to science and engineering, models for numerically intensive problem solving, high performance numerical algorithms, FORTRAN 90 and high-performance FORTRAN. Same as

(ME 777) **Prerequisites:** Knowledge of UNIX, FORTRAN, and previous course on numerical methods. Graduate standing.

MAT 783 - Topics in Topology

Credits 3

Notes:

May be repeated for credit with the consent of the mathematics department. Except under special circumstances, total credits limited to six credits.

Prerequisites: Consent of instructor.**MAT 789 - Topics in Advanced Mathematics**

Credits 3

Graduate-level course in some field of mathematics, at advanced level, depending upon the current interest of the staff and the students. Notes: May be repeated to a maximum of six credits.

MAT 790 - Independent Study

Credits 1 – 3

Library work and reports on topics of mathematical interest. Notes: May be repeated for credit with the consent of the mathematics department. Except under special circumstances, total credits will be limited to six.

MAT 791 - Thesis

Credits 1 – 6

Notes: May be repeated but only six credits will be applied to the student's program. Grading S/F grading only.

MAT 792 - Research Seminar

Credits 1

Oral presentation of assigned articles.

Notes: May be repeated to a maximum of four credits.

MAT 793 - Teaching Concentration Professional Paper Research

Credits 1 – 3

Individual research towards an applied professional paper under the direction of a faculty member.

Notes: May be repeated any number of times, but no more than three credits will count towards degree requirements. Grading S/F grading only. **Prerequisites:** Consent of instructor.

MAT 799 - Dissertation

Credits 3-6

Research analysis and writing toward completion of dissertation and subsequent defense. A minimum of 24 dissertation credits is required for a degree program. Dissertation may be repeated but only a maximum of 36 credits may be used in students degree program. Grading S/F grading only **Prerequisites:** Successful completion of qualifying examination and approval by department.

Statistics

STA 663 - Applied Statistics for Engineers
STA 667 - Introduction to Mathematical Statistics
STA 669 - Environmental Statistics I: Univariate Methods
STA 689 - Advanced Statistics Topics
STA 690 - Independent Study
STA 691 - Statistics for Scientists I
STA 692 - Statistics for Scientists II
STA 693 - Applied Regression Analysis
STA 695 - Nonparametric Statistics

Note: The courses above, when taught by a member of the graduate faculty, may be applied to a graduate program. For listings and a course description of this 600-level course, please consult the current Undergraduate Catalog under the corresponding 400 number. Notes: The 600-level MAT and STA courses that are normally available for graduate credit are those numbered 650 or higher; the exceptions are MAT 680, which may be counted for graduate credit in an education degree program, and STA 691, STA 693, and STA 695, which may be counted for graduate credit in a biological sciences program. This course offered by another department may also be taken for graduate credit.

STA 713 - Experimental Design

Credits 3

Fundamental principles of analysis of variance; one-way, two-way, and higher order designs; nested designs; randomized blocks; split plot designs; Latin squares; multiple comparisons; analysis of covariance.

Prerequisites: MATH 181 and one of the following: STAT 411, STA 663 and STA 693.

STA 715 - Multivariate Statistical Methods

Credits 3

Multivariate techniques with emphasis on application. Topics include multivariate analysis of variance, discriminant analysis, canonical correlation and independence, principal component analysis, factor analysis, cluster analysis and analysis of repeated measurements.

Prerequisites: MATH 181, MATH 463 and one of the following: STAT 411, STA 663, STA 691.

STA 717 - Environmental Statistics

Credits 3

Testing for multivariate normality, data dependent transformations for multivariate normality, tests for outliers for multivariate data, multivariate control charts, exploratory data analysis of multivariate data using principal components, cluster analysis, factor analysis, and multivariate calibration problems. **Prerequisites:** MATH 181 and one of the following: STAT 411, STA 663, STA 691.

STA 731 - Probability Theory and Its Applications

Credits 3

Topics include: set theory, limits of sets, probability space, random variables, measurability, independence, expectation, probability inequalities, convergence, laws of large numbers, central limit theorem, moment generating functions, characteristic functions, large deviation theory, martingale theory, random walk. **Prerequisites:** MAT 657

STA 750 - Time Series Analysis

Credits 3

Topics include ARMA and ARIMA processes; autocorrelation and partial autocorrelation functions; spectral density and periodogram; Yule-Walker equations; model fitting, forecasting and diagnostics; state-space models and the Kalman filter; multivariate time series; use of statistical software. **Prerequisites:** STA 667 or consent of instructor.

STA 751 - Spatial Statistics

Credits 3

Stochastic process, first and second order stationarity, intrinsic hypothesis, models of spatial dependence, different forms of Kriging — Ordinary Kriging, Universal Kriging, Probability Kriging, bicubic splines, conditional simulation. **Prerequisites:** STA 667 or consent of instructor.

STA 755 - Stochastic Modeling I

Credits 3

Probability theory, Markov chains in discrete and continuous time, the Poisson process, renewal theory, queueing theory, reliability theory, martingales, stationary processes, statistical inference for stochastic processes, and simulation techniques. **Prerequisites:** STA 667 or consent of instructor.

STA 756 - Stochastic Modeling II

Credits 3

Probability theory, Markov chains in discrete and continuous time, the Poisson process, renewal theory, queueing theory, reliability theory, martingales, stationary processes, statistical inference for stochastic process, and simulation techniques. **Prerequisites:** STA 755

STA 761 - Regression Analysis I

Credits 3

Fitting a straight line, matrix theory, examining residuals, selecting the "best" fit, multiple regression, non-linear regressions, multivariate normal, estimation, classification, principal components, canonical correlation, distribution of characteristic roots. **Prerequisites:** STA 667 and MAT 663, or equivalent.

STA 762 - Regression Analysis II

Credits 3

Fitting a straight line, matrix theory, examining residuals, selecting the "best" fit, multiple regression, non-linear

regressions, multivariate normal, estimation, classification, variance-covariance matrix, testing sets of variates, principal components, canonical correlation, distribution of characteristic roots. **Prerequisites:** STA 667 and MAT 663 or equivalent.

STA 763 - Analysis of Variance I

Credits 3

Special topics in matrix theory; noncentral chi-square, F, and t; the multivariate normal distribution; Cochran's theorem; point and interval estimation; one-, two-, three-, higher-way layouts; Latin squares, incomplete blocks and nested designs, analysis of covariance; random effects models; mixed models; randomization models.

Prerequisites: STA 667 and MAT 663 or equivalent.

STA 764 - Analysis of Variance II

Credits 3

Special topics in matrix theory; noncentral chi-square, F, and t; the multivariate normal distribution; Cochran's theorem; point and interval estimation; one-, two-, three-, higher-way layouts; Latin squares, incomplete blocks and nested designs, analysis of covariance; random effects models; mixed models; randomization models.

Prerequisites: STA 667 and MAT 663 or equivalent.

STA 765 - Statistical Decision Theory

Credits 3

Introduction to decision theory, decision rules, loss functions, risk functions, decision principles, utility theory, prior information and subjective probability, noninformative priors, the posterior distribution, conjugate families, predictive distribution, Bayesian estimators, generalized Bayes estimators, credible regions, hypothesis testing, admissibility of Bayes rules, robustness of Bayes rules, minimax analysis, invariance, Bayesian sequential analysis.

Prerequisites: STA 667 or consent of instructor.

STA 767 - Mathematical Statistics I

Credits 3

Basic probability theory, conditional probability, independence, random variables, probability distribution functions, distribution functions, transformations, function of random variables, expectations, moment generating functions, discrete and continuous distributions, exponential family, joint distribution, marginal distribution, modes of convergence, limiting distribution, random sample, sampling distribution, principle of data reduction.

Prerequisites: Prerequisites STA 667 or consent of instructor.

STA 768 - Mathematical Statistics II

Credits 3

Random sample, sampling theory, point estimation, sufficiency, likelihood, method of moment, maximum likelihood estimator, Bayes estimator, unbiasedness,

optimality, decision theory, hypothesis testing, likelihood ratio tests, Bayes test, most powerful test, set estimation, evaluating interval estimators, sequential estimation, asymptotics, robustness, linear models. **Prerequisites:** STA 767

STA 789 - Topics in Advanced Statistics

Credits 3

Graduate-level course in some field of statistics, depending upon the current interest of the faculty and the students.

Notes: May be repeated to a maximum of six credits.

STA 790 - Independent Study

Credits 1 – 3

Library research and reports on topics of statistical interest.

Notes: May be repeated to a maximum of six credits with consent of the department.

STA 791 - Thesis

Credits 3 – 6

Notes:

May be repeated but only six credits applied to the student's program. Grading S/F grading only.

STA 792 - Research Seminar

Credits 1

Oral presentation of assigned articles. Notes: May be repeated to a maximum of four credits.

STA 793 - Techniques of Statistical Consulting

Credits 1 – 3

Seminar series and practicum covering technical and nontechnical aspects of statistical consulting, including skills for effective communication with clients, report writing, issues in sampling and design of experiments, and other statistical tools commonly used in a consulting setting.

Notes: May be repeated to a maximum of six credits.

STA 799 - Dissertation

Credits 3-6

Research analysis and writing toward completion of dissertation and subsequent defense. A minimum of 24 dissertation credits is required for the degree program. Dissertation may be repeated but only a maximum of 36 credits may be used in students degree program.

Prerequisites: Successful completion of qualifying examination and approval by department.

Physics & Astronomy

Chair

Pang, Tao

(1991), Professor; B.S., Fudan University; Ph.D., University of Minnesota.

Graduate Coordinator

Spight, Lon D.

(1970), Associate Professor; B.S., M.S., Colorado State University; Ph.D., University of Nevada, Reno.

Graduate Faculty

Chen, Changfeng

(1990), Professor; B.S., Ph.D., Peking University.

Cornelius, Andrew

(1999), Associate Professor; B.S., Drake University; Ph.D., Washington University.

Farley, John W.

(1987), Professor; B.A., Harvard College; M.A., Ph.D., Columbia University.

Kwong, Victor H.

(1984), Professor; B.S., Queen's University; M.S., University of Windsor; Ph.D., University of Toronto.

Lepp, Stephen H.

(1991), Professor; B.S., University of Minnesota; M.A., Ph.D., University of Colorado, Boulder.

Nagamine, Kentaro

(2006), Assistant Professor; B.S., University of Tokyo; M.A., Ph.D., Princeton University.

Pravica, Michael

(2003), Associate Professor; B.S., Cal Tech; A.M., Ph.D., Harvard University.

Proga, Daniel

(2005), Associate Professor; M.S., Nicolaus Copernicus University; Ph.D. Nicolaus Copernicus Astronomical Center.

Rhee, George

(1993), Associate Professor; B.A., Cambridge University; M.Sc., Leiden University; M.A., Cambridge University; Ph.D., Leiden University.

Selser, James C.

(1981), Professor; B.S., U.S. Air Force Academy; M.S., Ph.D., University of California, Davis.

Shelton, David P.

(1988), Professor; B.A., M.S., Ph.D., University of Manitoba.

Smith, Diane Pyper

(1980), Associate Professor; A.B., University of California, Berkeley; Ph.D., University of California, Santa Cruz.

Zane, Len

(1973), Professor; B.S., City College of New York; Ph.D., Duke University.

Zhang, Bing

(2004), Associate Professor; B.S., M.S., Ph.D., Peking University.

Zygelman, Bernard

(1990), Professor; B.S., City College of New York; Ph.D., City University of New York.

Professor Emeritus

Weistrop, Donna E.

(1990-2005), Emeritus Professor; B.A., Wellesley College; Ph.D., California Institute of Technology.

The Physics Department offers M.S. and Ph.D. degrees in physics, with concentrations in three research areas: laser physics, high pressure physics (in collaboration with LLNL and LANL), and condensed matter physics. The Physics Department also offers M.S. and Ph.D. degrees in Astronomy. The astronomers make use of space telescopes such as the Hubble Space Telescope, Swift, Chandra X-ray Observatory and XMM-Newton Observatory, etc. to conduct research. The department's experimental research programs are supported by fully equipped laboratories and mechanical, electronic and glass shops. The department is well equipped with state-of-the-art computing facilities, which allow for performing virtually any modeling and computer simulation.

Astronomy M.S.

Admission Requirements

Applicants must have an undergraduate degree in Physics, Astronomy or other related area. Applicants must have a minimum grade point average (GPA) of 2.75 for all undergraduate work or a minimum 3.00 GPA for the last two years of undergraduate work.

Degree Requirements

There are two options, Thesis and Non-Thesis that may be used to receive a M.S. in Astronomy Degree. The completion requirements for each are as follows:

Completion Requirements for the Thesis Option

A minimum of 30 graduate credits is required, including a minimum of 15 credits (excluding thesis) in 700-level astronomy or physics courses and six hours of research for thesis credit. A final oral exam is required on course work and thesis. A GPA of 3.00 or better is required in all course work which is part of the degree program.

Completion Requirements for the Non-Thesis Option

A minimum of 30 graduate credits past the bachelor's level is required, including the following:

1. A Minimum 30 graduate level semester credits in physics, astronomy or related fields (excluding thesis and graduate seminar). At least 15 credits of 700 level astronomy or physics courses. A GPA of 3.00 or better in all course work which is part of the degree program. The program must also include the following core courses:

AST 713 - Astrophysics I

AST 714 - Astrophysics II

AST 710 - Observational Astronomy Techniques

AST 721 - Astrophysics of Gaseous Nebulae and Active Galactic Nuclei

AST 725 - High Energy Astrophysics

AST 727 - Cosmology

AST 747 - Interstellar Medium

PHYS 771 - Advanced Topics in Experimental and Theoretical Physics

2. Satisfactory Performance

On an astronomy qualifying examination on graduate astronomy knowledge at the master's level.

Astronomy Ph.D.

Admission Requirements

Applicants must have an undergraduate degree or a Masters degree in Physics, Astronomy or related area. Applicants must have a minimum GPA of 2.75 for all undergraduate work or a minimum 3.00 GPA for the last two years of undergraduate work. In addition, applicants seeking direct admission to the doctoral program without a previously earned Master of Science degree must have a score in the 65th percentile or above on the Advanced Physics portion of the GRE before admission and have a minimum GPA of 3.00 for all undergraduate work or an overall 3.25 GPA for the last two years of undergraduate work. Applicants with a Master's degree must have an overall 3.00 GPA in their Master's program and at least 15 credit hours of graduate-level course work in physics or astronomy with a grade of B or better. A student entering with a Master's degree will be required to complete at least 30 additional credits, including dissertation credits, beyond the Masters.

Degree Requirements

A total of 60 graduate credits past the bachelor's level is required, including the following:

1. A minimum of 36 graduate level semester credits in astronomy or related fields (excluding doctoral dissertation and graduate seminar), which must include the following core courses:

AST 713 - Astrophysics I

AST 714 - Astrophysics II

PHYS 702 - Classical Mechanics I

PHYS 721 - Quantum Theory I

PHYS 482/682 and graduate standing.

PHYS 711 - Electromagnetic Theory I

PHYS 700 - Mathematical Physics I

AST 710 - Observational Astronomy Techniques

AST 721 - Astrophysics of Gaseous Nebulae and Active

AST 725 - High Energy Astrophysics

AST 727 - Cosmology

AST 731 - Stellar Atmospheres: Theory, Observation, and Analysis

AST 747 - Interstellar Medium

PHYS 771 - Advanced Topics in Experimental and Theoretical Physics

2. Six credits of PHYS 796 - Graduate Seminar including three acceptable presentations by the student.
3. A minimum of 18 semester credits of:PHYS 799 - Doctoral Dissertation
4. Satisfactory performance on an astronomy qualifying examination on graduate astronomy knowledge. This requirement must be fulfilled by the second year in the program.
5. A dissertation of high quality consisting of significant original research.
6. Satisfactory performance on a final examination which will consist of an oral defense of the dissertation.

Notes: A student who enters the doctoral program with a Master's degree must satisfy all of the above requirements numbered 1-6. The exact number of graduate semester credit hours past the Master's level will depend upon the quality of the student's preparation and the rate of progress during research. All courses used to satisfy the course work requirements (listed as 1. above) must have the approval of the Department. The number of graduate credits beyond the Master's level must be at least 30; typically it will be more.

Physics M.S.

Admission Requirements

Applicants must have a minimum GPA of 2.75 for all undergraduate work or a 3.00 GPA for the last two years of undergraduate work. The applicant must have completed 18 semester credits of upper-division undergraduate physics.

Degree Requirements

A minimum of 30 graduate credits is required including a minimum of 15 credits (excluding thesis) in 700-level courses and six hours of research for thesis credit. A final oral exam is required on course work and thesis. A GPA of 3.00 or better is required on all course work that is part of the degree program.

Physics Ph.D.

Admission Requirements

Applicants must meet the usual admission requirements of the Master of Science program at UNLV. In addition, applicants seeking direct admission to the doctoral program without a previously earned Master of Science degree must have a score in the 65th percentile or above on the Advanced Physics portion of the GRE before admission. Applicants with a bachelor's degree in physics must have a minimum GPA of 3.00 for all undergraduate work or a 3.25 GPA for the last two years of undergraduate work, and a

minimum of 18 credits of upper-division physics. Applicants with a master's degree in physics must have at least 15 credit hours of graduate-level course work in physics with a grade of B or better and a 3.25 GPA in the master's program.

Degree Requirements

A total of 60 graduate credits past the bachelor's level, including the following:

1. A minimum of 36 graduate-level semester credits in physics or related fields (excluding doctoral dissertation and graduate seminar), which must include the following core courses:
 - PHYS 711 - Electromagnetic Theory I
 - PHYS 712 - Electromagnetic Theory II
 - PHYS 721 - Quantum Theory I
 - PHYS 722 - Quantum Theory II
 - PHYS 700 - Mathematical Physics ISix of the 36 credits must be taken in the fourth or fifth year. Course work used to satisfy the requirements for a master's degree may be included. A minimum grade of B- is required in each course. An overall GPA of 3.00 or better is required on all course work that is part of the degree program. Course work taken outside the Physics Department must have departmental approval.
2. Six credits of PHYS 796 - Graduate Seminar including three acceptable presentations by the student
3. A minimum of 18 semester credits of: PHYS 799 - Doctoral Dissertation
4. Satisfactory performance on a written qualifying examination on advanced undergraduate physics and a satisfactory score on the GRE Advanced Physics examination. Successful candidates to the doctoral program must have satisfactory scores (generally 50 percent or better) on the GRE Advanced Physics test. Both of these requirements must be fulfilled during the first two years in the graduate program.
5. A dissertation of high quality.
6. Satisfactory performance on a final examination that will consist of an oral defense of the dissertation.

Notes: A student who enters the doctoral program with a master's degree must satisfy all of the above requirements numbered 1-6. The exact number of graduate semester credit hours past the master's degree will depend upon the quality of the student's preparation and the rate of progress during research.

All courses used to satisfy the course work requirement (listed as 1 above) must have the approval of the Department. The number of graduate credits beyond the master's level must be at least 30 and typically will be more. Each student will have a four-member advisory committee, which will carry out an annual review of the student's progress.

Examinations

There are three examinations: 1) a written qualifying examination must be passed. All students entering the Ph.D. program are required to pass a written qualifying examination administered by the department before the completion of the second full year of study. 2) A satisfactory score (generally 50 percent or better) must be achieved on the GRE Advanced Physics test before completion of the second full year of study. 3) A final oral defense of the doctoral thesis must be passed.

Dissertation

The doctoral dissertation reports the results of significant original research, performed independently by the student, written in lucid scientific prose.

Course Descriptions

Astronomy

AST 710 - Observational Astronomy Techniques

Credits 3

Techniques used in observational astronomy. Students plan and execute an observing program on a research grade telescope. Data reduction and analysis using standard professional software packages and procedures.

Prerequisites: Graduate standing.

AST 713 - Astrophysics I

Credits 3

Laws of physics applied to astrophysical situations. Notes: Major topics include solar physics, element synthesis, stellar evolution, end states of stars.

Prerequisites: Graduate standing.

AST 714 - Astrophysics II

Credits 3

Laws of physics applied to astrophysical situations. Notes: Major topics include interstellar medium, the Milky Way, active galaxies, galaxy clusters, the Big Bang.

Prerequisites: Graduate standing.

AST 721 - Astrophysics of Gaseous Nebulae and Active Galactic Nuclei

Credits 3

Theory and observations used to determine the physical conditions in gaseous nebulae (H II regions, planetary nebulae, supernova remnants, etc.) and active galactic nuclei. Formation of spectra in these regions and analysis to determine temperatures, density and chemical composition. Recent observational results also discussed. Same as (Previously known as PHYS 777.) **Prerequisites:** Graduate standing.

AST 723 - Astrophysical Fluids

Credits 3

Physics of fluids applied to astrophysical situations. Major topics include single-fluid theory, waves, shocks, fronts, magnetohydrodynamics, and plasma physics.

AST 725 - High Energy Astrophysics

Credits 3

Introduction of high energy astrophysics. Theory to understand high energy phenomena in the universe, including radiation mechanisms and various energy power sources (accretion, nuclear, spindown, magnetic). Objects include neutron stars, black holes, bursters. Brief introduction of neutrino, cosmic ray, and gravitational astrophysics.

AST 727 - Cosmology

Credits 3

Classical cosmology, the isotropic universe, gravitational lensing the age and distance scales, the early universe, observational cosmology, matter in the universe, galaxies and their evolution, active galaxies, galaxy formation and clustering, cosmic background fluctuations. Same as (Previously known as PHYS 777.) **Prerequisites:** Graduate standing.

AST 729 - Galaxies

Credits 3

Observation and theoretical basis for our current understanding of galactic astronomy. Major topics include Morphology of Galaxies, the Milky Way, equilibria of collisionless systems, spiral structure, and dark matter.

Prerequisites: Graduate standing.

AST 731 - Stellar Atmospheres: Theory, Observation, and Analysis

Credits 3

Theoretical treatment of stellar atmospheric structure and radiative transfer, state-of-the-art astrophysical analysis techniques used to derive atmospheric parameters, our current observational understanding of stellar atmospheres, special topics in stellar atmospheres (pulsation, chromospheric activity, etc.), and relevance to galactic and extragalactic astronomy. **Prerequisites:** Graduate standing.

AST 747 - Interstellar Medium

Credits 3

Physics of the interstellar medium. Overall chemical, thermal and physical state of the gas in our galaxy. Astrochemistry, cosmic rays, radiative transfer, atomic and molecular physics, thermal equilibrium, and the overall dynamics of the galaxy. Same as (Previously know as PHYS 771.) **Prerequisites:** Graduate standing.

Physics

PHYS 604 - Computational Techniques in Physics

PHYS 614 - Intermediate Laboratory II

PHYS 622 - Electricity and Magnetism

PHYS 624 - Mechanics

PHYS 626 - Physics of Solids

PHYS 631 - Nuclear and Elementary Particle Physics

PHYS 641 - Mathematical Physics I

PHYS 642 - Mathematical Physics II

PHYS 651 - Modern Scientific Instrumentation

PHYS 661 - Light and Physical Optics

PHYS 662 - Modern Optics and Photonics

PHYS 667 - Thermodynamics

PHYS 668 - Statistical Mechanics

PHYS 681 - Quantum Mechanics I

PHYS 682 - Quantum Mechanics II

PHYS 683 - Special Topics in Physics

PHYS 685 - Condensed Matter Physics

Note: Graduate credit may be obtained for courses designated 600 or above. A full description of this course may be found in the Undergraduate Catalog under the corresponding 400 number. Notes: Credit at the 600 level normally requires additional work.

PHYS 700 - Mathematical Physics I

Credits 3

Reviews and introduces various specific mathematical functions and techniques basic to the study of physics.

PHYS 701 - Mathematical Physics II

Credits 3

Reviews and introduces various specific mathematical functions and techniques basic to the study of physics.

PHYS 702 - Classical Mechanics I

Credits 3

Newtonian mechanics from an advanced point of view. Variational principles. Lagrange's and Hamilton's equations, central forces, rigid body motion, canonical transformations, Hamilton-Jacobi theory, small oscillations.

PHYS 703 - Classical Mechanics II

Credits 3

Newtonian mechanics from an advanced point of view. Variational principles. Lagrange's and Hamilton's equations, central forces, rigid body motion, canonical transformations, Hamilton-Jacobi theory, small oscillations.

PHYS 705 - Advanced Optical Systems

Credits 3

Analysis and design of complete optical systems. Light sources and detectors. Matrix methods. Characteristics and application of optical components including lenses, mirrors, fibers, filters, holographic elements, prisms, and gratings.

Apertures, stops, and pupils. Fourier optics. **Prerequisites:** Graduate standing or consent of instructor; PHYS 461 or equivalent.

PHYS 707 - Condensed Matter Theory I

Credits 3

Comparison of different band structure calculation methods. Local-density approximation. Relation of structural, transport, and optical properties to electronic structure. Properties of metals, insulators and semiconductors. Quantum theory of magnetism. **Prerequisites:** PHYS 482/682, PHYS 483/683 and graduate standing.

PHYS 708 - Condensed Matter Theory II

Credits 3

Lattice dynamics. Electron-photon interaction. Elementary excitations. Many-body effects in condensed matter physics. Superconductivity. Phase transitions. Renormalization group theory. **Prerequisites:** PHYS 707 and graduate standing.

PHYS 711 - Electromagnetic Theory I

Credits 3

General properties of vector fields with special application to electrostatic and magnetostatic fields. Solutions to boundary value problems. General electromagnetic equations and conservation theorems. Energy and momentum in the electromagnetic field. Motions of charged particles in electromagnetic fields. Electromagnetic theory of radiation electrodynamics and special relativity. Reflection, refraction, and dispersion of electromagnetic waves. **Prerequisites:** PHYS 422/622 and graduate standing.

PHYS 712 - Electromagnetic Theory II

Credits 3

General properties of vector fields with special application to electrostatic and magnetostatic fields. Solutions to boundary value problems. General electromagnetic equations and conservation theorems. Energy and momentum in the electromagnetic field. Motions of charged particles in electromagnetic fields. Electromagnetic theory of radiation electrodynamics and special relativity. Reflection, refraction, and dispersion of electromagnetic waves. **Prerequisites:** PHYS 422/622 and graduate standing.

PHYS 721 - Quantum Theory I

Credits 3

Development of quantum theory. Schrodinger equation, operators, expectation values. Matrix formalism of Heisenberg, eigenvalue problems, wave packets, conjugate variables, and uncertainty principle. Solution of wave equation for square potentials, harmonic oscillator, and hydrogen-like atoms. Perturbation theory, both time-independent and time-dependent. Degeneracy, interaction of matter with radiation, selection rules. Scattering theory,

Born approximation and other approximation methods. Dirac notation and an introduction to spin. **Prerequisites:** PHYS 482/682 and graduate standing.

PHYS 722 - Quantum Theory II

Credits 3

Development of quantum theory. Schrodinger equation, operators, expectation values. Matrix formalism of Heisenberg, eigenvalue problems, wave packets, conjugate variables, and uncertainty principle. Solution of wave equation for square potentials, harmonic oscillator, and hydrogen-like atoms. Perturbation theory, both time-independent and time-dependent. Degeneracy, interaction of matter with radiation, selection rules. Scattering theory, Born approximation and other approximation methods. Dirac notation and an introduction to spin. **Prerequisites:** PHYS 482/682 and graduate standing.

PHYS 723 - Quantum Optics

Credits 3

Properties of light, its creation, and its interaction with matter explored as quantum-mechanical phenomena. Quantization of the light field. Quantum theory of coherence. Dissipation and fluctuations. Light amplification. Nonlinear optics. **Prerequisites:** PHYS 622 and PHYS 682/721, or consent of instructor.

PHYS 724 - Laser Applications: Interaction with Matter

Credits 3

Laser principles. Introduction to laser spectroscopy, isotope separation, and trace element analysis. Laser induced fusion. Laser induced plasmas and their radiation. **Prerequisites:** Graduate standing or consent of instructor.

PHYS 725 - Spectroscopy

Credits 3

Survey of spectroscopy, including absorption and emission spectroscopy, classical grating spectroscopy, laser spectroscopy, Raman spectroscopy, and Fourier transform spectroscopy. Intensities, sensitivity limits, and resolution. High-resolution and ultra-high-resolution spectroscopy. Photon correlation spectroscopy. Analysis of spectra. **Prerequisites:** PHYS 461/661, 481/681 and graduate standing.

PHYS 726 - Advanced Quantum Theory

Credits 3

The Dirac equation, hole theory, second quantization, Feynman diagrams, self-energy, vacuum polarization, renormalization, QED effects in high-Z atoms, path integral methods in field theory. **Prerequisites:** PHYS 722 and graduate standing.

PHYS 727 - Advanced Topics in Semiconductor Devices I

Credits 3

Topics of current interest in solid state electronic devices: physics of semiconductors, thermal and optical and

electronic properties of semiconductors, bipolar junction devices, field effect devices, surface related effects, optoelectronic devices, semiconductor lasers. Applications and the design of circuits using these devices. Intended for electrical and electronic engineers, physicists, and qualified senior students in engineering and physics. **Prerequisites:** PHYS 411 and 683, or EEG 414 and 420, and consent of instructor.

PHYS 728 - Applications of Group Theory in Quantum Mechanics

Credits 3

Abstract group theory, theory of group representations, and direct product theory. Relationship to quantum mechanics; applications to atomic, molecular and solid state physics. Time-reversal symmetry, continuous groups, and the symmetric group. **Prerequisites:** PHYS 482/682 and graduate standing.

PHYS 731 - Statistical Physics I

Credits 3

Liouville's theorem, ensembles, Boltzmann and Gibbs methods. Non-ideal gases, cluster expansions, theory of condensation. **Prerequisites:** PHYS 467, 468 and graduate standing.

PHYS 732 - Statistical Physics II

Credits 3

Quantum statistical mechanics, Fermi-Dirac and Bose-Einstein statistics. Phase transitions. Fluctuations. **Prerequisites:** PHYS 731 and graduate standing.

PHYS 741 - Atomic and Molecular Theory

Credits 3

Hartree-Fock theory, many-body perturbation theory, relativistic effects, energy levels, oscillator strengths, bound-continuum processes, Born-Oppenheimer approximation for molecules, symmetries, selection rules. **Prerequisites:** PHYS 721 and graduate standing.

PHYS 771 - Advanced Topics in Experimental and Theoretical Physics

Credits 3

Consists of lectures dealing with experimental and theoretical aspects of one of the fields listed. a) Electrodynamics. b) Fluid mechanics. c) Plasma physics. d) Quantum theory. e) Nuclear physics. f) Atomic and molecular physics. g) Electron and ion physics. h) Low-temperature physics. i) Solid and/or liquid state. k) Cosmic rays. l) Relativity. m) Elementary particles. p) Astrophysics. r) Atmospheric Physics. s) Geophysics. t) Applied Optics. Notes: May be repeated for credit in different fields to a maximum of 12 credits. **Prerequisites:** Depends on particular topic, consult instructor.

PHYS 777 - Advanced Special Problems

Credits 1 – 6

Special study of advanced topics not specifically covered in listed courses. Notes: May be repeated to a maximum of six credits. **Prerequisites:** Prior conference with instructor.

PHYS 781 - Thesis Research

Credits 1

Research leading to master's level program prospectus. Notes: May be repeated but only one credit can be applied to the student's program. Grading S/F grading only.

Prerequisites: Enrollment in the M.S. Program.

PHYS 782 - Dissertation Research

Credits 1

Supervised research prior to advancement to candidacy in the doctoral program. Notes: May be repeated but only two credits can be applied to the student's program. A maximum of one credit is allowed per semester. Grading S/F grading only. **Prerequisites:** enrollment in the doctoral program.

PHYS 796 - Graduate Seminar

Credits 1

Students required to give presentations on topics outside their Ph.D. work and to discuss the presentations. Presentations by graduate students given on a regularly scheduled basis, last about an hour, and given at the nonspecialist level. Notes: A total of three acceptable presentations in three different semesters during the six semesters of enrollment required. May be repeated to a maximum of six credits. **Prerequisites:** Graduate standing.

PHYS 797 - Thesis

Credits 3 – 6

Notes: May be repeated but only six credits will be applied to the student's program. Grading S/F grading only.

PHYS 799 - Doctoral Dissertation

Credits 3 – 6

Doctoral dissertation.

Notes: May be repeated. A minimum of 18 credits required for the degree. **Prerequisites:** Qualifying exam and approval by department.

Water Resources Management

Director

Charalambos Papelis

(1994), Associate Research Professor; B.S., National Technical University, Athens, Greece; M.S., Ph.D., Stanford University.

Graduate Faculty

Faculty participating in the Water Resources Management Graduate Program (WRM) are affiliated with several different colleges, departments, and centers of UNLV and the NSHE. Researchers from governmental or private agencies may also participate as adjunct faculty. A list of participating faculty can be found at the website of the WRM Graduate Program at <http://sciences.unlv.edu/wrm>.

The Water Resources Management Program is a flexible, interdisciplinary course of study leading to an M.S. degree. It is a technically and scientifically based program that blends the physical aspects of the hydrologic sciences, in a broader sense, with policy and management issues in hydroscience. People with degrees in physical, biological, or natural sciences and engineering and those with degrees in the social sciences, management, environmental studies, or related disciplines are encouraged to apply to the program. Working together, the student and faculty advising committee will design specific courses of study or thesis topics such that all students will strengthen their understanding of hydrologic sciences and water management while also developing technical skills.

The Water Resources Management Graduate Program is housed in the College of Sciences and encourages multidisciplinary study and research with participating faculty at UNLV from the colleges of Sciences, Business, Urban Affairs, Engineering, and Liberal Arts and participating faculty at the Harry Reid Center for Environmental Studies (HRC) on the UNLV campus, the Desert Research Institute (DRI), and the University of Nevada, Reno (UNR). Adjunct participating faculty may also be with the U.S. Environmental Protection Agency (EPA), the U. S. Geological Survey (USGS), Department of Energy (DOE), Las Vegas Valley Water District (LVVWD), the Bureau of Reclamation (BOR) or other governmental or private agencies.

Water Resources Management M.S.

Admission Requirements

The deadline for fall semester application is February 1. The deadline for spring semester application is October 1. Applicants to the program must hold a B.S. or B.A. degrees in the physical, natural or social sciences, business, management, or a related field.

1. A minimum overall undergraduate grade point average of 3.00.
2. Submission of an application, as well as official transcripts of all college-level course work to the Graduate College. Send the following (items 3-6) to:
Graduate Admissions Committee
Water Resources Management Program
University of Nevada Las Vegas
4505 S. Maryland Parkway, Box 454029
Las Vegas, NV 89154-4029

3. Copies of all transcripts sent to the Graduate College.
4. Satisfactory scores on the Graduate Record Exam. This requirement may be waived in the case of candidates with exceptional professional experience.
5. Three letters of recommendation from individuals competent to comment on the applicant's promise as a graduate student.
6. A letter of application stating the student's interests and goals.

Degree Requirements

Because of the interdisciplinary nature of the Water Resources Management Graduate Program, students are encouraged to select courses from different departments that would strengthen their background and help them achieve their research and educational goals. Students must develop their course work program with the consent of the advisor and the student's advisory committee. Courses from different colleges and departments may be incorporated into the student's program of study. Students should consult the listings of individual departments.

Thesis Option

1. Course Work
 - a. One required course: WRM 706 - Research Methods in Water Resources Management
 - b. Six credits in Hydrologic Sciences courses required (GEOL or CEE courses)
 - c. Three additional credits in Science, mathematics, or engineering courses required (see listing of BIO, CEE, CHEM, GEOL, MAT, MEG, PHYS, or STA courses)
 - d. Nine credits in Management, public administration, economics, law, or political science courses required (see listing of ECO, EPS, ENV, HIS, LAW, MGT, MIS, POS, or PUA courses)
 - e. Six credits of Electives (see listing of BIO, CEE, CHEM, ECO, EPS, ENV, GEOL, HIS, LAW, MAT, MEG, MGT, MIS, PHYS, POS, PUA, or STA courses)
2. Thesis: WRM 798 – Thesis (required credits: 6)
3. Final Examination: There will be a final examination that will include a comprehensive oral examination.
4. Total semester credit hours: 33 credits

Non-thesis Option

1. Course Work
 - a. One required course WRM 706 - Research Methods in Water Resources Management
 - b. Six credits in Hydrologic sciences courses required (GEOL or CEE courses)
 - c. Six additional credits in Science, mathematics, or engineering courses required (see listing of BIO, CEE, CHEM, GEOL, MAT, MEG, PHYS, or STA courses)
 - d. Twelve credits in Management, public administration, economics, law, or political science

- courses required (see listing of ECO, EPS, ENV, HIS, LAW, MGT, MIS, POS, or PUA courses)
- e. Six credits of electives (see listing of BIO, CEE, CHEM, ECO, EPS, ENV, GEOL, HIS, LAW, MAT, MEG, MGT, MIS, PHYS, POS, PUA, or STA courses)
2. Professional paper: WRM 796 - Professional Paper in WRM (required credits: 3)
 3. Total semester credit hours: 36 credits

Notes: A minimum of 15 credit hours must be in 700-level courses for both degree options. A 3.00 grade point average is required in all course work used in the degree program.

Course Descriptions

WRM 706 - Research Methods in Water Resources Management

Credits 3

Discussion of the processes of scientific research and research design as applied to modern water resources management. Includes scientific approaches to field and laboratory research, research and professional ethics, writing, and public presentation. Model thesis prospectus and grant proposals prepared. **Prerequisites:** Graduate standing or consent of instructor.

WRM 790 - Special Topics in Water Resources Management

Credits 1 – 3

Topics selected and published in the class schedule.

Notes: May be repeated to a maximum of nine credits.

Prerequisites: Consent of instructor.

WRM 791 - Independent Study

Credits 1 – 3

Review of recent literature in a specialized area related to water resources. Notes: May be repeated to a maximum of four credits. **Prerequisites:** Consent of instructor.

WRM 796 - Professional Paper in WRM

Credits 1-6

Professional paper preparation, including review of literature or similar research effort.

Notes: May be repeated to a maximum of three credits. Not permitted for students pursuing the M.S. Thesis option.

Prerequisites: Consent of instructor.

WRM 798 - Thesis

Credits 1 – 3

Enrollment by consent of research director only. Notes:

May be repeated for credit with cumulative maximum of six credits allowed toward degree program. Grading S/F grading only.

INDEX

A

About UNLV, 7
Academic Integrity, 16
Academic Policies, 16
Accounting, 30
Accounting M.S., 31
Accounting, Advanced Graduate Certificate, 32
Accounting, Graduate Certificate, 32
Addiction Studies Certificate, 64
Adding or Dropping Classes, 14
Administrative Drops and Classroom Conduct, 19
Admission & Registration Information, 11
Admission Process, 12
Admission Requirements, 11
Admission Requirements and Procedures for International Applicants, 11
Admission Status and Classification of Students, 13
Advancement to Candidacy, 23
Allied Health Sciences, School of, 215
Alumni Association Scholarships, 29
Annual Jeanne Clery Campus Safety and Security Report, 1
Anthropology, 296
Anthropology M.A., 297
Anthropology Ph.D., 298
Application for Graduation, 23
Application Procedures for Domestic and International Applicants, 11
Architecture, School of, 183
Art, 189
Astronomy M.S., 393
Astronomy Ph.D., 394
Audit Fee, 24

B

Barrick Graduate Fellowships, 28
Biochemistry M.S., 360
Biological Sciences M.S., 377
Biological Sciences Ph.D., 378
Biomedical Engineering M.S.B.E., 173
Board of Regents, 1
Business Administration, 33
Business Administration & Dental Medicine Dual M.B.A./D.M.D., 36
Business Administration & Hotel Administration Dual M.B.A./M.S., 36
Business Administration & Juris Doctor Dual M.B.A./J.D., 37
Business Administration & Management Information Systems Dual M.B.A./M.S., 38
Business Administration Executive E.M.B.A., 39
Business Administration M.B.A., 40
Business Administration, The Master of, 35

C

Cancellation of Courses and Programs, 15
Cancellation of Registration, 15
Change of Department, 13
Chemistry, 359
Chemistry M.S., 360
Civil & Environmental Engineering, 138
Clinical Mental Health Counseling M.S., 64
Clinical Psychology, 334
College of Business, 30
Commencement, 24
Communication Studies, 401
Communication Studies M.A., 401
Community Health Sciences, School of, 233

Comprehensive and Final Examinations, 22
Computer Science M.S.C.S., 148
Computer Science Ph.D., 149
Computer Science, School of, 148
Conditional Admission, 13
Construction Management, 154
Construction Management M.S.C.M., 154
Continuous Enrollment, 18
Counselor Education, 62
Counselor Education, Advanced Graduate Certificate Programs, 63
Course Numbers, 15
Creative Writing M.F.A, 306
Credit Requirements, 17
Credit toward Degree, 17
Criminal Justice, 403
Criminal Justice Professional M.A, 404
Criminal Justice Traditional M.A., 405
Curriculum & Instruction, 67
Curriculum & Instruction Ed.D., 72
Curriculum & Instruction Ed.S., 72
Curriculum & Instruction M.Ed. & M.S., 70
Curriculum & Instruction Ph.D., 73

D

Deferred Payment Option, 26
Degree Programs, 4
Delinquent Accounts, 26
Dental Medicine, School of, 248
Disclosures, 1
Doctoral Degree Students, 18
Dropping/Withdrawing From Classes, 14
Dual Degrees
 M.B.A. or M.I.S. & M.S. in Hotel Administration, 263

E

Economics, 47
Economics M.A., 47
Education, College of, 60
Educational Leadership, 89
Educational Leadership Ed.D. in PK-12 Education Leadership, 92
Educational Leadership Ed.S., 92
Educational Psychology, 106
Educational Psychology & Juris Doctor Dual Ph.D./J.D., 107
Educational Psychology M.S., 108
Educational Psychology Ph.D., 108
Electrical & Computer Engineering, 157
Electrical Engineering M.S.E.E., 158
Employment, 29
Engineering M.S.E., 139
Engineering Ph.D., 140
Engineering, Howard R. Hughes College of, 137
English, 305
English Ph.D., 308
Environmental & Occupational Health, 238
Environmental & Occupational Health M.P.H., 238
Environmental and Public Affairs, School of, 408
Environmental Studies, 408
Equal Opportunity Statement, 9
Ethics and Policy Studies, 328
Ethics and Policy Studies M.A., 329
Executive Crisis and Emergency Management M.S., 412
Executive Leadership Cohort Ed.D., 93
Exercise Physiology M.S., 220
Experimental Psychology, 336

F

Federal Direct Stafford Loans, 27
Federal Loan Programs, 27
Federal Perkins Loans, 27

Federal Work Study, 29
Film, 191
Final Research/Creative Documents, 21
Finance, 51
Finance Graduate Certificate, 51
Financial Assistance, 27
Fine Arts, College of, 183
Foreign Languages, 313
Foreign Languages M.A., 314
Forensic Social Work Certificate, 427

G

Geoscience, 366
Geosciences M.S., 367
Geosciences Ph.D., 369
Good Neighbor Counties, 25
Good Neighbor Regulations for Reduced Nonresident Tuition, 24
Grade Changes, 16
Grade Point Average, 18
Grading System, 15
Graduate and Professional Student Association, 10
Graduate Assistantships, 27
Graduate College, The UNLV, 9
Graduate Credit, 17
Graduate Program Examinations, 22
Graduate Provisional, 13
Graduate Scholarships and Fellowships, 28
Graduate Standing, 13
Graduate Tuition and Fees, 24
Graduation Procedures, 23
Granting of Degrees, 23
Grants-in-Aid, 26
Group Health and Accident Insurance Fee, 25

H

Health Care Administration & Policy, 241
Health Care Administration M.H.A., 242
Health Physics & Diagnostic Sciences, 215
Health Physics M.S., 216
Health Promotion, 244
Health Promotion M.Ed., 245
Health Sciences, Division of, 215
Higher Education Leadership M.Ed., 94
Higher Education Leadership Ph.D., 94
History, 317
History M.A., 320
History Ph.D., 318
Hospitality Administration - Executive Program (Online) M.H.A., 264
Hospitality Administration Ph.D., 266
Hotel Administration M.S., 267
Hotel Administration, William F. Harrah College of, 261

I

I or Incomplete Grade, 15
Immunization Requirement, 14
Informatics M.S., 168
Informatics Ph.D., 169
Informatics, School of, 168

J

James F. Adams/GPSA Scholarships, 29
Job Location and Development, 29
Journalism & Media Studies M.A., 419
Journalism & Media Studies, Hank Greenspun School of, 419
Juris Doctor Dual Programs, 281
Juris Doctor/Doctor of Philosophy in Education (JD/PhD), 283
Juris Doctor/Master of Business Administration (JD/MBA), 281

K

Kinesiology & Nutrition Sciences, 219
Kinesiology M.S., 220

L

Law, William S. Boyd School of, 279
Learning & Technology Ph.D., 109
Leave of Absence, 18
Liberal Arts, College of, 296
Life Sciences, School of, 376
Limitation on Credit Load, 18

M

Management, 52
Management Information Systems, 54
Management Information Systems & Business
Administration Dual M.S./M.B.A., 54
Management Information Systems & Hotel Administration
Dual M.S., 55
Management Information Systems M.S., 57
Management, Graduate Certificate in, 52
Marriage & Family Therapy, 421
Marriage & Family Therapy Certificate, 422
Marriage & Family Therapy M.S., 423
Master 's Degree Students, 18
Mathematical Sciences, 382
Mathematical Sciences M.S., 383
Mathematical Sciences Ph.D., 385
MBA Program, Accelerated, 41
McNair Post-Baccalaureate Scholarship, 28
Mechanical Engineering, 171
Mechanical Engineering M.S.E., 177
Mechanical Engineering Ph.D., 178
Mental Health Counseling Certificate, 64
Music, 193
Music M.M., 194
Musical Arts D.M.A., 196

N

Neal J. Smatresk, Message from the UNLV President, 2
Nevada Residency, 14
Nevada Residency for Tuition Purposes, 24
Nevada Residency, Applying for, 24
Nevada System of Higher Education, 1
New Venture Management Graduate Certificate, 53
Non-Degree Student, 14
Nonprofit Management Certificate, 413
Nonresident Tuition, 24
Nursing Education Post-Masters Certificate, 256
Nursing M.S.N., 251
Nursing Ph.D., 254
Nursing, School of, 249

O

On-Campus Employment, 29
Oral Defense, 23

P

Pediatric Nurse Practitioner Certificate, 256
Physical Therapy, 224
Physical Therapy D.P.T., 224
Physics & Astronomy, 392
Physics M.S., 394
Physics Ph.D., 394
Political Science, 326
Political Science M.A., 327
Political Science Ph.D., 328
President's Graduate Fellowships, 28
Probation and Separation, 18
Professional or Scholarly Papers or Projects, 22
Program Accreditations, 7
Psychology, 334
Psychology Ph.D., 334

Public Administration, 411
Public Administration M.P.A., 413
Public Health M.P.H., 234
Public Health Ph. D., 235
Public Management Certificate, 414

Q

Qualifying Examinations, 22
Qualifying for Nevada Residency, 24

R

R.N. to M.S.N. Pathway, 250
Radiochemistry Ph.D., 362
Recreation & Sport Management, 276
Refund of Fees, 26
Registration Policies, 14
Repeat Policy, 15
Requirements for Domestic Applicants, 11
Research & Graduate Studies, Division of, 9
Reserving Courses for Graduate Credit, 14
Residence Credit Requirement, 17
Residency Decisions, 24
Revocation of Admission, 13
Room and Board Refund, 26

S

S or F (Satisfactory or Failing) Grades, 16
Scholarships, 29
School Counseling M.Ed., 64
School Psychology, Education Specialist in, 107
Sciences, College of, 358
Second Admission or Readmission to the Graduate College,
13
Services for Graduate Students, 10
Six-Year and Eight-Year Policy, 18
Social Work & Juris Doctor Dual M.S.W./J.D., 428

Social Work M.S.W., 429
Social Work, School of, 426
Sociology, 342
Sociology (Bachelor's to Doctorate Program) Ph.D., 342
Sociology (Post - M.A. Program) Ph.D., 346
Sociology M.A., 348
Spanish, Hispanic Studies M.A., 314
Special Education, 116
Special Education Ed.D., 118
Special Education Ed.S., 118
Special Education M.Ed./M.S., 117
Special Education Ph.D., 120
Special Fees and Charges, 25
Sport and Leisure Service Management M.S., 276
Sports Education Leadership, 131
Sports Education Leadership M.Ed., 131
Sports Education Leadership M.S., 132
Sports Education Leadership Ph.D., 133
Student Financial Services, 27
Student Health Fee, 25
Summer Session Scholarships, 29
Symbols, Grade, 15

T

Teacher Education Ph.D., 74
The Degree Program, 21
Theatre, 207
Theatre M.A., 208
Theatre M.F.A., 208
Thesis and Dissertation, 21
Transcripts of Credit, 16
Transfer Credit Limitations: After Admission and
Enrollment, 17
Transfer Credit Limitations: Prior to Admission and
Enrollment, 17
Transfer Work, 13
Transportation M.S.T., 141

Tuition & Fees, 24

Undergraduates Taking Graduate-Level Courses, 14

U

Unit of Credit, 15

Urban Affairs, Greenspun College of, 400

W

Water Resources Management, 398

Water Resources Management M.S., 399

Web Resources, 6

Women's Studies, 355

Workforce Education & Development M.S. or M.Ed., 96

X

X (Hold) Grade, 16

Y

Your Graduate School Experience, 10