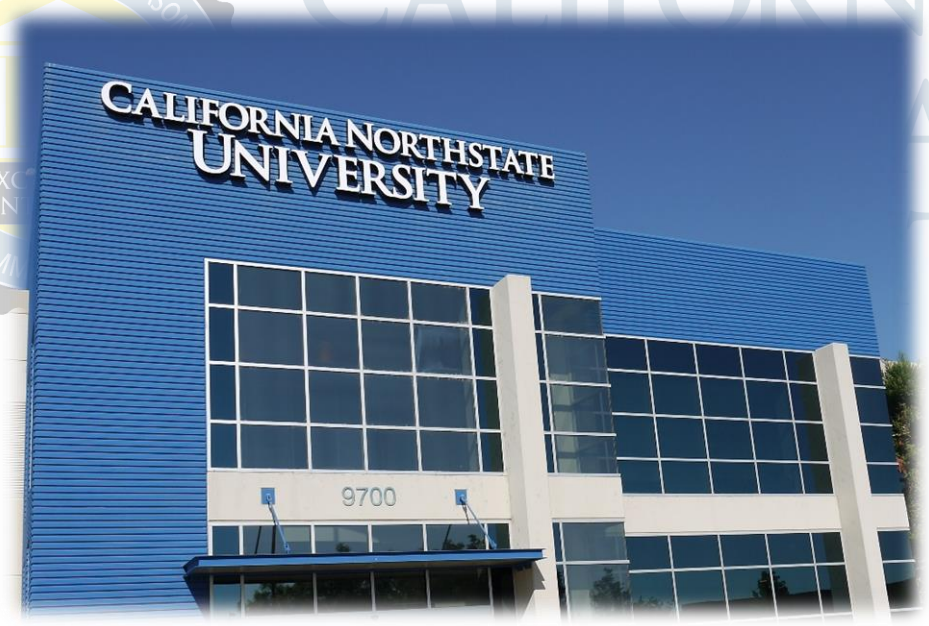
CALIFORNIA NORTHSTATE UNIVERSITY

MASTER of PHARMACEUTICAL SCIENCES

Master of Science in Pharmaceutical Sciences



Student Handbook

2018-2019

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Introduction

Advances in biotechnology have significantly increased the need for pharmaceutical scientists with comprehensive knowledge and diverse skills than a typical specific subject program can provide. The Pharmaceutical Sciences Master Program (MPS) at the California Northstate University (CNU) provides rigorous background in a range of scientific disciplines that are critical to the preparation of the next generation of pharmaceutical scientists. Situated in Northern California, CNU is surrounded by over 700 biotechnology/pharmaceutical companies, with proximity to Silicon Valley – one of the world's leading technology innovation centers. Graduates with a Master of Pharmaceutical Sciences from CNU can look forward to abundant job opportunities in a variety of public and private settings, including research and development, drug manufacturing, and regulatory affairs, or to continuing on to PhD, PharmD and MD programs.

MPS at CNU is a unique program integrated with the Colleges of Pharmacy and Medicine. With over 20 faculty members from a variety of disciplines, the MPS program prepares students with integrated pharmaceutically-relevant aspects of classical disciplines and applications in drug discovery and development with unique clinical and therapeutic perspectives. The MPS at CNU has designed a flexible Master Program to prepare students for a wider spectrum of professional career in pharmaceutical sciences fields and leadership roles in industry while also providing them with the opportunity to strengthen their fundamental knowledge and obtain a hands on skills in research.

Accepted graduate applicants commonly have strong scientific backgrounds, a passion for pharmaceutical sciences/biotechnology and in many cases ample laboratory experience. Students with undergraduate degrees in the chemistry, biological sciences, and related fields are encouraged to apply.

Mission Statement

To advance the science of pharmaceutical research by developing future scientists trained to promote health through knowledge, research, and social responsibility

Vision

Preeminence in pharmaceutical sciences research, drug development skills, and integrated education abilities

Faculty Profiles

Dr. Zhuqiu (James) Jin, PhD

Zhuqiu Jin is an Associate Professor in the Department of Pharmaceutical & Biomedical Sciences at the California Northstate University College of Pharmacy. He obtained his M.S. degree in Pharmacology from Shenyang Pharmaceutical University and a Ph.D. degree in Pharmacology from Central South University. Dr. Jin was a postdoctoral scholar at the University of California, San Francisco exploring the effects of sphingolipids in cardioprotection. Prior to joining California Northstate University, Dr. Jin taught Pharmacology for Pharm.D. students and Ph.D. graduate students and carried out cardiovascular research as a faculty member at South Dakota State University.

Dr. Jin's research interest is focused on sphingolipid signaling pathway in cardiac fibrosis and remodeling. To uncover the cross-talk between immune cells and cardiac myocytes or fibroblasts in myocardial injury is the major field that Dr. Zhuqiu Jin is exploring.

Dr. Hongbin Wang, PharmBS, MS, PhD

Hongbin Wang is an Assistant Professor in the Department of Pharmaceutical & Biomedical Sciences at California Northstate University College of Pharmacy (CNUCOP). He received his Ph.D. from University of Pennsylvania, Department of Pharmacology. After receiving his doctoral degree, Dr. Wang worked as a Postdoctoral Researcher in the Department of Systems Pharmacology and Translational Therapeutics and a Senior Research Investigator in the Department of Pathology & Laboratory Medicine, University of Pennsylvania Perelman School of Medicine. During his time at PennMedicine, Dr. Wang supervised multiple undergraduates, graduates and postdoctoral researchers.

Dr. Wang is interested in studying: 1), interaction of complement activation fragment C4a with protease-activated receptor (PAR) 1/4 G protein-coupled receptors (GPCRs) and their roles and signaling pathways in the initiation and progression of complement related diseases. 2), the function and regulation of protein kinase C enzymes (PKCs), the receptors for the phorbol ester tumor promoters and the second messenger diacylglycerol (DAG), an important intracellular mediator of proliferation and malignant transformation. 3), chimaerins, novel phorbol ester/DAG receptors with Rac-GAP activity toward Rac that is a small GTPase-binding protein that regulates gene expression, cell cycle progression, actin cytoskeleton organization, cell adhesion and migration.

Dr. Ahmed El-Shamy

Dr. Ahmed Elshamy is an assistant professor of virology at California Northstate University. In 1999, Dr. Elshamy received a DVM from faculty of Vet. Medicine Suez Canal University, Egypt. In 2009, he received a PhD in Molecular Virology at Kobe University, Japan, where he also awarded two years post-doctoral fellowship. From Oct. 2011 to Dec. 2017, Dr. Elshamy joined Division of Liver Diseases at Mount Sinai School of Medicine, New York as a senior post-doctoral fellow. During his Ph.D and post-doctor studies, Dr. Elshamy published 25 publications in high impact peer-viewed journal. He is the first author in 10 publications; three of them have been published in the highest journals of liver field (two in Hepatology

and one in Journal of Hepatology). Over the course of these studies, Dr. Elshamy has established a global network with world-leading virology researchers. In 2014, Dr. Elshamy received Japan Society for the Promotion of Science (JSPS) Award; and in 2013, he received The Encouragement State Prize in Medical Sciences from the Academy of Scientific Research and Technology, Egypt. His PhD study was selected as the Medical School Excellent Paper for the 2008-2009 Academic Year from Kobe University, Japan (El-Shamy et al., Hepatology. 2008; 48:38-47).

As assistant lecturer at faculty of Vet. Medicine Suez Canal University, Egypt, Dr. Elshamy was responsible to teach the Diagnostic Virology course to post graduate students from 2001 – 2005. In 2004, he was awarded the best Teaching Assistant Trainee completing Teaching Skills Courses, Suez Canal University, Egypt. During his post-doctoral training at Kobe University and Mount Sinai School of medicine, Dr. Elshamy trained several medical, master and Ph.D students on molecular virology techniques, especially isolating the virus on tissue culture.

Liver cancer is the second leading cause of site-specific cancer-related death worldwide and the most rapidly increasing cause of cancer-related death in North America. Hepatitis B and C viruses are the leading risk factors of liver cancer development. Therefore, Dr. Elshamy's research focuses on investigating the biology underlying cellular pathways disrupted by oncogenic HBV and HCV strains using novel cell culture system that was recently established by Dr. Elshamy's team (El-Shamy et al., J. Hepatology 2016). This research plan aims eventually to identify novel viral markers for liver cancer and novel targets for liver cancer therapy. In addition, Dr. Elshamy will use the newly established cell culture-based system as an efficient platform for high throughput screening of novel therapies for liver cancer.

Dr. Elshamy's research plan will open several doors to (i) use stat-of-art research techniques (including RNA-seq, Single cell sequencing, Mass cytometry-CyToF and next generation sequencing), (ii) train and mentor both under graduate and graduate students, and (iii) collaborate with multidisciplinary teams.

Dr. Simeon Kotchoni, PhD

Dr. Kotchoni is an associate professor in the Department of Pharmaceutical and Biomedical Sciences at California Northstate University, College of Pharmacy (CNUCOP). Prior to joining CNUCOP, he was an assistant Professor at Rutgers University, Camden, New Jersey (2011-2017). He received his B.S. and MS in Biochemistry and Cell Biology from University of Abomey Calavi, Benin, and another MS in Microbiology from Obafemi Awolowo University, Ile-Ife, Nigeria. He received his Ph.D. from the University of Bonn, Germany, where he study the role of Aldehyde Dehydrogenase (ALDH) Gene superfamily in a model plant, Arabidopsis thaliana. After his Ph.D., Dr. Kotchoni has worked as a postdoctoral researcher in Europe (Bonn, Germany), and USA (West Virginia University and Purdue University), using interdisciplinary research techniques, including molecular genetics, cell biology, proteomics, transcriptomics, metabolomics to understand the molecular and cellular mechanisms of growth development and environmental adaptation of organisms.

The Kotchoni laboratory studies health benefits of natural products, especially, medicinal plants, and micororganisms. We focus on understanding the molecular and clinical effects of natural-derived compounds on chronic diseases and developing botanical therapeutics for health

promotion and wellness. Our work extends to worldwide research collaborations on drug discovery and development. Drug discovery from natural products represents a re-visited area of active interest. In a multi-disciplinary investigator collaboration, our laboratory is currently developing small molecules from natural products against diabetes, Hepatitis B Virus, prostate, brain, breast and colon cancers with limited or no side effects.

Dr. Catherine Yang, PhD

Dr. Yang is a Professor of Molecular Pharmacology at the Department of Basic Science of College of Medicine of California Northstate University (CNU). Before joining CNU, Dr. Yang was a biochemistry/pharmacology Professor in the Department of Chemistry and Biochemistry at Rowan University for 23 years. She also held Professorships at Cooper Medical School of Rowan University in the Departments of Chemistry and Biochemistry and Translational Biomedical Sciences. While at Rowan, Dr. Yang served as the Chairperson for the Department of Chemistry and Biochemistry from 2007 to 2016 and the Director for the Biochemistry Program from 2000 to 2007. She has held research and faculty positions at Harvard Medical School, the American Health Foundation, Boston Biomedical Research Institute, Tokyo University of Medicine and Dentistry, University of Pennsylvania and Zhejiang University of Technology.

Dr. Yang has made strong contributions in elucidating mechanisms of tumor progression, and in the development of novel cancer drugs and antibiotics. She has led research groups studying proteolytic regulatory mechanisms in the advanced stages of prostate cancer, lung cancer and leukemia. Her in-depth research on type 2 diabetic metabolic regulation led to a dual function diabetes drug patent. Dr. Yang's immunological research resulted in an allergy vaccine development that is currently under clinical trials at affiliated clinics. The specific approach of triggering induction of immunologic tolerance to external or autologous allergens, and induction of sensitization to infectious or tumor antigens, with targeted tissue delivery of particles sized to facilitate uptake by specific cell populations, will provide unique therapeutic platform for curing advancement stage cancer. Dr. Yang's unique predictive biomarker studies have also spurred a nano-sensor development for an early cancer diagnosis.

Dr. Yang has published more than 60 research papers, several biotechnology books, and is an inventor of several patented inventions. She has also secured numerous grants from the NIH, NSF, Research Corporation and New Jersey Health Foundation as well as funding from many corporations and health foundations. She serves on various review boards of federal, private and health foundation funding agencies.

Dr. Ruth Vinall, PhD

Ruth Vinall is an Associate Professor in the Department of Pharmaceutical & Biomedical Sciences at California Northstate University College of Pharmacy (CNUCOP). She received her Ph.D. from Cardiff University, U.K., Department of Anatomy. After receiving her doctoral degree, Dr. Vinall worked as a postdoctoral researcher at UC Davis Medical Center. In 2009 Dr. Vinall completed a NIH K30 program-funded M.A.S. degree in Clinical Research at UC Davis and was subsequently appointed as a research faculty in the Department of Urology. During her time at UC Davis Dr.

Vinall supervised multiple undergraduate, graduate and medical students, and in 2009 and 2010 was awarded Outstanding Mentor awards for her work with the UC Davis CURE program.

Dr. Vinall's research focuses on prostate and bladder cancer research. She recently received an NIH R15 grant entitled 'Role of the AR-Nrdp-1-ErbB3 axis in mediating prostate cancer health disparities'. In addition to prostate cancer health disparities research, she is interested in determining mechanisms of chemoresistance and identifying biomarkers that can predict patient's response to chemotherapy, a primary focus is miRNA research.

Dr. Valerie Gerriets, PhD

Prior to joining the CNSU faculty, Dr. Valerie Gerriets received her PhD from the Pharmacology and Cancer Biology department at Duke University, examining T cell metabolism in the context of autoimmune and inflammatory disease. During graduate school, she also obtained a certificate in college teaching and participated in the Duke Scholars in Endocrinology and Metabolism program. Dr. Gerriets then completed a postdoctoral fellowship in the Pediatric Endocrinology division at Duke, as well as serving as the instructor of a pharmacology course at Duke. She now teaches a broad range of pharmacology topics at CNUCOM.

Dr. Ishwarlal (Kenny) Jialal, MBChB, MD

Dr. Ishwarlal Jialal graduated with the equivalent of an MD, PhD (MB.CH.B, MD) from the University of Natal Medical School, Natal, South Africa, and thereafter undertook fellowships at the Joslin Diabetes Center, Harvard Medical School, and in the Division of Endocrinology, Metabolism and Nutrition at the University of Washington in Seattle. He then joined the faculty of the University of Texas Southwestern Medical Center at Dallas in 1988 as Assistant Professor and became Professor of Internal Medicine and Pathology with tenure in 1997. He was Director of the Division of Clinical Biochemistry and Human Metabolism and was the first hold of the C. Vincent Prothro Chair in Human Nutrition Research. He then joined UC Davis Medical Center as the first holder of Robert E. Stowell Endowed Chair in Experimental Pathology, Director of the Laboratory for Atherosclerosis and Metabolic Research. On his retirement in 2016 he was Distinguished Professor of Internal Medicine, Division of Endocrinology, Diabetes and Metabolism, at the University of California, Davis, Medical Center and Staff Endocrinologist at the VA Medical Center, Sacramento. He is presently Professor of Physiology, Metabolism and Pathology at California Northstate University, College of Medicine and Staff Endocrinologist at the VA Medical Center, Mather, CA.

To date, he has published over **506** original papers and invited reviews in the areas of diabetes, atherosclerosis, lipid metabolism, nutrition and vascular biology and has a **H-Index of 73**. He has received numerous awards for his research and has served on Editorial Boards of numerous journals including the **American Journal of Clinical Nutrition, Journal of Molecular and Cellular Cardiology, Journal of Diabetes and Its Complications, and Journal of Clinical Endocrinology and Metabolism**. Dr. Jialal served as Section Editor of AJCP for **Clinical Chemistry, Associate Editor, Atherosclerosis, and Editor-in-Chief of Metabolic Syndrome & Related Disorders**. He also has a

long standing interest in hyperlipidemia and diabetes. His major research interest is in the role of inflammation in atherosclerosis, metabolic syndrome, and understanding the pathobiology of diabetic vasculopathies. His research has been funded over the years by the National Institutes of Health (NIH), American Diabetes Association, Juvenile Diabetes Research Foundation, and American Heart Association. He serves on the Grant Review Panels of the ADA and JDRF, as well as the National Institutes of Health.

Dr. Jialal has received numerous awards for his work including the VERIS Award for Nutrition Research; the Centrum Center Science for Nutrition Award, American Society of Nutritional Sciences; the International Hermes Prize for Vitamin Research; the Bennie Zak Award for Outstanding Research, Lipids and Lipoproteins Division, AACC; the Grace Goldsmith Award from the American College of Nutrition; the NIH Mid-Career Investigator Award in Patient Oriented Research, the Distinguished Scientist Award from the National Academy of Clinical Biochemistry, Recipient of the Outstanding Contributions to Clinical Chemistry in a Selected Area of Research Award of the American Association for Clinical Chemistry, the Linus Pauling Award, American College for Advancement in Medicine; Philip Levine Award, American Society of Clinical Pathology, Cooper Award, Lipoprotein and Vascular Diseases Division, AACC, Joliff Award, Division of Clinical and Diagnostic Immunology, AACC and the Garry-Labbe Award for his outstanding contributions in Nutrition , AACC and Diplomate, American Board of Clinical Lipidology . He has been listed **Best Doctors in America for 8 years** .He has been recipient of the **Pathology Teaching Award** from the residents at both UT Southwestern and UCDMC.

Dr. Eman Atef, PhD

Eman Atef is currently an Associate Professor of Pharmacokinetics and Pharmaceutics at the California Northstate University College of Pharmacy. She Joined MCPSH- University in 2006 as an Assistant Professor and acted as the Director of Pharmaceutical Sciences Program. She then got promoted to associate professor in 2011. Dr Atef joined California Northstate University College of Pharmacy in Nov 2013.

Dr. Atef has an active research group. She supervised multiple Masters, PhD and undergraduate students. Her team focuses on improving the solubility of poorly soluble small molecules using solid and lipid dosage forms as well as targeted drug delivery. She is also involved in melanoma drug delivery design. Dr Atef still holds an adjunct position at MCPSH- University, and acts as the major graduate students' advisor. She is currently collaborating with Texas Tech Medical School.

Dr. Atef is an author of multiple peer reviewed papers and acts as an editor for International Journal of Clinical Pharmacology & Toxicology and Journal of Pharmacogenomics & Pharmacoproteomics. She teaches Pharmaceutics, Industrial Pharmacy, Pharmacokinetics, Pharmaceutical Analysis, Pharmaceutical Technology, and Physical Pharmacy among other graduate and undergraduate courses.

Dr. Linh Ho, PhD

Linh Ho is an Assistant Professor in the Department of Pharmaceutical & Biomedical Sciences at the California Northstate University College of Pharmacy. She received her B.S. in Pharmacy and M.S. in Pharmaceutical Sciences from University of Medicine and Pharmacy HCMC, and a Ph.D. in Chemistry and Chemical Biology (Pharmacology) from University of California San Francisco (UCSF). Prior to joining California Northstate University, Dr. Ho continued her post-doctoral research at UCSF in regulation of mesenchymal stem cell fate, adipogenesis, and metabolism homeostasis of mitochondrial Sirtuin-3. She has been also working on molecular mechanism of mitochondrial disease (MELAS). Dr. Ho's research focuses on mitochondrial Sirtuins and signalling pathway in metabolic abnormalities, especially type II diabetes. She is exploring Anti-diabetogenic Role of a Sirtuin-3-Adipokines (Adiponectin) Axis in Adipocytes.

Dr. Eugene Kreys, PharmD, PhD, BCPS

Eugene Kreys is an Assistant Professor of Clinical & Administrative Sciences at the California Northstate University College of Pharmacy. He received his Pharm.D. from the University of Michigan College of Pharmacy in Ann Arbor. He went on to complete a pharmacy practice residency at the Hospital of the University of Pennsylvania in Philadelphia. He subsequently accepted a position as clinical pharmacist at the University of Pittsburgh Medical Center and then Medical University of South Carolina. After spending several years as a clinician Dr. Kreys returned to academia to further develop his research interests. He received a Ph.D. in Pharmaceutical Sciences from The University of Texas at Austin College of Pharmacy. Dr. Kreys has extensive experience assessing the effects of medication adherence on clinical outcomes and the impact evidence-based interventions on public health. Dr. Kreys aims to continue conducting pharmacoepidemiological and pharmacoeconomic studies relevant to today's healthcare system. Specifically, Dr. Kreys is interested in pragmatic comparative effectiveness research focusing on patients treated in a naturalistic setting, which incorporate cost-effectiveness analyses to promote the applicability to public policy and better informed treatment decisions.

Dr. Leo Fitzpatrick, PhD

Leo Fitzpatrick is the Assistant Dean of Research at the California Northstate University College of Pharmacy. He began his scientific career, by doing a post-doctoral fellowship at the University of Texas Medical School (Houston). Subsequently, Dr. Fitzpatrick was involved in drug discovery and development at three pharmaceutical companies. At Otsuka Pharmaceutical Inc. (Maryland Research Institute), he contributed to the development of Tetomilast, which advanced into phase 3 clinical trials for Inflammatory Bowel Disease (IBD). Subsequently, Dr. Fitzpatrick began a 10 year (2003-2013) faculty position at the Penn State College of Medicine (Hershey, PA). While at Penn State, he continued ongoing research related to IBD, infectious colitis and arthritis. His research collaborations resulted in the funding of 15 academic-related grants/contracts with pharmaceutical/biotechnology companies. While at Penn State, Dr. Fitzpatrick collaborated with a German company (4SC AG). This collaboration contributed to the development of Vidofludimus

(a novel immunosuppressive drug), which has entered phase 2 clinical trials for IBD in Europe. He has served on the editorial board of World Journal of Gastrointestinal PathoPhysiology, and Pharmacy & Pharmacology International Journal. Dr. Fitzpatrick has also served on the scientific advisory board for Baxter Health Care. His research interests are in IBD, Infectious Colitis and Rheumatoid Arthritis. He has published 54 original research articles, as well as approximately 70 conference-related abstracts. Dr. Fitzpatrick has taught graduate and medical student classes in pharmacology, immunology and GI PBL at the Penn State College of Medicine, as well as classes in pathophysiology and immunology at the California Northstate University College of Pharmacy.

Dr. Tibebe Woldemariam, PharmBS, PhD

Tibebe Woldemariam is Associate Professor at the California Northstate University College of Pharmacy. He received his B.S. in Pharmacy and Ph.D. in Pharmaceutical Chemistry from Addis Ababa University, Ethiopia and University of Bradford, England, respectively. Before joining CNUCOP, he worked as a Senior Research Chemist at Biotechnology Companies in Massachusetts and California, where he was responsible for the isolation and characterization of bioactive molecules from diverse microbial, plants and plants tissue culture extracts. He began his academic career at King's College London, before he joined California Northstate University College of Pharmacy as an Assistant Professor in 2008. In addition to his regular duties as an associate professor, Dr. Woldemariam works as a community pharmacist to expand his knowledge beyond Medicinal Chemistry and help precept students when needed.

Dr. Suzanne Clark, BS Pharm, PhD

Suzanne Clark, RPh, PhD, is an Associate Professor of Pharmacology at California Northstate University College of Pharmacy and Vice-Chair of the Department of Pharmaceutical & Biomedical Sciences. She received her B.S. from the University of Iowa, her B.S. in Pharmacy from the University of Wyoming, and her Ph.D. in Pharmacology from Duke University. Her graduate research focused on in vitro models of epilepsy, anticonvulsant drug development, and glutamatergic/GABAergic processes. Her post-doctoral research at the Durham Veterans Administration Medical Center/Duke University Medical Center focused on epilepsy and military occupational exposures to neurotoxins and their underlying neurotoxic mechanisms. After completing additional postdoctoral work on AMPA receptors and epilepsy at Colorado State University, she moved to the University of Wyoming School of Pharmacy, where she taught Pathophysiology to PharmD and Nursing students for nine years. She moved to the CNU College of Pharmacy in 2014, where she teaches pharmacology and pathophysiology of the nervous system. She also worked as a hospital and community pharmacist in Colorado and as a specialist at the Duke Poison Control Center. Her interests include neuropharmacology, occupational and environmental public health, pharmacy education, and team-based learning. She was a founding member of the new Pharmacy Special Primary Interest Group in the American Public Health Association. She has included PharmD and Nursing students in many aspects her teaching, research, and service, and has facilitated opportunities for students to receive institutional,

regional and national awards, as well as helping them pursue post-graduate education, academic positions, and public health opportunities.

Dr. Rania Elkeeb, Pharm BS, PhD

Rania Elkeeb is an Assistant Professor in the Department of Pharmaceutical and Biomedical Sciences at the California Northstate University, College of Pharmacy. She received her bachelor degree in Pharmacy from Petra University, Amman Jordan in 1997 and earned her Ph.D in Pharmaceutics and Industrial Pharmacy from Massachusetts College of Pharmacy and Health Sciences, Boston, Massachusetts, in May 2005.

Dr. Elkeeb teaches Biopharmaceutics and Dosage Form, Compounding and Pharmacokinetics. She has also served as an Adjunct Assistant Professor of Pharmaceutical Sciences at the Massachusetts College of Pharmacy, Worcester, Massachusetts and at the Department of Pharmaceutical and Biomedical Sciences at the California Northstate College of Pharmacy prior to joining as fulltime faculty.

She joined Dr. Howard Maibach 's Laboratory "Surge Lab" in the Department of Dermatology, School of Medicine at the University of California San Francisco in 2008 as a Junior Specialist Researcher; where she trained in dermal and ungula drug delivery, dermatopharmacokinetics and onychopharmacokinetics analysis. Dr. Elkeeb continues to collaborate with University of California, School of Medicine, Department of Dermatology in her research in the field of transdermal and ungual drug delivery.

She has published peer-reviewed research articles in both transdermal and ungual drug delivery and is currently serving as an editor member of SciTz Dermatology and a reviewer for the Journal" Current Drug Delivery".

Dr. Nicholas Valley, PhD

With over 10 years of chemical research experience, Dr. Nicholas Valley brings breadth to his work, including interests in computational chemistry, molecular spectroscopy, and interfacial structure and dynamics. As a Postdoctoral Research Associate at the University of Oregon from 2012 – 2015, Dr. Valley focused on the development of methodology for the calculation of vibrational sum frequency spectra of molecules at aqueous interfaces, programming automation of calculation of spectra combining data from classical molecular dynamics and electronic structure methods, and calculating behavioral and spectral properties of environmentally relevant molecules at aqueous interfaces.

In addition to his graduate teaching and research experience at the University of Notre Dame and Northwestern University, Dr. Valley has co-authored numerous publications, including several as first author of record, and is presently a member of American Chemical Society and the Phi Beta Kappa Honor Society.

Dr. Christopher Wostenberg

Dr. Christopher Wostenberg has been tutoring and mentoring students in science and math since he was a sophomore at California State University, Long Beach (CSULB). While at CSULB, Dr. Wostenberg was involved in undergraduate research in the field of organic synthesis under the guidance of Dr. Eric Marinez.

At Pennsylvania State University (PSU), where he entered under a departmental and university fellowship, Dr. Wostenberg's area of study as a graduate student was protein structure and dynamics and their relationship to binding in the lab of Dr. Scott Showalter. While obtaining his PhD in Chemistry at PSU, he served as a teaching assistant for the first semester of organic chemistry. Among his accolades of distinction at PSU are the Paul Berg Prize in Molecular Biology and the Braucher Award for graduate research in Chemistry, both awarded in 2010.

Prior to joining the faculty at California Northstate University in the College of Health Sciences, Dr. Wostenberg was a post-doctoral researcher in the Batey lab at the University of Colorado, Boulder (CU, Boulder) from 2012 - 2015. His research was in the field of biochemistry/biophysics, however, he switched to studying RNA structure and function utilizing riboswitches as a model RNA.

Currently, Dr. Wostenberg is collaborating with the College of Health Sciences faculty members to design chemistry lectures and labs as well as the math placement exam and Introduction to College Math course. Additionally, he is a member of RNA society and the American Chemical Society. His research interests are understanding the role structure and dynamics has on the function of biological macromolecules.

Dr. Hatem Elshabrawy, PharmaBS, PhD

Dr. Hatem Elshabrawy is an Assistant professor of Immunology at California Northstate University, College of Pharmacy. In 2003, he received his B.S. in Pharmacy from Cairo University, Egypt. After earning his B.S., Dr. Elshabrawy taught pharmacy students classes in Immunology, General and Medical Microbiology, Molecular Biology, Cell Biology, Pharmacology, and Medicinal Chemistry. In 2012, Dr. Elshabrawy earned his Ph.D. in Microbiology and Immunology from University of Illinois at Chicago. Dr. Elshabrawy's current research is an extension of his postdoctoral research which focuses on studying the pathogenesis of Rheumatoid Arthritis (RA) and the development of small molecules or antibodies as therapeutics for RA. His research efforts led to 13 original research articles, a patent, and several abstracts in international research conferences. Dr. Elshabrawy serves as an Editor and scientific reviewer for many peer-reviewed journals including Journal of Infectious Diseases, Journal of Leukocyte Biology, Scientific Reports, PLOS ONE, Molecular Medicine, and others.

Learning Outcomes

M.S. in Pharmaceutical Sciences Graduate Program Learning Outcomes (PLOs)

PLO 1: Foundational Knowledge in Pharmaceutical Sciences. Demonstrates the knowledge, skills, attitudes, and ethics that are required as scientists or scientific advocates

1.1. Demonstrate essential knowledge of pharmaceutical sciences needed to advance these sciences

1.2. Evaluate scientific literature and scientific products

PLO 2: Exposure to research instrumentation and laboratory techniques of pharmaceutical sciences

2.1. Demonstrate technical proficiency with basic laboratory techniques for pharmaceutical sciences

2.2. Utilize innovation in research instrumentation and laboratory techniques in basic science and drug discovery/ development

PLO 3: Critical thinking skills and problem-solving abilities

3.1. Demonstrate skillful research design and adaptation

3.2. Apply critical thinking and problem-solving skills to make decisions in developing, testing, and producing pharmaceutical products

PLO 4: Critical writing skills and data presentation abilities

4.1. Demonstrate writing skills needed for a career in pharmaceutical sciences and effective communication of scientific ideas in oral and visual formats appropriate for key audiences

4.2. Work effectively in a collaborative scientific setting and demonstrate appropriate intercommunication skills

PLO 5: Promote scientific and technique development of pharmaceutical sciences

5.1. Demonstrate ability to design mechanism-based drugs

5.2. Utilize scientific and technical skills needed to advance the discovery and management of new drugs and other therapeutic products

Objectives of the program:

- Expand the students' foundation of Basic Pharmaceutical Sciences with emphasis in drug design, drug development or drug delivery.
- Expand the students' pharmaceutical research skills.
- Develop the students' ability to identify problems, formulate hypotheses, plan and execute experiments, analyze data and present results.

Strength of the program:

- Augment the growth of CNU in the area of pharmaceutical sciences
- Bolster interactions between the clinical pharmacologists from COP and clinicians from COM
- Create a translational medical innovation center to enhance CNU programs
- Establish an interdisciplinary program for training new generations of pharmaceutical scientists and regulatory affairs specialists
- Foster scholarly interactions between faculty from different Colleges on drug discovery
- Harness the energy in innovation and translational medical sciences
- Leverage the faculty expertise from the Colleges of Health Sciences, Medicine, and Pharmacy

Additional Scope of the program:

This program also provides advanced training in theory and laboratory- based settings to students opting for higher education in the health-related professions (M.D./Pharm.D, MD/Ph.D., and Pharm.D/Ph.D) and graduate schools (Ph.D.). In addition, this program provides a sufficient foundation in basic pharmacology, molecular biology and biochemistry to allow the students the flexibility to pursue careers in pharmaceutical and biotechnology industries, as well as regulatory affairs.

Program Objectives

The MPS program is designed to provide fundamental knowledge and skills in the pharmaceutical sciences to students who are interested in pursuing careers in academia, the pharmaceutical industry, and government positions after graduation.

Master's Degree Requirements

This proposed M.Sc. program will be completed within two years. There are two tracks, the Thesis-based Track and the Capstone Track (**Table 1**).

Track A (Thesis-based Track): To graduate from the M.Sc. program, students in this track must earn a minimum of 31 credits. In addition to the course requirements, students must pass a written prequalifying examination and complete a thesis.

Track B (Capstone/Course Track): Students in this track must pass a minimum of 31 credits along with successfully completing a written qualifying examination, and a capstone paper that consists of conducting a detailed literature review and analysis on a selected topic in lieu of a thesis.

Table 1. Comparison between Thesis-based Track and Capstone Track

	Plan A: Thesis-based Track	Plan B: Capstone Track
Years	2	2
Credits	31	31
Core Courses	25	21
Electives	6	10
Written Examination	Yes	Yes
Thesis	Yes	Capstone paper

Curriculum Design (Credits, Course Coordinator)

The course codes and course names as well as coordinators/instructors of all courses are listed in **Table 2**.

Track A (Thesis-based Track)

Core Courses (*25 credits*)

- Introduction to Pharmaceutical Sciences (11 credits): Section I (5 credits, Fall), Section II (6 credits)
- Techniques in Pharmaceutical Sciences: Theory and Practice (4 credits): Section I (2 credits, Fall), Section II (2 credits, Fall)
- Biostatistics & Research Methods (3 credits)
- Literature & Technical Writing Skill (3 credits)
- Journal Club and Graduate Seminar (1 credit)
- Research and Thesis (3 credits): Individual faculty advisor

Elective Courses (Minimum requirement: *6 credits*)

- Advanced Topics in Immunology (4 credits)
- Advanced Topics in Medicinal Chemistry (5 credits)
- Advanced Topics in Neuropharmacology (2 credits)
- Advanced Topics in Cardiovascular Pharmacology (3 credits)
- Advanced Topics in Physical Pharmacy (3 credits)
- Cellular and Molecular Biology (5 credits)
- Drug Discovery & Development (3 credits)
- Mechanisms of Drug Toxicity (2 credits)
- Novel Dosage Forms & Delivery (3 credits)

- Pharmacoeconomics (3 credits)
- Pharmacogenetics & Personalized Medicine (2 credits)
- Regulatory Affairs in Pharmaceuticals (3 credits)
- Clinical Toxicology (3 Credits)

Track B (Capstone/Course Track)

Core Courses (*21 credits*)

- Introduction to Pharmaceutical Sciences (11 credits): Section I (5 credits, Fall), Section II (6 credits, Spring)
- Drug Development & Design (3 credits)
- Biostatistics & Research Methods (3 credits)
- Literature & Technical Writing Skill (3 credits)
- Journal Club and Graduate Seminar (1 credit)

Elective Courses (Minimum requirement: *10 credits*)

- Advanced Topics in Immunology (4 credits)
- Advanced Topics in Medicinal Chemistry (5 credits)
- Advanced Topics in Neuropharmacology (2 credits)
- Advanced Topics in Cardiovascular Pharmacology (3 credits)
- Advanced Topics in Physical Pharmacy (3 credits)
- Cellular and Molecular Biology (5 credits)
- Drug Discovery & Development (3 credits)
- Mechanisms of Drug Toxicity (2 credits)
- Novel Dosage Forms & Delivery (3 credits)
- Pharmacoeconomics (3 credits)
- Pharmacogenetics & Personalized Medicine (2 credits)
- Regulatory Affairs in Pharmaceuticals (3 credits)
- Clinical Toxicology (3 Credits)

Table 2. Courses Offered in the Master Degree in Pharmaceutical Sciences Program

Course	Course name	Credit	Coordinator	Instructor
MPS 501	Introduction to Pharmaceutical Sciences	11 for two sections	Section I (5)—Dr. Elkeeb Section II (6)-Dr. Clark	Dr. Atef
MPS 502	Techniques in Pharmaceutical Sciences	4 for two sections	Section I (2)-Dr. Atef Section II (2)-Dr. Jin	Dr. Woldemariam Dr. Vinall
MPS 503	Biostatistics & Research Methods	3	Dr. Kreys	
MPS 504	Literature & Technical Writing Skill	3	Drs. Moczydlowski & Davis	
MPS 505	Journal Club and Graduate Seminar	1	Dr. Fitzpatrick	
MPS 506	Research and Thesis	3	Dr. Jin	Individual faculty advisor
MPS 601	Advanced Topics in Immunology	3	Dr. Elshabrawy	Dr. Fitzpatrick Dr. Gerriets
MPS 602	Advanced Topics in Medicinal Chemistry	5	Dr. Woldemariam	
MPS 603	Advanced Topics in Neuropharmacology	2	Dr. Clark	
MPS 604	Advanced Topics in Cardiovascular Pharmacology	3	Dr. Jin	
MPS 605	Advanced Topics in Physical Pharmacy	3	Dr. Atef	
MPS 606	Cellular & Molecular Biology	5	Dr. Vinall	
MPS 607	Drug Discovery & Development	3	Dr. Fitzpatrick	
MPS 608	Mechanisms of Drug Toxicity	2	Dr. Jin	
MPS 609	Novel Dosage Forms & Delivery	3	Dr. Atef	
MPS 610	Pharmacoeconomics	3		Dr. Cheung
MPS 611	Pharmacogenetics & Personalized Medicine	3	Dr. Gerriets	
MPS 612	Regulatory Affairs in Pharmaceuticals	3	TBD	
MPS 613	Clinical Toxicology	3	Dr. Lackey	

Program Timeline

Tentative Schedule

Fall	Spring	Summer
Year 1		
*MPS 501 (I) Introduction to Pharmaceutical Sciences I	*MPS 501 (II) Introduction to Pharmaceutical Sciences II	MPS 506 Research & Thesis
*MPS 502 (II) Techniques in Pharmaceutical Sciences I	*MPS 502 (II) Techniques in Pharmaceutical Sciences II	
MPS 602Advanced Topics in Medicinal Chemistry	*MPS 503 Biostatistics & Research Methods	
MPS 606 Cellular & Molecular Biology	*MPS 504 Literature & Technical Writing	
*MPS 505 Journal Club and Graduate Seminar	*MPS 505 Journal Club & Graduate Seminar	
Year 2		
MPS 505 Journal Club & Graduate Seminar	MPS 505 Journal Club & Graduate Seminar	
MPS 506 Research & Thesis	MPS 506 Research & Thesis	
MPS 601 Advanced Topics in Immunology	MPS 607 Drug Discovery & Development	
MPS 603 Advanced Topics in Neuropharmacology	MPS 608 Mechanisms of Drug Toxicity	
MPS 604 Advanced Topics in Cardiovascular Pharmacology	MPS 609 Novel Dosage Forms & Delivery	
MPS 605 Advanced Topics in Physical Pharmacy	MPS 610 Pharmacogenetics & Personalized Medicine	
MPS 610 Pharmacoeconomics	MPS 611 Regulatory Affairs in Pharmaceuticals	

*Indicates core courses

Credit Assignment Policy

Per the Credit Assignment Policy, one unit of credit equals one hour of instruction for didactic course each week per semester; for classes containing lab work such as Techniques in Pharmaceutical Sciences (MPS 502), one unit of credit is equal to two hours each week. All courses for MPS are 100% face-to-face on-campus teaching, with the exception of one course: MPS 607: Drug Discovery and Development. This comprehensive course is designed using a hybrid teaching format, combining direct faculty-student interaction and eLearning. MPS 607 is 3-credit course and is divided into two sections: I and II. The first section is online teaching "Making Medicines" provided by a pharmaceutical company. This section is comprised of seven modules and requires approximately 15-20 hours to complete. This is equivalent to one lecture hour per week for a 16-week semester. The second section of this course is on-campus classroom teaching. Dr. Leo Fitzpatrick will instruct the relevant chapters three hours per week for 11 weeks (equivalent to two hours per week for 16 weeks).

For each 15-week semester, one (1) unit of credit is assigned per hour each week of classroom and a minimum of two (2) hours of out-of-class student work (homework). For courses that include workshop and/or laboratory time, one (1) unit of credit is assigned per two (2) hours each week of student time spent in this activity.

Journal Club & Attendance at Seminars and Thesis Presentations

The journal club and graduate seminar are conducted mainly by students, facilitated by the course coordinator. Each week, a student presents a paper related to their research/scholarship interest. The chosen paper will be announced prior to the class and copies provided to all participants. The goal of the journal club is to create an open venue for friendly but lively scientific discussion. Students are encouraged to critically review the paper, and understand how to gauge its impact on the field. Grades will be determined primarily based on the presentation of the student during the course, as well as overall class participation.

Assisting in Research and Teaching

Under the recommendation of faculty members and the advisory committee, research assistantship and teaching assistantship that cover tuition and other expenses are provided to outstanding graduate students with the final approval from the Dean.

MPS Thesis Advisory Committee

This committee, which is recommended by the MPS program Director and approved by the Dean, shall consist of at least three faculty members. All members of the committee shall be members of the Graduate Program Faculty. The student's Major Advisor (Thesis Mentor) typically serves as Chair of the committee.

Thesis Guidelines

The thesis is a vital portion of the curriculum for graduate students choosing the thesis-based track. These students will conduct hands-on, original research in CNU's state-of-the-art laboratories, mentored by faculty with experience in the biomedical and pharmaceutical sciences. Students will select their research topics after consultation with their major advisors. This course will examine student capabilities in scientific literature review, research design, research execution, statistics, result analysis & discussion, and written skills as required to produce a laudable thesis.

Lab-based thesis research starts in the summer of the 1st year and proceeds through the entire 2nd year, with 1 credit in each semester. Students will be evaluated each semester, and their progress monitored closely by their thesis advisors. The components of this course evaluation

include the following comprehensive elements: literature review; experimental design; research performance; statistical analysis; result presentation and discussion, and conclusion.

- Literature review: 5%
- Research design: 20%
- Research performance: 20%
- Statistical analysis: 5%
- Result analysis and expression: 10%
- Discussion: 10%
- Thesis quality: 20%
- Oral presentation: 10%

Final grades for the student thesis will be indicated as Satisfactory (S) or Unsatisfactory (U) without any computation of grade points for the course into the semester or cumulative grade point average (GPA). A Satisfactory score in this course is granted based on the evaluation results with 70% or above. Unsatisfactory for Research & Thesis will be indicated if the net result of evaluation components is less than 70% in two semesters. Extension to the 3rd year for students with "U" grade will be reviewed by the thesis committee and approved by the Dean of College of Graduate Studies. Only one year extension is allowed for students with "U". For details please refer to the Graduate Student Handbook.

Thesis Defense

Defense of thesis is the final step for graduate students on the thesis-based track. This process tests the depth and breadth of knowledge in pharmaceutical sciences, and will assess the overall understanding of scientific inquiry as it relates to the thesis. Students will be expected to justify their decisions in study design and interpretation of data. The advisory committee will make the recommendation based on the quality of thesis, answers to all questions, and other factors. The Dean of College of the Graduate Studies will make the final decision upon the recommendation of committee.

Requirements for Laboratory-based Research

Laboratory research is one of the essential components for graduate students in the Master's program in Pharmaceutical Sciences at California Northstate University (CNU). Any students working in the Lab must abide by the following standards.

1. Students must complete the Collaborative Institutional Training Initiative (CITI) training and relevant biosafety training that are required for the personnel working in the Lab at CNU. CITI is an on-line service program providing research ethics and related modules to faculty, staff, and students working for research projects or courses. Students must present completion certificates to their major advisors prior to self-directed work in the labs. Students must complete and pass the Responsible Conduct of Research course and

the student Biosafety and Biosecurity Course. Additional courses may be recommended or required by their instructors.

2. Students must respect all ethical standards and must observe all federal, state, local, and institutional regulations.
3. Students must abide by all safety regulations while present in the labs, including those regarding appropriate clothing and shoes. Students must wear lab coat, gloves, and other appropriate personal protective equipment when performing procedures in the Lab.
4. Students must follow all standard operating procedures and protocols when conducting research.
5. Students must work in their designated areas. All shared equipment and instruments must be cleaned and stored in their original location after completing experiments.
6. Students must maintain original research records, catalogs, and research materials following good practices. Computer records must be consistent with the notebooks. Students are strongly encouraged to discuss the records and seek approval from the advisors.
7. All packages, containers, buffers and reagents in the Lab must have discernible, compliant labels that include name, date, identity, and sources.
8. Eating, drinking, or smoking in the Lab are strictly prohibited. Violators will be excluded from the research projects or relevant courses.
9. Hand washing with clean, running water is a good practice before leaving the Lab, and is required after certain procedures.
10. It is expected that all students will exercise professionalism and decorum while in the Labs. Horseplay, practical jokes, pranks or other inappropriate or distracting behaviors will result in a loss of Lab privileges and may impact student graduation.
11. Please report all unexpected issues to your advisors or Lab Manager.

Graduate Environment

The size of the master program of Pharmaceutical Sciences fosters a close interaction between the graduate students and the entire faculty. Every effort is made to create an environment of scholarship, creativity and learning, which is the very essence of graduate study. This enhances the quality of student-faculty communications and enriches the academic environment to benefit both learning and discovery. The College of Graduate Studies strongly supports the MPS students interacting with students from College of Pharmacy and College of Medicine.

General Attendance Policy

The MS program will follow University guidelines in attendance policy, which requires mandatory attendance for all students. Specifically, students are expected to attend and participate in all classes, and complete all exams and assessments as scheduled (together defined as "coursework").

However, occasionally an absence from coursework will be unavoidable. The policy described below delineates the circumstances when an absence will be considered excused along with expectations for timely communication with the Course Coordinator and makeup of missed coursework.

A. Approval of Absence

Students should seek approval for an absence from the course coordinator well in advance of the absence if possible, by completing an Excused Absence Request Form. In the case of emergency absence, students should complete and submit the Excused Absence Request Form within 3 business days of returning to campus after the absence. Regardless of whether an absence is excused or unexcused, students are expected to demonstrate professionalism and to follow procedure when requesting an absence.

B. Duration of Absence

A student may request no more than three academic days of excused absences per semester. Absences exceeding five academic days per semester may require a student to request a Leave of Absence or a Withdrawal. Students must contact the Office of Academic Affairs (OAA) if any one absence period exceeds five days to discuss these options.

C. Type of Excused Absence

A student may request an excused absence, from the course coordinator, only for reasons listed below:

- Medical (self or immediate family)
- Military duty
- Immigration & Naturalization
- Jury duty
- Legal
- Bereavement (first degree relative)
- Involvement in traffic accident documented by law enforcement report
- Professional Leave – conferences, invited presentations/posters, competitions, (requires verification of academic standing).

D. Makeup Allowances

Students are responsible for contacting the course coordinator to arrange makeup of coursework, otherwise they will receive a zero grade. A student seeking an excused absence should complete the Excused Absence Request Form and seek the Course Coordinator's signature for each course the student was absent within three business days upon return to courses or campus. The form must then be given to the Dean of Academic Affairs, who will

approve or not the absence request. The OAA will notify the student and course coordinator of the outcome of the absence request.

If an absence is excused, students will be allowed the option to make up missed coursework, rotations, or missed assessments. The nature and type of makeup, makeup time, date, format, duration, and grading is at the sole discretion of the Course Coordinator, but in general Coordinators will draw the following distinction between "high" and "low" stakes assessments/coursework, and professional leave:

- A student who is absent for a "high stakes" exam or other such activity considered high stakes, provided the absence has been excused, will be required and allowed to make up the work.

- If a student is absent for a "low stakes" assessment the Course Coordinator may choose to drop the missed coursework from the gradebook or provide a makeup opportunity.

- A student requesting an absence to attend a professional meeting must demonstrate they are in good academic standing. Requests for professional leave must be submitted at least 10 business days in advance of the professional conference attendance. If attendance coincides with a high stakes exam it is highly likely that the absence will be denied.

Time Limit

The Master in Pharmaceutical Sciences degree is a two year (21-24 months) program. All requirements must be fulfilled within a period of two years following initial registration, although course credit is not nullified until three years after completion of a course. Any student who has not achieved candidacy by the end of their second year will be reviewed by the Thesis Committee for placement on academic probation, regardless of grade point average, and recommendations for progress will be established.

Admission General Information

Requirements for Admission to the M.S. in Pharmaceutical Sciences Program

Critical Date: The deadline to submit an application for Fall 2018 enrollment will be May 1, 2018. All supporting documents must be received prior to May 1, 2018 for Fall 2018 enrollment and official transcripts must be received by 9/30. The online application must be completed fully.

Educational Prerequisites

- A bachelor's degree (B.S. or B.A.) or higher in Biology, Chemistry or relevant science disciplines.
- A cumulative grade point average (GPA) of 2.8 is considered competitive. When evaluating applicants, greater emphasis will be placed on courses that are relevant to our program.
- Completion of the GRE. No minimum requirement for GRE scores- only the General Test is required.
- Completion of an English proficiency test for international students from non-English speaking countries:
    - Minimum TOEFL paper-based test (PBT) score: 550
    - Minimum TOEFL internet-based test (IBT) score: 80
    - Minimum IELTS score: 6.5
    - International applicants are exempt only if you are a native English speaker or have completed at least two years as full-time student at a college or university where English is the primary language of instruction at the time in which you apply.

Requirements and Materials for Applying to M.S. in Pharmaceutical Sciences:

1. Application Fee: $100 for U.S. citizens and permanent residents; $120 for international applicants. Applicants who demonstrate financial need can request an application fee waiver.
2. Personal Statement: Please provide a personal statement describing your professional goals as well as the characteristics you possess that make you a qualified candidate for entry into the Masters of Pharmaceutical Science Program.
3. Official Transcripts: Your academic records from each college-level institution you have attended are required and must be directly submitted from your institution or educational credential evaluators. Canadian applicants and all other foreign applicants must submit a foreign coursework evaluation; CNU accepts evaluations from ECE, IERF, WES, and Education Perspectives.
4. Official GRE General Test scores

5. Official TOEFL scores for international applicants
6. Three Letters of Recommendation: At least two letters must be submitted from faculty members who are knowledgeable about your academic capabilities and interests. You will be asked to list the names and contact information for these references as well. They will each receive instructions for uploading their letter of recommendation.

Additional Admission Requirements

Applicants are strongly encouraged to communicate with potential CNU research advisors listed in the graduate program prior to the admissions process. It is important to identify a research mentor and anticipated area of research prior to beginning the program. Formal research laboratory rotations with faculty members will be implemented after your admission. Onsite interviews are also provided to enable applicants to familiarize themselves with CNU faculty and their research areas.

Nondiscrimination Policy

California Northstate University (CNU) is committed to cultivating a diverse community that recognizes and values inherent worth in individuals, fosters mutual respect, and encourages individual growth. The University believes that diversity enhances and enriches the quality of our academic program. CNU provides equal opportunity in education and employment and does not discriminate on the basis of race, color, creed, religion, national origin, ethnicity, gender identity, gender expression, age, sexual orientation, political affiliation, veteran status, or disability.