***Twin Cities Campus***

# Experimental and Clinical Pharmacology M.S.

*Experimental and Clinical Pharmacology*

**College of Pharmacy**

Link to a list of faculty for this program.

**Contact Information:**
Department of Experimental and Clinical Pharmacology, University of Minnesota College of Pharmacy, 7-115 Weaver-Densford Hall, 308 Harvard Street S.E., Minneapolis, MN 55455 (612-625-2160)
Email: grad-ecp@umn.edu
Website: https://z.umn.edu/ecpgrad

- Program Type: Master's
- Requirements for this program are current for Fall 2019
- Length of program in credits: 34
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the General Information section of the catalog website for requirements that apply to all major fields.

The Experimental and Clinical Pharmacology (ECP) graduate program was designed specifically for students interested in clinical research. Its goal is to advance the science of human pharmacology and therapeutics to improve the safe, effective, and economical use of drugs by patients.

Students study such topics as experimental pharmacotherapy, drug metabolism, infectious disease, neuroscience/neuropharmacology, pharmacometrics, and pharmacogenomics. Graduates are prepared for distinguished careers in clinical research.

## Program Delivery

This program is available:

- via classroom (the majority of instruction is face-to-face)

## Prerequisites for Admission

The preferred undergraduate GPA for admittance to the program is 3.00.

A U.S. bachelor's degree or a comparable foreign degree from a recognized college or university is required.

Preference is given to candidates who have had professionally-related pharmacy education, but those from other fields such as biology, chemistry, statistics, and public health will be considered.

Other requirements to be completed before admission:
All international students who are non-English speakers are required to submit TOEFL scores. TOEFL test date must be within 2 years of program start. However, applicants who have completed 24 quarter credits or 16 semester credits within the past 24 months in residence as full-time students at recognized institutions of higher learning in the United States or other English-speaking countries before entering the University of Minnesota are generally exempted from this requirement. GRE required by all students except for applicants that have completed a PharmD at a U.S.-accredited institution.

**Special Application Requirements:**
Students are generally admitted to the ECP program for fall semester only. All application materials should be submitted by the admissions deadline listed on the departmental website. Applications received after the application deadline will be considered on a space-available basis only.

Application to the ECP program at the University of Minnesota is done entirely online. A supplemental departmental application form is also required. Applicants should upload it directly to the online application system.

International applicants must submit score(s) from one of the following tests:

- TOEFL
  - Internet Based - Total Score: 79
  - Internet Based - Writing Score: 21
  - Internet Based - Reading Score: 19

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The preferred English language test is Test of English as Foreign Language

Key to test abbreviations(TOEFL).

For an online application or for more information about graduate education admissions, see the General Information section of the catalog website.

## Program Requirements

**Plan A:** Plan A requires 24 major credits, up to null credits outside the major, and 10 thesis credits.The final exam is oral.

**Plan B:** Plan B requires 34 major credits and up to null credits outside the major.The final exam is oral.

This program may be completed with a minor.

Use of 4xxx courses toward program requirements is permitted under certain conditions with adviser approval.

A minimum GPA of 3.00 is required for students to remain in good standing.

At least 2 semesters must be completed before filing a Degree Program Form.

**Required Courses (10 credits)**

-Students admitted fall 2017 and fall 2018: Take ECP 5220 and 8230 (2 credits each), ECP 8100 twice (2 credits total) and ECP 8992 four times (4 credits total) to meet the 10-credit minimum.
ECP 5220 - Regulatory Issues in Drug Research (2.0 cr)
ECP 8100 - Seminar (1.0 cr)
ECP 8230 - Principles of Clinical Pharmacology (2.0 cr)
ECP 8992 - Directed Readings in Experimental and Clinical Pharmacology (1.0 cr)

**Statistical Analysis (4 credits)**

Select at least one of the following courses in consultation with the advisor. Two courses are preferred and will count towards Electives or Focus Area.
PUBH 6450 - Biostatistics I (4.0 cr)
*or* PUBH 6451 - Biostatistics II (4.0 cr)
*or* STAT 5101 - Theory of Statistics I (4.0 cr)
*or* STAT 5102 - Theory of Statistics II (4.0 cr)

**Electives**

Select electives, in consultation with the director of graduate studies and/or the advisor, to complete the master's minimum credit requirement.
ANAT 5xxx
ANAT 6xxx
ANAT 7xxx
ANSC 5xxx
ANSC 8xxx
BBE 5xxx
BBE 8xxx
BICB 5xxx
BICB 8xxx
BINF 5xxx
BIOC 5xxx
BIOC 6xxx
BIOL 5xxx
BIOL 6xxx
BIOL 8xxx
BMEN 5xxx
BMEN 8xxx
BMSC 8xxx
BTHX 5xxx
BTHX 8xxx
CGSC 8xxx
CHEM 5xxx
CHEM 8xxx
CLS 5xxx

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CLS 8xxx
CMB 5xxx
CMB 8xxx
ECHO 4xxx
ECP 5xxx
ECP 8xxx
EEB 5xxx
EEB 8xxx
GCD 5xxx
GCD 6xxx
GCD 8xxx
HINF 5xxx
HINF 8xxx
MATH 5xxx
MATH 8xxx
MCDG 8xxx
MEDC 5xxx
MEDC 8xxx
MICA 8xxx
NSC 5xxx
NSC 8xxx
NSCI 5xxx
NSCI 6xxx
NURS 5xxx
NURS 6xxx
NURS 7xxx
NURS 8xxx
PHAR 5xxx
PHAR 6xxx
PHAR 7xxx
PHCL 5xxx
PHCL 8xxx
PHM 5xxx
PHM 6xxx
PHM 8xxx
PHSL 5xxx
PHSL 6xxx
PHSL 8xxx
PUBH 5xxx
PUBH 6xxx
PUBH 7xxx
PUBH 8xxx
SAPH 5xxx
SAPH 8xxx
SCB 5xxx
SCB 8xxx
SCIC 8xxx
STAT 5xxx
STAT 8xxx
TXCL 5xxx
TXCL 8xxx
VMED 5xxx
VMED 8xxx
BIOC 8xxx

**Focus Areas**

**Plan A**

Take exactly 10 credit(s) from the following:

•ECP 8777 - Thesis Credits: Master's (1.0 - 18.0 cr)

*-OR-*

**Plan B**

Take 10 project credits.

ECP 8776 - Project Credits: Master's Plan B (1.0 - 18.0 cr)

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*-OR-*

**Focus Area -- Pharmacometrics (10 credits)**

Coursework chosen from the following list, or other courses to meet the 10-credit focus area requirement, are selected in consultation with the advisor.

ECP 8500 - Advances in Pharmacometrics Modeling and Simulation (1.0 cr)
*or* ECP 8501 - Pharmacometrics (2.0 cr)
*or* ECP 8502 - Introductory Population Pharmacokinetic Methods (2.0 cr)
*or* ECP 8503 - Intermediate Population PK/PD Methods (2.0 cr)
*or* ECP 8504 - Modeling Biologics (2.0 cr)
*or* ECP 8505 - Application of physiological-based pharmacokinetic modeling(PBPK) to model-informed drug development (2.0 cr)
*or* ECP 8506 - Clinical Trial Simulation (2.0 cr)
*or* PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)
*or* PUBH 7430 - Statistical Methods for Correlated Data (3.0 cr)
*or* PUBH 7440 - Introduction to Bayesian Analysis (3.0 cr)
*or* PUBH 7450 - Survival Analysis (3.0 cr)
*or* STAT 5101 - Theory of Statistics I (4.0 cr)
*or* STAT 5102 - Theory of Statistics II (4.0 cr)

*-OR-*

**Focus Area -- Neuroscience/Neuropharmacology (10 credits)**

Coursework chosen from the following list, or other courses to meet the 10-credit focus area requirement, are selected in consultation with the advisor.

NSC 5461 - Cellular and Molecular Neuroscience (3.0 cr)
*or* NSCI 5501 - Neurodegenerative Diseases, Mechanisms to Therapies (3.0 cr)
*or* PUBH 6450 - Biostatistics I (4.0 cr)
*or* PUBH 6451 - Biostatistics II (4.0 cr)
*or* PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)
*or* **Neuro-Immune Interactions**
CMB 8361 - Neuro-Immune Interactions (3.0 cr)
*or* NSC 8026 - Neuro-Immune Interactions (3.0 cr)
*or* PHCL 8026 - Neuro-Immune Interactions (3.0 cr)
*or* **Advanced Neuropharmaceutics**
CMB 8481 - Advanced Neuropharmaceutics (4.0 cr)
*or* NSC 8481 - Advanced Neuropharmaceutics (4.0 cr)
*or* PHM 8481 - Advanced Neuropharmaceutics (4.0 cr)

*-OR-*

**Focus Area -- Infectious Diseases (10 credits)**

Coursework chosen from the following list, or other courses to meet the 10-credit focus area requirement, are selected in consultation with the advisor.

ECP 5620 - Drug Metabolism and Disposition (3.0 cr)
*or* MICA 8002 - Structure, Function, and Genetics of Bacteria and Viruses (4.0 cr)
*or* MICA 8003 - Immunity and Immunopathology (4.0 cr)
*or* MICA 8010 - Microbial Pathogenesis (3.0 cr)
*or* PHAR 6224 - Advanced Pharmacogenomics and Precision Medicine (2.0 cr)
*or* PUBH 6450 - Biostatistics I (4.0 cr)
*or* PUBH 6451 - Biostatistics II (4.0 cr)
*or* PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)

*-OR-*

**Focus Area -- Pharmacogenomics (10 credits)**

Coursework chosen from the following list, or other courses to meet the 10-credit focus area requirement, are selected in consultation with the advisor.

ECP 5620 - Drug Metabolism and Disposition (3.0 cr)
*or* ECP 8900 - Advanced Topics in Experimental and Clinical Pharmacology (1.0 - 4.0 cr)
*or* GCD 4034 - Molecular Genetics and Genomics (3.0 cr)
*or* GCD 4143 - Human Genetics and Genomics (3.0 cr)
*or* GCD 8073 - Genetics & Genomics in Human Health (2.0 cr)
*or* PHAR 6224 - Advanced Pharmacogenomics and Precision Medicine (2.0 cr)
*or* PUBH 6381 - Genetics in Public Health in the Age of Precision Medicine (2.0 cr)
*or* PUBH 6450 - Biostatistics I (4.0 cr)
*or* PUBH 6451 - Biostatistics II (4.0 cr)
*or* PUBH 7420 - Clinical Trials: Design, Implementation, and Analysis (3.0 cr)

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